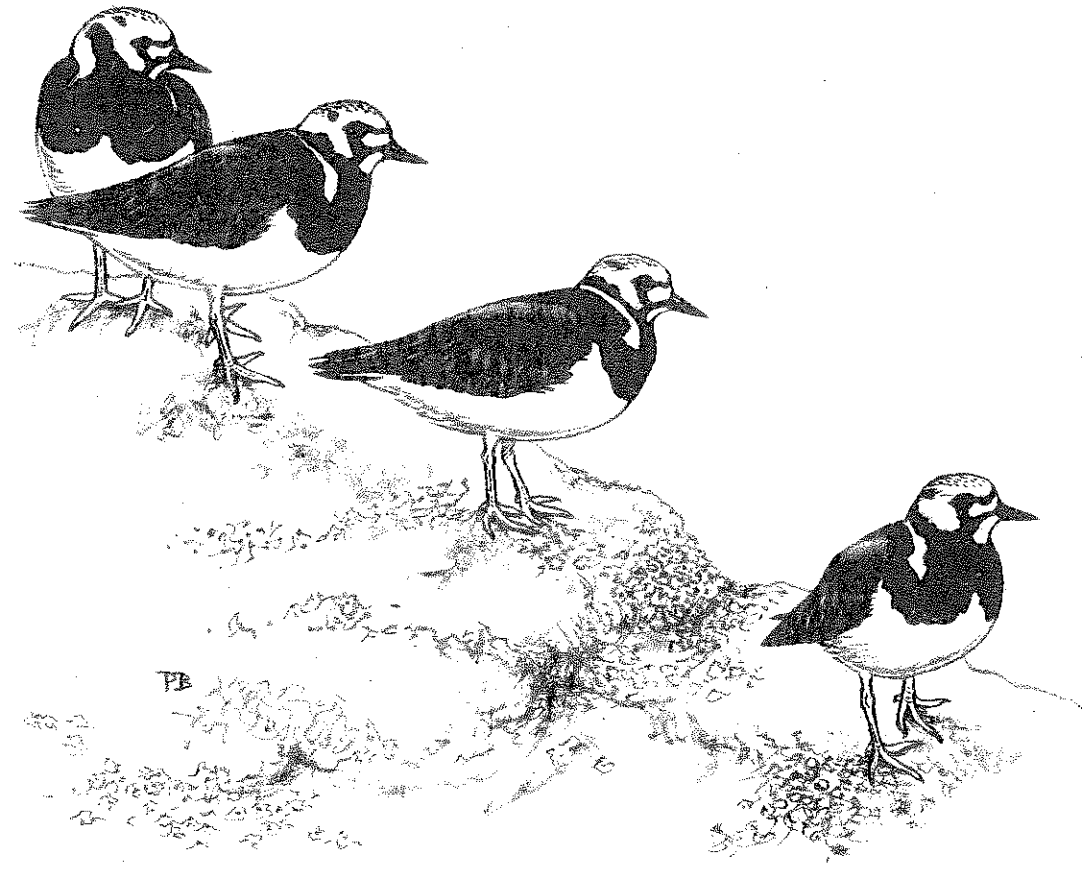

WILDFOWL AND WADER COUNTS 1989-90

Wildfowl and Wader Counts

1989 - 1990

The Results
of the National Wildfowl Counts
and Birds of Estuaries Enquiry
in the United Kingdom

By

J.S. Kirby, R.J. Waters and R.P. Prys-Jones

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This booklet represents the eleventh combined report of the National Wildfowl Counts and the Birds of Estuaries Enquiry and is based on count information supplied by many thousands of volunteer ornithologists. The national overview presented here, so critical to the conservation of bird populations in Britain and elsewhere, is only possible with the help of these people. We owe them an immense debt of gratitude.

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CONTENTS

WINTER WEATHER IN 1989-90

The autumn and winter (September to March) of 1989-90 was generally very mild with mean monthly temperatures close to or above normal in most parts of the UK. The period was also very wet and extensive flooding occurred at times during the winter.

September was generally fairly settled, warm and dry, though heavy thunderstorms featured during the middle of the month in many parts of south-east England. Mean monthly temperatures were above normal in England and Wales, due to rather high night-time temperatures, and were near normal in Scotland and Northern Ireland. Wind speeds were generally low and directions were variable during the month.

Though beginning settled, the weather in October gradually worsened, becoming very windy and very wet later in the month, particularly in southern England and Wales. Winds were mainly southerly or westerly, but north-westerly at times. Mean monthly temperatures were above normal. Snow or sleet fell on one or two days in the first half of the month in the far north of Scotland.

The unsettled weather of the last two weeks of October continued into the first ten days or so of November, with some further heavy rain. Towards mid-month, settled weather gradually became established over the whole of the UK, although bringing with it periods of widespread fog. Wind speeds were generally low and directions were southerly, variable or westerly at first, then easterly or variable in the latter half of the month. Mean monthly temperatures were generally near normal, though it was rather cool in many central and south-eastern areas of England. There was little snow or sleet.

December was mostly settled and dry with fog and frost at times until mid-month. There followed a period of very wet and at times windy weather. Strong winds from the south or south-west combined with an exceptionally high tides on the 14th to bring widespread flooding to many places on the south coast. Thunderstorms and heavy rain did little to allieviate the situation during the rest of the month. Wind directions were mostly variable or easterly until the 15th, southerly or westerly until the 26th, then mainly easterly. Mean monthly temperatures were below normal in the north, especially in the north of Scotland, and on the 13th snow fell in areas as far south as the Midlands and was very deep in places.

Such unsettled weather continued into January with periods of heavy rain prevailing. The month was generally very windy, especially on the 25th when a great deal of structural damage was done and a large number of trees brought down. Wind directions were predominantly south-westerly. Heavy snow falls occurred in Scotland from the 17th and in northern England, the Midlands and North Wales from the 24th. The snow was locally very deep at times.

February was also mostly unsettled with heavy rain at times, causing flooding in southern and north-western England and North Wales. Strong winds and spring tides combined on the 26th and 27th to cause severe flooding along several British coasts. The month was very windy with strong winds on over half of the days, blowing mainly from the south-west. Mean monthly temperatures were again above normal. Snow and sleet showers occurred sporadically throughout the month.

In western Scotland, the month of March was generally wet, but it was dry and mild in southern and eastern areas of Britain and in Northern Ireland. It was windy from time to time during the month, with the winds originating mainly in the south or west. Mean monthly temperatures were above normal in all areas of the UK. There were heavy snow falls in Scotland and northern England early in the month.

INTERPRETATION OF WATERFOWL COUNTS

A word of caution is perhaps necessary regarding the uses to which waterfowl counts can correctly be applied and the limitations of these data, especially in the summary form which, of necessity, is used in this booklet. The primary aim here is the rapid feedback of key results to the many participants in both the NWC and BoEE count schemes. The data are preliminary in the sense that they are uncorrected for differences in site coverage and count quality and, in the current form, they should not be used for population trend analysis. Persons requiring to make use of such data for research or site assessment purposes may obtain more detailed information from the appropriate headquarters.

Explanation of the basis for the qualifying levels used for defining both the international and national importance of sites is provided in Appendix 1. Note that, at present, the sites in Northern Ireland are considered in terms of what are strictly British qualifying levels; hence use of the term "national importance" for these is an anomaly which will require clarification when Irish data become available. In the "Species Accounts" and "Principal Sites" sections, it is necessary to bear in mind the distinction between sites regularly (i.e. based on five-year averages) holding wintering populations of national/international importance and those which may merely happen to exceed the appropriate qualifying levels in occasional winters. Also, the ranking of sites according to the total numbers of birds they support (Tables 6 & 54) should not be taken as a rank order of the conservation importance of these sites. This is because certain sites, perhaps low down in terms of their total numbers, may nevertheless be of critical importance to certain species or populations. Furthermore, more sites would be considered to be internationally important in view of their total bird populations than is apparent from the tables, as the 20,000 qualifying level refers to total waterfowl rather than just wildfowl or waders alone.

Peak counts based on monthly 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, some site data presented here derive from single counts during 1989-90. Similarly, peak counts from several winters should be used in preference to information from a smaller number of years, as the peak counts made in certain years may be unreliable due to gaps in coverage and disturbance- or weather-induced problems. The movement of birds between closely adjacent sites, sometimes corresponding with the dates of counts, may lead to altered assessments of a site's importance for a particular species. More counts than those made during a single monthly visit are necessary to assess accurately the true relative importance of each site.

IMPORTANT NOTICES

It has become very noticeable over recent years that there are increasingly long delays in getting all count information to headquarters (of both the WWT and BTO). Such delays not only make life difficult for local organizers, who have a considerable amount of voluntary paper-work to do, but usually mean that the analyses presented here are less complete than they could be and are completed in haste, in order to get this booklet to you within a reasonable time period. So, please, return your counts to the appropriate local organizer immediately after your last count of the season and in this way help to speed up the process. Many thanks.

The following changes to the WWT's Regional Organizers have occurred since the production of the July 1990 newsletter:

Greater London: V. Chambers, Woodlands, 6 Brookside Avenue, Wraysbury, Staines, Middlesex, TW19 5HB; Norfolk: L. Street, Ashtree Farm, Breydon Marine, Burgh Castle, Great Yarmouth, NR31 9PZ; North Humberside/North Yorkshire (Malton-Scarborough-Driffield): B. Pashby, 10 Ambrey Close, Hunmanby, Filey, N. Yorkshire, YO14 0LZ; North Humberside (see above): G. Bennett, Kingsfield, Stawberry, Gardens, Hornsea, HU18 1US; Gwent: C. Jones, 283 Malpas Road, Newport; Glamorgan: H. Harrop, 28 Heol Rhayader, Whitchurch, Cardiff, South Glamorgan, CF4 2DH.

WILDFOWL

By J.S.Kirby

The National Wildfowl Counts (NWC) Programme receives financial support from the Nature Conservancy Council (NCC) and the Department of the Environment for Northern Ireland (DoENI), and is organized by staff from The Wildfowl & Wetlands Trust's (WWT) headquarters in Slimbridge, Gloucestershire. Many thousands of volunteer ornithologists throughout the United Kingdom take part, and the success of the programme to date accurately reflects their enthusiasm and dedication. Instigated in 1947, the core activity in the counts programme comprises once-monthly counts of swans, geese, ducks and co-incident wetland species (currently divers, grebes, Cormorant and Coot), on a wide variety of wetland habitats including estuaries and coastal bays, reservoirs, lochs/loughs, gravel pits, freshwater marshes, rivers, canals and ponds. Most counts take place during the autumn and winter period, from September until March, although valuable information from other times of the year is currently also received. To complement the monthly counts, additional surveys of certain swans and geese are organized in most years, as some species prove difficult to census completely by the monthly counts alone. Also 'Special Surveys' of breeding and moulting waterfowl are carried out. The WWT works closely with the British Trust for Ornithology (BTO), as both organizations collect information on the waterfowl occupying coastal sites. Results from the Birds of Estuaries Enquiry (BoEE) for 1989-90 are presented in the second part of this booklet.

PROGRESS AND DEVELOPMENTS

There has been much progress and development of the NWC programme in 1989-90 which reflects, at least in part, a desire to become more efficient in what we do, and to do more to research and conserve wetland birds and their habitats. By far the most significant change during this period came as an indirect result of the strengthening of the Trust's fund-raising department, who successfully 'robbed' the NWC programme of David Salmon after 17 years of devoted service and absolute dedication to the cause. Thankfully though, David remains at Slimbridge, and appears always willing, at least so far, to offer solutions to problems that he has probably encountered on numerous occasions before! Thank you David, and good luck in your new role. Thus, as from March 1990, I stand as David's successor and have overall responsibility for the WWT's waterfowl monitoring programme.

In order to organize the work of the NWC programme efficiently, we established a 'Counts & Surveys Unit' in May 1990, the staff of which have responsibility for three closely-related areas of the Trust's work: (a) monthly wildfowl counts and additional autumn/winter surveys of swans and geese (Basic Monitoring); (b) additional breeding season and moulting surveys (Special Surveys); and, (c) detailed surveys of individual localities or regions (Special Projects). In order to cope with this extensive workload, staffing of the Unit has increased from just two members in March (Jeff Kirby and Simon Delany) to four full-time members plus a temporary helper and a student researcher by September 1990. Thus, we welcomed Peter Cranswick, Bill Haines, Dave Remmer and John Quinn.

The basic monitoring of wildfowl and related species through the monthly counts remained, as ever, a high priority during 1989-90. Summarized results from this, the 43rd consecutive season of counts, form the 'backbone' of this report. In order to improve the standardization of counts at coastal sites and ensure total compatibility between count information held by both the WWT and the BTO, a new combined BoEE/NWC recording form was introduced for use at coastal sites. Not only does this form ensure consistency between organizations, but it provides for the collection of standardized information on the extent of coverage achieved for each count, on count conditions and on disturbance factors, and it greatly facilitates the collation and computerization of count data at the level of individual sections of sites. Improvements to the way NWC data are accessed and used are being addressed by Peter Cranswick who joined the Unit in July 1990, thanks to additional financial support from the NCC. Peter's twelve month project will establish the relationships between the counting units used by volunteers participating in the NWCs and the BoEE, and relate these to statutory (governmental) site

designations (e.g. Sites of Special Scientific Interest, Ramsar sites etc.). In the first instance, only 500 selected wetlands are being considered in this project, and Peter is establishing computer files and computerized maps which show clearly how the various units relate to each other. This represents an important piece of work which will greatly facilitate the standardization and interpretation of wildfowl count data, and will hopefully be extended to include all wetlands counted regularly in the NWC programme in due course. Further improvements concerned with the administration of the NWC scheme are being tackled by Bill Haines, who joined the Unit on a four month WWT funded contract in August 1990. Bill is improving both our paper-based and our computer-based filing systems, allowing for speedier retrieval of original count forms and associated, site-based information (e.g. maps, habitat details, counters' names etc.). Such developments represent a first step towards the establishment of more efficient data-management systems which will ultimately be to the benefit of both contributors and users of NWC information.

Monthly wildfowl counts alone do not provide complete census data for a number of goose species which tend to feed away from wetlands during the day (and are thus missed by day-time counts) and/or occupy remote areas which are visited only irregularly. Therefore, the WWT has for many years organized supplementary surveys for appropriate species on an annual basis. Goose surveys conducted in 1989-90, in all cases involving assessments of total numbers, distribution and breeding success, included the following: surveys of both Pink-footed and Icelandic Greylag Geese throughout Britain in November (Kirby & Salmon 1990a) and in late March/early April (Kirby & Shimmings 1990); a complete census of Greenland White-fronted Geese organized by the Irish Wildlife Service and the Greenland White-fronted Goose Study (GWGS 1990); a complete census of native Greylag Geese on the Uists (Western Isles) in November; censuses of Greenland breeding Barnacle Geese wintering on Islay in December and February, and almost daily counts of Svalbard breeding Barnacle Geese wintering at Caerlaverock; autumn age-counts of Dark-bellied Brent Geese at a sample of British sites (Salmon 1989) and complete censuses of the British population in January and February 1990 (Kirby & Salmon 1990b). Further details of these surveys appear in the "Species Accounts" given below.

Regarding goose surveys, Kirby (1990a) documented the history and current procedures adopted for the census of Pink-footed and Icelandic Greylag Geese in Britain, and suggested ways of improving the census and maximizing the value of information gained from it. Such changes are considered necessary in order to successfully census these rapidly expanding populations. A number of the recommendations proposed were implemented in time for the autumn surveys in 1990, including a re-organization of the mechanisms by which the census is co-ordinated in the field, an extension of data collection into Iceland and investigations of the optimal time to census each population (with October counts being carried out in addition to the usual November count). Furthermore, new analyses of data collected during this census are underway. Bill Haines aims to investigate to what extent traditional spring concentrations occur and whether these differ from autumn/winter concentrations. Similar data from autumn and winter are being analyzed by Dave Remmer, a research student from Bristol Polytechnic who joined the Unit in September 1990, with the aim of defining goose sites and investigating both within-winter and between-winter changes in distribution.

Simon Delany joined the Trust in September 1989 and is primarily responsible for our programme of Special Surveys. To date, this has largely involved organization of the 1990 survey of breeding Mute Swans in Britain, a collaborative project involving the BTO and the Scottish Ornithologists' Club (SOC); preliminary results have been produced recently (Delany 1990a). In summer and autumn 1990, Simon also organized pilot surveys of breeding Shelducks in preparation for a national survey in 1992. This involved the testing of field methodology by WWT staff on the Severn Estuary for the third year in succession (see Fox & Salmon 1989a), and trial fieldwork at 18 other resorts in Britain by volunteers. Focussing on the same species, research student Emma Linton comprehensively reviewed the occurrence and expansion of inland breeding Shelduck in Britain using NWC and bird report information (Linton 1990, Linton & Fox, In press.). Further Special Surveys organized in 1989-90 and currently underway include an assessment of the total number of wintering Whooper Swans in Britain, Ireland and Iceland in January 1991, a repeat of the 1986 survey (Salmon & Black 1986), and investigations concerning habitat utilization by wintering Whooper, Bewick's and Mute Swans. Plans for further Special Surveys in the immediate future include a census of breeding/moulting Canada and Greylag Geese in 1991, and an assessment of the size of the Irish breeding Mute Swan population, in collaboration with the BTO and Irish Wildbird Conservancy (IWC), in summer 1992.

The appointment of John Quinn in August 1990, our Special Projects Officer, was made

possible by an 18-month contract awarded to the Trust's Wetlands Advisory Service by North West Water (NWW). John has been organizing additional autumn/winter counts in 1990-91 at approximately 200 reservoirs owned or leased by NWW, and has begun comprehensive analyses in order to assess the ornithological significance of each site and to relate the communities present to environmental and management characteristics. Further work for NWW will include a survey of breeding waterfowl at the same sites in 1991. Finally, recommendations will be made concerning the enhancement of the value of particular sites for wetland birds. We hope that this study represents the first in a long series of Special Projects to be undertaken by the Unit in years to come.

Other site-based studies undertaken in 1989-90 have included regular counts of the Somerset Levels for the second year running (Delany 1990b), and mid-week monthly counts of the 100 or so gravel pits comprising the Cotswold Water Park (Delany 1990c), again for the second year in succession. The Levels constitute one of the last extensive areas of wet grazing meadows in lowland England, whilst the Water Park is subjected to numerous development proposals and is, at times, particularly prone to high levels of human disturbance. Up-to-date count information on both sites is essential to ensure their continued importance.

RESEARCH, CONSERVATION AND MANAGEMENT

Information from the NWC programme continued to feature prominently in many Trust publications during 1989-90. Most of these are mentioned in the "Species Accounts" section but extensive contributions to a number of 'land-mark' seminars, workshops and topical reviews would seem worthy of special mention here.

Though taking place some time ago now, the proceedings of the International Symposium on Western Palearctic Geese, held in February 1989 at Kleve in the then Federal Republic of Germany, are soon to appear in the Dutch journal *Ardea*. Over 200 participants heard more than 50 presentations and scrutinized a similar number of posters that detailed the current status and management of geese in the region. Presentations by the WWT (and collaborators) included a review of the current status of Barnacle Geese in Svalbard and of their behaviour at staging areas in spring; a review of the Dark-bellied Brent Goose population in Britain; and, results of studies concerning the impact of native Greylags on crofting agriculture in the Uists, the relationship between breeding success in Greenland Barnacle Geese and meteorological conditions, and of site fidelity in Greenland White-fronted Geese. The proceedings of this meeting will be of considerable value to all interested in geese, their management and conservation.

Even further afield, Astrakhan, situated on the Volga Delta (USSR), was the venue for the International Waterfowl and Wetlands Research Bureau's (IWRB) symposium on Managing Waterfowl Populations in early October 1989. The proceedings from this remarkable conference have recently appeared (Matthews 1990) and contain a fascinating mix of interesting papers including many reports from the USSR. WWT contributors presented results concerning recent trends in Western Palearctic waterfowl, together with IWRB (Pirot & Fox 1990), and a review of that ever topical issue, shooting disturbance (Bell & Owen 1990).

There are three swan species and some nine populations of swans in the Western Palearctic and they appear to be relatively stable in numbers in NW Europe, with no significant or widespread declines (Pirot & Fox 1990). The region's geese comprise 24 more or less well defined populations of nine species, and intensive goose counts have shown that overall numbers have almost doubled over the last 20 years. In NW Europe, most goose populations are either stable or increasing, with the exception of the Lesser White-fronted Goose and the Light-bellied Brent Goose. Most populations of NW European wintering ducks and Coot, amounting to 7.5 and 1.5 million birds respectively, appear to be stable, except for the Shoveler which shows marked decreases in both France and Great Britain. In the Mediterranean region, however, there are indications of serious declines, affecting 5.3 million ducks and 2.5 million Coot (Pirot & Fox 1990). Shooting disturbance influences the behaviour and distribution of wildfowl, but it is difficult to quantify its actual impacts on individuals and, especially, on populations (Bell & Owen 1990). Different species show widely different sensitivity to disturbance. In general, diving ducks are least vulnerable not only because they gather their daily energy in rather a short time period but because they spend their day-time roosting on water. They are less likely to be influenced by shore-based shooting disturbance because they feed in deep water, often at night. However, they are prone to disturbance from boats. Grazing estuarine wildfowl are more likely to be disturbed

because they tend to feed in intertidal areas where hunting is prevalent. Networks of refuges not only reduce harvest rates of waterfowl but provide places where at least a proportion of the population can feed unmolested. The provision of refuges has become a cornerstone of wildfowl management and conservation (Bell & Owen 1990).

The third International Swan Symposium was held in Oxford in December 1989 and was attended by some 120 delegates. Numerous studies were reported with contributions being organized into sessions on distribution, migration, population studies, habitats, food and feeding, breeding, management and conservation. Not surprisingly, given the many years of pioneering swan research that has emanated from Slimbridge, the Trust had a number of contributions to make, including papers on the distribution within the USSR of Bewick's Swans colour-marked in Britain, and investigations into the activities of this species at a migratory site in the Estonian SSR. Full proceedings of the meeting will be published as a supplement to the Trust's journal *Wildfowl* early in 1991.

The launch of 'Protecting Internationally Important Bird Sites' (Stroud *et al.* 1990) by the NCC in March provides a fitting tribute to the many thousands of volunteer ornithologists who have contributed to waterfowl counts in Britain over the years. This comprehensive document presents detailed information on identified sites of international importance, on the rationale for their selection, and provides background information on the populations, status and habitats of selected rare/vulnerable/migratory species that occur regularly in Britain. Designations of sites as Special Protection Areas (SPAs) should have been made in 1981 but have been delayed and, in 1988, the NCC was asked by UK Government to review the extent to which the presently proposed suite of SPAs can fulfil its commitment under the EC Council Directive on the Conservation of Wild Birds (1979). This publication is the result of this request and should greatly facilitate long awaited designations by Government to ensure that all appropriate areas gain the international protection that they deserve. The potential problems caused by expanding goose populations, in particular the concentration of large numbers of birds into relatively small areas of farmland, received much attention during the Astrakhan meeting in late 1989. In Britain, this important theme was re-kindled, through initiatives of the Trust (see Owen 1990) and the NCC, and a workshop was held at Martin Mere in April 1990. The workshop was called to discuss such problems and involved farmers, the licensing authorities and a number of scientists who had been involved in goose damage assessments. Its proceedings and conclusions will appear in an NCC publication in early 1991. Each of the nine goose populations involved in Britain requires a different approach to conservation management, due to wide differences in abundance, behaviour and feeding habits. Some farmers in some areas do suffer considerable losses to geese but the quantification of loss is imprecise and expensive, meaning that compensation on a case-by-case basis will not work. Widescale shooting is not publicly acceptable. Thus geese must be accommodated in the agricultural landscape. Small, concentrated populations, such as the Svalbard Barnacle Goose, could be retained on intensively managed nature reserves. Medium sized concentrated populations (e.g. Dark-Bellied Brent Geese), may benefit from managed areas under SSSI designation, set-aside or countryside premium schemes. The large, dispersed populations (e.g. Pink-footed Geese) pose greater problems for they range over extensive areas. Designation of large areas as Environmentally Sensitive Areas (ESA), within which a farmer could accept payments to tolerate geese, or opt out and bear the losses or costs of preventing them, could provide the solution. The mood of the meeting was optimistic, though continued dialogue and close liaison will be necessary to enable progress towards potential solutions for goose-damage problems. Other countries face similar difficulties. In The Netherlands, for example, where the Government is paying considerable amounts of compensation to farmers (see Groot Bruinderink 1989), research is currently aimed at minimizing goose damage by altering land use in agricultural areas and restoring original habitats for wintering geese (Van Eerden 1990). A similar workshop dealing with international problems is planned for 1991.

Finally, Strangford Lough, that large and almost land-locked wetland to the south-east of Belfast, has been the focus of much recent attention. Declines in its waterfowl populations, and excessive levels of largely un-controlled shooting disturbance, stimulated the Strangford Lough Committee to implement a major review of the management of the Lough. This task was managed by IWRB under contract to the National Trust, who enlisted the help of an independent review coordinator, Dr. Palle Uhd Jepsen, and subcontracted the WWT to analyse data on Wigeon and Light-bellied Brent Geese (Fox *et al.* 1990a), and the BTO to examine wildfowl and wader count data in general (Langston 1990). After a workshop in June 1990, and meetings of the review panel, the final report with recommendations for the future management of the Lough has been produced (Uhd Jepsen 1990). Among the recommendations are calls for the Lough to be

given Ramsar, SPA and Marine Nature Reserve (MNR) status, for the existing refuge system to be revised and a proposed zoning program implemented, and for the introduction of a detailed monitoring and research programme (on wildlife, wildfowling and habitat degradation), which will under-pin decisions for wise use of the resource in future years.

COVERAGE IN 1989-90

The dates used for monthly wildfowl counts in 1989-90 were September 17th, October 15th, November 12th, December 17th, January 14th, February 11th and March 11th. Counts made at coastal sites were sometimes undertaken on different dates to correspond with appropriate tidal conditions and to correspond with counts made for the BoEE. As in earlier years, there was a special effort in January aimed at covering as many extra sites as possible to correspond with the International Census organized by the IWRB.

A grand total of 1,910 wetland sites in Britain and Northern Ireland were covered at least once during the 1989-90 season, including 1,825 in January and 1,178 in all seven of the priority months, September to March. This represents a considerable improvement in coverage on 1988-89; indeed, the number of sites counted in every month, in both Britain and Northern Ireland, was greater than that of the previous season. The counties/regions contributing most sites in 1989-90 were Strathclyde (118 sites), Co. Down (96), Gwynedd (94), Leicestershire (71), Derbyshire (70), Lancashire (63), Borders (53) and Hampshire (52), the expansion of coverage in Leicestershire and Co. Down being particularly pleasing. On the coast, no counts were received from the estuaries of the Conwy (see Figure 1, p. 45), Dart, Dulas Bay, Fleet Bay, Rough Firth and Spey, and particularly incomplete data were received from the Cleddau, Hamford Water, Humber and Poole Harbour (Dorset). Lack of counts from the Outer South Humber for the second year in succession (surely someone can rectify this?) is especially worrying, whilst new data from the southern coastline of Co. Down, Northern Ireland, represents a great bonus. Inland, count data from Clwyd, Dorset, Glamorgan, Greater Manchester, Gwent, Hereford & Worcester, Skye, Suffolk, SW Highland, Western Isles, and parts of Northern Ireland, were sadly relatively few and, although the situation regarding Suffolk has hopefully been resolved with the finding of a new Regional Organizer for that area, there has been little progress to date regarding an improvement in NWC coverage in the other areas, some of which are sparsely populated by ornithologists.

Numerous supplementary surveys of geese were accomplished in 1989-90 (see "Progress and Developments") and extra information for seaducks in the Moray Firth was again supplied by the Royal Society for the Protection of Birds (RSPB), courtesy of British Petroleum.

DATA PRESENTATION

There are a number of changes to the way NWC programme data have been presented in this report. Data derived from sources outwith the routine monthly counts are clearly identified throughout, either by means of specific references or by use of an asterisk (*) to identify counts derived from the Trust's goose censuses. The flagging of goose counts in this way is important as such surveys rely on different methodology (e.g. dawn/evening flight counts, field searching) to that adopted in the mid-monthly visits to wetlands. Furthermore, the dates of goose surveys have frequently, but not always, differed from those used for basic wetland monitoring.

In Tables 1 & 2, I have presented total counts for all species except for exotic, hybrid and domestic wildfowl. This enables an assessment of the the true scale of NWC monitoring with regard to particular species.

In order to save space, the following abbreviations for wetland types have been used in all tables that include site names:

Br.	= Broad(s)	Hbr.	= Harbour
Est.	= Estuary	Lo.	= Loch(s) or Lough(s)
Fth.	= Firth(s)	R.	= River
Gp.	= Gravel pit(s)	Rsr.	= Reservoir(s)

A more important change refers to the way information pertaining to individual sites is presented. In order to facilitate the matching of count information at coastal sites with that collected for waders through the BoEE, both the names of coastal sites, and the areas included in them, have been adjusted to correspond with those used in the second section of this report (see Figure 1, p. 45, and Kirby In press.). Thus, some of the wildfowl counts presented for particular coastal sites in this report may differ from those tabled in earlier issues, though the differences in many cases will be small. Similarly, where previous reports have presented figures for individual sectors of coastal sites (e.g. Caerlaverock, Elmley, Slimbridge etc.), I have combined these with adjacent areas, following Kirby (In press.), to present figures for whole sites only. Such presentation of 'whole site' figures has been adopted for all species except for some of the geese for which coastal site definitions would probably be inappropriate.

As in previous reports, counts made outwith the September to March period have been used in cases where they represent the maxima for the count season (June to July).

TOTAL NUMBERS

Tables 1 & 2 show the totals numbers of each species of wildfowl, grebe, Cormorant and Coot recorded in September to March 1989-90 for Britain and Northern Ireland separately.

Relatively high maximum numbers of both Mute and Bewick's Swans were recorded in each of Britain and Northern Ireland compared with 1988-89, though the number of Whooper Swans was somewhat lower. The numbers of Pink-footed, Greenland White-fronted, Icelandic Greylag, Barnacle and Dark-bellied Brent Geese were highest during the months of specific surveys for them, and in all cases apart from for Icelandic Greylags and Dark-bellied Brent Geese, exceeded that recorded during the previous year. The maximum count of Light-bellied Brent Geese in Northern Ireland (15,459 in October) was close to double that recorded in 1988-89 (Salmon *et al.* 1989).

Amongst the ducks, comparatively high numbers of Gadwall and Teal were recorded in both Britain (Table 1) and Northern Ireland (Table 2) in 1989-90, whilst Shoveler, Pochard and Ruddy Duck were particularly abundant in Britain. Moreover, the maximum number of Tufted Duck counted in Northern Ireland exceeded last years figure by some 12,000 birds. The numbers of seaducks, particularly Eider, Scoter *spp.* and Long-tailed Duck, were characteristically very variable due to difficulties in observing them adequately on a regular basis. Recorded maxima for grebes, Cormorant and Coot in Britain and Northern Ireland continue to rise steadily as more and more observers include them in the counts and as additional sites are counted.

Table 1. TOTAL NUMBERS OF WILDFOWL, GREBES, CORMORANT AND COOT COUNTED IN GREAT BRITAIN IN EACH MONTH OF 1989-90.

The numbers of sites counted are given in brackets.

	Sep (1331)	Oct (1404)	Nov (1433)	Dec (1415)	Jan (1707)	Feb (1461)	Mar (1450)
Little Grebe	2420	2516	2378	1843	2365	1473	1597
Great Crested Grebe	8197	7305	7629	5585	6943	5652	6555
Cormorant	10042	11401	10904	10187	11284	10378	10081
Mute Swan	11640	12242	11745	10643	12616	10161	8453
Bewick's Swan	1	112	1988	7116	8444	5123	816
Whooper Swan	28	1164	3976	3163	4149	3335	2764
Bean Goose	2	87	32	320	380	36	2
Pink-footed Goose	3292	98467	182969*	76852	93418	62183	121,791*
European White-fronted Goose	1	15	183	2895	5259	5803	246
Greenland White-fronted Goose	1	325	14434*	917	721	485	12984*
Greylag Goose (Icelandic)	1528	50493	83577*	44106	29277	36201	64,374*
Greylag Goose (feral)+	13443	11101	11606	9348	12742	8750	7019
Canada Goose	33664	28772	31483	29860	34015	26071	20210
Barnacle Goose++	182	12476	16052	8018	10958	4816	17229
Dark-bellied Brent Goose	180	32955	60517	70302	83749*	73657*	34690
Light-bellied Brent Goose	295	734	1805	3008	1116	566	6666
Shelduck	18907	34216	57879	59952	74059	63029	50058
Mandarin	83	119	129	226	62	44	48
Wigeon	65613	159366	164184	261264	230536	146832	88237
Gadwall	6166	5506	5553	6651	7581	4546	3688
Teal	68009	79241	86767	135135	112905	66402	39192
Mallard	156013	160613	157440	169865	181062	109464	61710
Pintail	12275	24660	19771	26383	23122	10032	3490
Garganey	20	4	1	0	0	0	6
Shoveler	7132	8157	6278	5755	5829	4929	4900
Pochard	13051	21642	28494	34150	41329	34239	10161
Tufted Duck	33078	34607	37396	42989	48453	38528	32060
Scaup	111	844	744	966	1807	3680	1313
Eider	25757	19039	50403	17574	16644	20754	13805
Common/Velvet Scoter+++	3135	2937	4987	5696	8171	9745	916
Long-tailed Duck	2	173	1101	736	736	829	674
Goldeneye	216	1757	5720	10899	12702	12270	9830
Smew	0	1	3	40	57	53	38
Red-breasted Merganser	1642	1721	2700	2639	2855	2434	2842
Goosander	371	746	1098	2452	2733	1726	1354
Ruddy Duck	1773	2163	2054	2362	2829	2343	1811
Coot	88292	98760	82485	79871	80901	55908	41032

+ In all months except September, the feral component of this species is approximated by totalling counts from English (exc. Northumberland) and Welsh sites only and adding 1,500 (after Shimmings *et al.* 1989) for the feral birds in Dumfries & Galloway. ++ Includes mainly birds from the Greenlandic and Svalbard breeding populations, with a few feral birds also. +++ In some instances, these species are inseparable.

Table 2. TOTAL NUMBERS OF WILDFOWL, GREBES, CORMORANT AND COOT COUNTED IN NORTHERN IRELAND IN EACH MONTH OF 1989-90.

The numbers of sites counted are given in brackets.

	Sep (112)	Oct (114)	Nov (115)	Dec (115)	Jan (118)	Feb (140)	Mar (134)
Little Grebe	690	829	881	751	504	372	348
Great Crested Grebe	1241	1955	1255	1294	697	1357	1353
Cormorant	2222	2333	1999	2040	1617	1328	1252
Mute Swan	2197	2517	1915	2041	2101	1713	1640
Bewick's Swan	0	0	238	463	504	428	35
Whooper Swan	4	525	1022	1452	2169	2429	1904
Greenland White-fronted Goose+	0	0	13	26	0	77	3
Greylag Goose++	231	341	316	369	413	456	421
Light-bellied Brent Goose	4484	15459	12179	3538	3676	3017	2168
Canada Goose	190	258	169	203	335	230	299
Barnacle Goose	62	91	58	56	57	58	56
Shelduck	191	267	1733	2454	2753	2844	2390
Wigeon	8611	12569	11630	5336	6351	3214	2333
Gadwall	154	250	225	275	286	135	167
Teal	2880	3192	4127	6285	5624	3441	2653
Mallard	11081	11090	8231	7049	7732	3847	2377
Pintail	25	45	140	167	128	109	28
Shoveler	111	287	150	111	207	85	106
Pochard	1513	10696	28244	36946	16408	4620	1272
Tufted Duck	5363	19125	7385	30402	20441	11884	9986
Scaup	1	57	4	1217	513	591	751
Eider	192	131	482	13	738	752	568
Common/Velvet Scoter	0	0	1150	213	0	2	3
Long-tailed Duck	0	0	0	35	2	9	95
Goldeneye	32	1043	3531	12169	4598	6118	10651
Smew	0	0	0	2	0	1	0
Red-breasted Merganser	717	695	887	369	484	502	489
Goosander	0	0	0 0	0	2	0	
Ruddy Duck	23	11	6	7	1	17	0
Coot	7547	9810	7146	6907	5354	3719	3195

+ See the appropriate Species Account for census details for the whole of Ireland. ++ It is not possible to separate the feral from the wild component of this population in Northern Ireland.

MONTHLY FLUCTUATIONS

Since the number of sites counted is not the same in all months, monthly count totals may not necessarily reflect true changes in relative abundance during the season. However, this can be examined by using only counts from sites counted in all seven months (September until March). Once these totals are calculated, the number present in each month can be expressed as a percentage of the maximum numbers present, thus revealing patterns of seasonality for the considered species. This is shown in Tables 3 & 4, for Britain and Northern Ireland separately. Non-migratory, scarce and irregularly counted species are omitted.

In both Britain and Northern Ireland, mid-winter (December to February) was the period during which most species reached maximum abundance, the rise to this peak being steady in most cases but especially dramatic for the included swan and goose species. Other species, however, were relatively more abundant earlier in the season, during the September to November period. These include the grebes, Shoveler and Coot in both countries, and the Mallard and Wigeon in Northern Ireland only. Such patterns are perhaps indicative of either emigration from the UK or movements away from the sites counted and, for these, detailed count information from other countries, particularly Eire, would provide valuable information. There is some suggestion from the tables that grebe numbers in Northern Ireland may peak later than in Britain, perhaps reflecting movement between the two areas by these species. The single species perhaps showing most stability in numbers counted from month to month was the Cormorant.

Table 3. PROPORTIONS IN EACH MONTH OF THE PEAK POPULATION PRESENT ON BRITISH SITES THAT WERE COUNTED IN ALL SEVEN MONTHS OF 1989-90.

The number of sites included was 1,075 and bracketed figures give averages for the 1984-85 to 1988-89 period.

	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Little Grebe	100 (100)	68 (99)	90 (92)	68 (76)	80 (80)	55 (66)	59 (68)
Great C. Grebe	98 (100)	93 (93)	100 (87)	68 (71)	83 (62)	68 (68)	78 (78)
Cormorant	92 (92)	100 (100)	97 (97)	85 (90)	87 (93)	83 (89)	84 (86)
Bewick's Swan	0(0)	2(1)	43 (31)	83 (65)	94 (99)	100 (73)	34 (27)
Whooper Swan	1(1)	28 (36)	100 (90)	79 (96)	88 (89)	74 (82)	79 (64)
E. White-front. G.	0 (0)	0 (0)	3 (8)	48 (48)	93 (91)	100 (93)	38 (35)
Dark-b. Brent G.	0 (1)	39 (45)	73 (74)	84 (90)	100 (93)	88 (96)	45 (60)
Shelduck	22 (23)	54 (44)	86 (62)	78 (75)	100 (94)	86 (95)	74 (80)
Wigeon	36 (15)	70 (49)	85 (70)	100 (83)	99 (100)	62 (69)	27 (44)
Gadwall	60 (72)	66 (86)	79 (93)	95 (96)	100 (80)	61 (66)	45 (47)
Teal	52 (47)	60 (64)	69 (81)	100 (100)	81 (80)	49 (60)	28 (40)
Mallard	100 (85)	99 (87)	97 (91)	97 (99)	96 (91)	62 (66)	37 (36)
Pintail	50 (37)	97 (82)	78 (81)	100 (94)	84 (80)	34 (55)	6 (21)
Shoveler	83 (85)	100 (97)	73 (78)	66 (68)	63 (54)	58 (53)	49 (49)
Pochard	35 (30)	58 (59)	74 (86)	92 (94)	100 (95)	84 (91)	28 (49)
Tufted Duck	72 (81)	71 (79)	86 (95)	94 (98)	100 (96)	84 (84)	73 (74)
Goldeneye	2(1)	14 (10)	52 (57)	86 (78)	100 (92)	98 (98)	91 (94)
Goosander	17 (21)	26 (20)	47 (42)	90 (76)	100 (89)	74 (87)	58 (74)
Coot	88 (83)	100 (93)	84 (96)	80 (93)	77 (86)	52 (66)	38 (47)

Table 4. PROPORTIONS IN EACH MONTH OF THE PEAK POPULATION PRESENT ON NORTHERN IRELAND SITES THAT WERE COUNTED IN ALL SEVEN MONTHS OF 1989-90.

The number of sites included was 103 and bracketed figures give equivalent figures for 1988-89.

	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Little Grebe	77 (100)	89 (89)	100 (77)	77 (55)	54 (41)	37 (30)	26 (33)
Great C. Grebe	70 (100)	72 (38)	35 (60)	100 (25)	18 (20)	27 (11)	68 (50)
Cormorant	100 (100)	93 (83)	83 (97)	90 (99)	55 (71)	35 (57)	54 (72)
Bewick's Swan	0 (0)	0 (0)	76 (29)	100 (92)	78 (100)	48 (99)	9 (8)
Whooper Swan	0 (0)	27 (24)	60 (63)	69 (73)	91 (86)	99 (100)	100 (87)
Shelduck	7(2)	9(5)	77 (28)	100 (100)	98 (85)	90 (65)	87 (39)
Wigeon	25 (3)	95 (47)	100 (68)	56 (69)	76 (100)	33 (81)	30 (31)
Gadwall	54 (100)	88 (64)	79 (82)	95 (56)	100 (82)	45 (62)	58 (36)
Teal	50 (16)	57 (36)	66 (84)	100 (86)	90 (100)	42 (79)	45 (33)
Mallard	100 (100)	90 (60)	68 (67)	50 (65)	55 (50)	29 (34)	21 (21)
Pintail	16 (14)	31 (30)	100 (86)	93 (82)	95 (70)	82 (100)	19 (31)
Shoveler	39 (45)	100 (100)	53 (91)	37 (89)	72 (87)	29 (79)	36 (21)
Pochard	4 (4)	29 (31)	77 (100)	100 (64)	44 (50)	11 (17)	3 (10)
Tufted Duck	18 (23)	63 (25)	25 (98)	100 (97)	66 (100)	37 (84)	30 (64)
Scaup	0 (0)	5 (5)	0 (8)	100 (100)	30 (54)	34 (29)	60 (96)
Goldeneye	0 (0)	9 (13)	28 (99)	100 (100)	34 (62)	43 (51)	84 (57)
Coot	82 (98)	100 (100)	77 (95)	70 (74)	54 (81)	32 (49)	28 (42)

INDICES

Because not all sites are counted in every year, population changes cannot be derived from simply comparing total numbers counted in each year. Consequently, a simple method of indexing population change has been derived and has been applied to wildfowl and wader counts for many years.

Table 5 gives index values for individual species in Britain for each of the 1985-86 to 1989-90 seasons, and for earlier five-year periods for comparison. Indices are not, as yet, calculated for Northern Ireland. The values are obtained by comparing only counts for sites covered in the relevant month in consecutive years, and by relating the ratio of the two monthly totals to an arbitrary standard, nominally 1970-71, when the index was set at 100. The months chosen for each species are those in which the greatest numbers are usually present. For species which may peak in either of two months, the average indices for these months are given, and for those with significant populations at different times of the year (usually autumn and mid-winter), separate sets of indices are given. Species for which complete censuses are attempted each year (e.g. Pink-footed Goose) and species counted irregularly (e.g. seaducks) are omitted.

Indices for 1989-90 suggest relatively large population increases in Britain for Mute and Bewick's Swans, Canada Geese, Teal, Shoveler and Pochard (Table 5). Amongst these, of particular note were large increases in the indices for Teal (by 130%) and Shoveler (116% in October/November and 115% in January). For Gadwall and Goosander, the trends went in opposite directions according to the month chosen, with the former species decreasing in October but increasing in December and the latter showing an increase in January and a February decline. Index values for the remaining species suggested population declines but these were mostly small. Declines of 24% in Tufted Ducks (in December) and 34% in Red-breasted Mergansers (in January), however, are particularly large and the future fortune of these species will need to be monitored carefully.

Future editions of this report may well contain much improved wildfowl indices following a thorough examination of the way we currently estimate them. The study, commissioned by IWRB and conducted by Professor Les Underhill, was presented as a BTO Research Report and discussed in full by representatives from the BTO, IWRB and WWT in April 1990. The new method will enable us to make maximal use of the available information by basing the index on an appropriate group of months, rather than relying on counts from just one month, will enable

gaps in coverage to be approximated, and will allow the fitting of confidence intervals to index values (Underhill 1989). This approach represents a great improvement on the current system and is likely to be implemented following further exploration and testing of the technique.

Table 5. INDICES FOR WILDFOWL POPULATIONS IN BRITAIN, 1960-61 TO 1989-90.

		Mean 60/61 64/65	Mean 65/66 -69/70	Mean 70/71 -74/75	Mean 75/76 -79/80	Mean 80/81 -84/85	85/86	86/87	87/88	88/89	89/90
Mute Swan	-Sep	105	96	103	93	119	125	132	140	158	169
	-Jan	88	106	90	85	89	89	90	101	102	113
Bewick's Swan	-Jan	15	50	72	153	215	298	360	227	233	244
Whooper Swan	-Nov	69	77	104	148	164	164	152	166	235	225
	-Jan	202	146	118	114	116	144	130	174	180	174
E. White-front. G.	-Jan	62	85	56	39	40	51	45	89	68	43
Canada Goose	-Sep/Jan	47	72	127	175	275	366	351	425	444	451
Dark-b. Brent G.	-Jan	61	87	134	305	455	520	455	469	523	406
Shelduck	-Jan	92	106	102	132	133	148	121	120	125	125
Wigeon	-Oct	111	112	138	149	183	148	185	185	235	219
	-Jan	83	91	84	85	97	122	127	107	113	96
Gadwall	-Oct	42	50	146	149	259	351	462	425	553	515
	-Dec	86	81	164	336	781	1112	1017	1295	1464	1488
Teal	-Dec/Jan	94	76	115	150	193	174	132	178	199	259
Mallard	-Sep	73	83	92	82	92	89	91	89	94	101
	-Dec	78	89	86	80	90	102	91	101	91	91
Pintail	-Dec	27	54	151	177	147	144	75	167	134	123
Shoveler	-Oct/Nov	91	97	144	193	201	215	219	197	180	208
	-Jan	50	63	113	139	127	108	70	88	107	123
Pochard	-Jan	64	105	124	122	101	87	78	86	102	114
Tufted Duck	-Sep	44	64	110	122	134	126	115	113	135	122
	-Dec	73	91	119	123	123	138	132	140	170	130
Scaup	-Jan	64	110	114	33	11	10	13	29	24	6
Goldeneye	-Jan	115	92	126	109	98	99	108	110	114	104
Red-b. Merganser	-Jan	49	101	115	245	222	228	295	204	195	129
Goosander	-Jan	92	80	121	285	213	271	283	325	311	363
	-Feb	171	115	153	123	171	143	272	177	191	148

PRINCIPAL SITES

In addition to the criteria for individual species (see Appendix 1), any site regularly holding a total of 20,000 or more waterfowl (i.e. divers, grebes, wildfowl, waders, etc.) qualifies as internationally important, as agreed by the Contracting Parties to the Ramsar Convention (Ramsar Convention Bureau 1988). Table 6 lists all UK sites holding an average of 10,000 or more wildfowl, Great Crested and Little Grebes, Cormorants and Coots, ranked according to their average peak counts over the five-year period 1985-86 to 1988-89. This should not be taken as an absolute ordering of the conservation importance of the included sites as certain sites, perhaps low down in terms of their total numbers, may nevertheless be of critical importance to certain species or populations. Also, more sites ought to be considered as internationally important in view of their total bird populations than is apparent from the table, as the 20,000 level applies to waterfowl (including waders) rather than to wildfowl alone.

For each winter in turn, the peak counts for each site are calculated by listing the highest count for each species, irrespective of the month in which it was made, and then totalling these counts. The peak total for 1989-90 is given in the first column, and average figures for the most recent five year period are provided for comparison. The locations of these sites, together with those included in subsequent tables are given in Appendix 2.

Peak numbers in 1989-90 at six sites exceeded the appropriate five-year average by over 30%,

thus revealing considerable increases in the importance of these sites to waterfowl. These were the Slains Lochs (+73%), Loch of Skene (+67%), Ribble Estuary (+47%), Abberton Reservoir (+45%), North Norfolk Marshes (+33%) and Morecambe Bay (+31%). Conversely, very much smaller numbers than expected from the five-year averages were recorded in 1989-90 at Dupplin Loch (-47%), Loch Eye (-45%), Wigtown Bay (-39%), Lindisfarne (-38%) and Loch Leven (-32%). All of these usually support large goose flocks and their position in Table 6 depends, to varying degrees, on whether the geese were present on the count dates. Hamford Water was counted only three times (September to November) in 1989-90 and thus the figure presented for this site is unrepresentative.

Table 6. SITES AVERAGING MAXIMA OF MORE THAN 10,000 WILDFOWL, GREBES, CORMORANT AND COOT OVER 1985-86 TO 1989-90.

	Peak count 1989-90	Average count 1985-86 to 1988-89
Lo. Neagh/Beg	102893	82677
Wash	71648	67545
Ouse Washes	80561	64109
Ribble Est.	84253	57417
Lo. of Strathbeg	40329	40922
Solway Est.	42619	37673
Abberton Rsr.	49401	33986
Lindisfarne	18965	30569
Montrose Basin	23278	30270
N Norfolk Marshes	39949	30077
Mersey Est.	30451	29422
Thames Est.	25968	29363
Dee Est.	33760	26272
Morecambe Bay	33740	25672
Dornoch Fth.	20852	24048
Martin Mere	24675	23989
Forth Est.	24610	23765
Strangford Lo.	22155	23241
Severn Est.	20241	23032
Lo. Leven	15201	22147
Lo. Foyle	16503	22120
Westwater Rsr.	23982	21412
Rutland Water	21470	21054
Inner Moray Fth.	24219	20359
Swale Est.	20871	19379
Slains Lo.	31922	18446
Cromarty Fth.	19141	18051
Chichester Hbr.	16140	17746
Blackwater Est.	15649	17677
Humber Est.	14724	17540
Dinnet Lo.	18129	16860
Medway Est.	17909	16384
Derwent Ings	x	15758
Dupplin Lo.	8200	15427
Carsebreck/Rhynd Lo.	15476	15317
Wigtown Bay	9156	15123
The Fleet/Wey	12106	14843
Lo. Eye	7943	14329
Langstone Hbr.	12239	12825
Burry Inlet	10448	12476
Hamford Water	(3034)	11249
Lo. of Skene	17244	10296

SPECIES ACCOUNTS

The following tables rank the principal sites for each species according to average maxima calculated from counts received in any month (June to May) during the last five seasons, 1985-86 to 1989-90. Crosses indicate missing counts and incomplete counts are bracketed. In the first instance, averages were calculated using only complete counts, but if any incomplete counts exceeded this initial average they were then also incorporated and the averages recalculated. The sites included in the tables are in most cases those that exceed the appropriate G.B. qualifying level for national importance (see Appendix 1). However, where this would involve a very long list of sites, a convenient higher level has been selected and used. The "month" column shows when the maximum count of 1989-90 was made, an asterisk (*) denotes counts made during WWT goose surveys and other sources of information are cited accordingly. As in Table 6, the locations of the included sites are given in Appendix 2.

Little Grebe *Tachybaptus ruficollis*

The numbers of Little Grebes recorded during NWCs are small due, at least in part, to their secretive habits and liking for small streams, ponds, canals and rivers, most of which are not well represented amongst the habitats of count sites. Maximum numbers were recorded in Britain in October (Table 1) and in Northern Ireland in November (Table 2), involving some 3,345 individuals (October figures) in all. Numbers declined steadily through the non-breeding season (Tables 3 & 4).

Little Grebes were first included in the counts in most areas in 1988-89. Sites supporting average maxima of 50 or more are shown in Table 7, with Loughs Neagh and Beg and Strangford Lough supporting by far the highest numbers. Other sites holding more than 50 individuals in 1989-90, but failing to qualify for entry into the table on averages, include Morecambe Bay (86, October), Deben Estuary (84, January), Swale Estuary (71, March), Medway (60, January) and Eversley Cross/Yateley Gravel Pits (55, November).

Table 7. LITTLE GREBE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. Neagh/Beg	x	292	x	412	480	(Nov)	395
Strangford Lo.	x	x	98	x	103	(Nov)	101
Southampton Water	x	x	x	87	50	(Nov)	69
Chew Valley Lake	54	70	80	42	83	(Aug)	66
Thames Est.	30	27	19	146	104	(Oct)	65
R. Soar: Leicester	x	x	x	62	67	(Jan)	65
Rutland Water	x	x	46	73	69	(Oct)	63
R. Test: Leckford	x	x	x	49	52	(Dec)	51
Upper Lo. Erne	x	30	x	62	57	(Mar)	50

Great Crested Grebe *Podiceps cristatus*

The total numbers of Great Crested Grebes recorded in 1989-90 peaked early in the season in both Britain (8,197, September) and Northern Ireland (1,955, October), and suggest that the U.K. wintering population is likely to exceed 10,000 individuals. The estimate of Osborne (1986) was more conservative and placed the combined British and Irish wintering population in the region of 7-10,000 birds. However, given the fact that the species is undoubtedly under-recorded by NWCs in the UK, and that counts from Eire are not received, the true wintering population is surely far greater than this. Sixteen sites currently support over 150 Great Crested Grebes according to average maxima calculated over the past five seasons (Table 8). Peak numbers recorded at most sites have been extremely variable over recent seasons and only for Belfast Lough have the numbers of this species increased consistently from year to year. The maximum number at Abberton Reservoir was particularly high for that site, and large numbers were present at the nearby Stour Estuary (322) in the same month, Colne Estuary (322, January) and Alton Water (151, March), thus revealing a sizeable influx into that part of Essex in 1989-90. Other sites holding more than 150 individuals were Wraysbury Reservoir (241, September) and Larne Lough (179, September). Fox & Roderick (In press.) have reviewed current knowledge of the whereabouts of Great Crested Grebes in Welsh inshore waters. During the moulting period, Lavan Sands is of key importance to grebes, and there are relatively large numbers in winter in Tremadog Bay and off the north Ceredigion coast.

Breeding Great Crested Grebes have been the focus of a study into feather eating published recently for, unlike all other birds, they consume large quantities of their own feathers. Piersma & Van Eerden (1989) showed that when the diet consisted of smelt, which left little indigestible matter, more feathers were eaten than with a diet of perch or pikeperch, which leave more fish debris. They suggest that feathers, in the absence of indigestible matter, contribute substance to the stomach content, facilitating pellet formation. In this way, the habit of regularly emptying the stomach minimizes the chance of serious build-up of gastric parasites in the gut.

Table 8. GREAT CRESTED GREBE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. Neagh/Beg	1105	1104	1356	1605	1188	(Dec)	1272
Forth Est.	542	759	795	311	849	(Sep)	651
Belfast Lo.	282	279	703	776	886	(Oct)	585
Rutland Water	705	462	382	605	544	(Jan)	540
Chew Valley Lake	530	445	430	560	490	(Aug)	491
Swale Est.	556	418	(68)	346	160	(Nov)	370
Upper Lo. Erne	263	374	446	404	306	(Mar)	359
Queen Mary Rsr.	310	410	413	251	360	(Dec)	349
Grafham Water	411	524	288	179	264	(Nov)	333
Medway Est.	226	194	143	357	254	(Nov)	235
Borth/Ynyslas	310	177	(103)	190	x		223
Conwy Bay	260	x	189	164	x		204
Morecambe Bay	111	202	128	277	236	(Oct)	191
Abberton Rsr.	220	229	93	44	303	(Nov)	178
Carlingford Lo.	199	186	164	106	216	(Jan)	174
Pitsford Rsr.	151	169	189	202	142	(Nov)	171

Cormorant *Phalacrocorax carbo*

As discussed last year (Salmon *et al.* 1989), both the British and Irish Cormorant population are probably well in excess of 10,000 birds, with the combined population likely to be around 25,000. Total numbers recorded in 1989-90 reached maxima of 11,401 in Britain and 2,333 in Northern Ireland (Tables 1 & 2), both in October. Thereafter, the numbers counted on NWC sites in Britain remained relatively constant, but fell markedly from January onwards in Northern Ireland (Table 4). As relatively few birds breed in the Province (see Hutchinson 1989), this presumably represents movement towards milder conditions in Eire and towards the many breeding colonies.

Table 9 lists all sites that support at least 200 birds according to average four year maxima (this species was not included in the counts prior to 1986-87). At about one half of the sites, peak numbers in 1989-90 exceeded that of the previous season and at six sites, including the top two, the number of Cormorants present have increased consistently from year to year. Such increases are probably associated with increased winter food supplies, through fish stocking schemes, and reduced human persecution. A further eight sites held 200 or more Cormorants in 1989-90: Inner Clyde (663, November), Killard to Bloody Bridge, Co. Down (409, February), the Colne (409, February), Tees (337, September) and Alt (344, December) Estuaries, Carmarthen Bay (276, March), Rostherne Mere (214, February) and William Girling Reservoir (200, October).

Table 9. CORMORANT: MAXIMA AT MAIN RESORTS

	1986/87	87/88	88/89	89/90	(Mth)	Average
Lo. Neagh/Beg	x	x	591	951	(Dec)	771
Morecambe Bay	303	544	733	1497	(Sep)	769
Inner Moray Fth.	685	940	641	229	(Oct)	624
Forth Est.	(145)	414	479	766	(Sep)	553
Medway Est.	x	219	415	920	(Jul)	518
Solway Est.	527	374	483	550	(Oct)	484
Poole Hbr.	436	426	615	232	(Oct)	427
Strangford Lo.	504	397	365	317	(Oct)	396
Queen Mary Rsr.	x	278	438	315	(Dec)	344
Ranworth/Cockshoot Br.	267	354	368	325	(Mar)	329
Abberton Rsr.	233	117	x	570	(Nov)	307
Belfast Lo.	68	x	235	369	(Oct)	302
Ouse Washes	286	169	182	533	(Mar)	293
Blackwater Est.	x	252	345	219	(Mar)	272
Swale Est.	136	301	394	228	(Mar)	265
Rutland Water	x	x	280	250	(Mar)	265
Dee Est.	x	210	290	291	(Sep)	264
Outer Ards	61	374	379	197	(Feb)	253
Wash	188	198	294	224	(Nov)	226
Stour Est.	x	209	244	162	(Oct)	205
Upper Lo. Erne	182	181	131	316	(Dec)	203

Mute Swan *Cygnus olor*

In the late 1970s and early 1980s, the disastrous impact on Mute Swan numbers of lead poisoning caused by the ingestion of discarded fishing weights became common knowledge, at least amongst ornithologists! Following the ban in early 1987 on most sizes of lead fishing weights, both NWC (Salmon *et al.* 1989) and other information appeared to suggest that a recovery by Mute Swan populations in many areas was underway. The indices for Britain for 1989-90 appear to confirm this trend, with both the September and January values reaching the highest ever recorded. In order to examine and quantify this apparently good news further, the NCC commissioned the WWT, BTO and SOC to undertake a national survey of breeding Mute Swans in 1990, thus updating earlier surveys undertaken in 1955/56, 1961, 1978 and 1983. The results available so far (Delany 1990a), clearly indicate considerable increases in most regions of Britain since the 1983 census, although data from a number of regions has yet to be received. Moreover, some of the most conspicuous increases have occurred in areas where lead poisoning was previously known to be a major problem. Full details of the 1990 Mute Swan survey will appear at a later date, and extension of the survey to Ireland will hopefully take place in summer 1992.

Sixteen sites averaged more than 180 Mute Swans during the 1985-86 to 1989-90 period (Table 10) and at all, apart from five, did the numbers in 1989-90 exceed the average. The number at Loughs Neagh and Beg continues to increase, this site supporting some 67% of all Mute Swans counted in Northern Ireland in September. Breydon Water (370, January), Loch Bee (254, January), the R. Tweed between Junction Pool and Coldstream (196, October) and the R. Avon between Blashford and Hucklesbrook (191, December) each held over 180 individuals in 1989-90.

Table 10. MUTE SWAN: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. Neagh/Beg	(314)	1069	1269	1120	1465	(Sep)	1231
The Fleet/Wey	660	869	836	(571)	891	(Nov)	814
Abberton Rsr.	450	547	481	440	599	(Sep)	503
Ouse Washes	477	500	586	399	544	(Jan)	501
Lo. of Harray	216	293	456	655	683	(Nov)	461
Christchurch Hbr.	370	392	341	402	538	(Jul)	409
Colne Est.	341	435	618	306	316	(Feb)	403
Tweed Est.	602	309	268	240	360	(Jan)	356
Somerset Levels	(74)	(55)	286	271	332+	(Mar)	296
Stour Est.	212	349	290	357	233	(Feb)	288
Rutland Water	171	462	229	258	205	(Sep)	265
Upper Lo. Erne	134	197	229	336	430	(Oct)	265
Thames Est.	157	210	248	260	298	(Jan)	235
R. Welland: Spalding	305	254	164	241	176	(Oct)	228
Strangford Lo.	300	193	176	212	174	(Sep)	211
R. Avon: Fordingbridge	186	159	153	215	208	(Sep)	184

+ from Delany (1990b).

Bewick's Swan *Cygnus columbianus bewickii*

Relatively large numbers of Bewick's Swans were recorded in both Britain (Table 1) and Northern Ireland (Table 2) during 1989-90, with the January index surpassing the level attained in the previous two seasons (Table 5). This almost certainly reflected an exceptionally good breeding season for this species with WWT Centres reporting estimates of 21.8% young at Slimbridge and 18.6% young on the Ouse Washes (Rees *et al.* 1990). The numbers reported from the Martin Mere/Ribble Estuary flock continue to increase, placing this site firmly in third position in the UK for this species (Table 11). Fewer birds than expected were present on the Nene Washes, but the nearby Ouse Washes held considerably more than average. The numbers

recorded on the St. Benets Levels, Ludham (266, March) and at Lough Foyle (180, January) in 1989-90, if maintained, would render these sites of international importance for this species.

The Trust's on-going and varied research programme into the ecology of swans continued at strength during 1989-90 and the results from two separate analyses have been published recently. Rees (1989) examined the hypothesis that variation in the migratory patterns of individual Bewick's Swans may be attributable to differences in the response of each individual to thresholds connected to changes in daylength. Consistency from year to year in the arrival and departure dates of an individual bird would provide evidence in support of this if it exceeds a level referable to chance. An analysis of re-sighting data from birds colour-ringed at Slimbridge revealed that this was in fact the case. Furthermore, consideration of the data obtained for parents and their full-grown offspring indicated that the offspring may acquire, either genetically or by learning, their parents' migratory thresholds. Such heritability levels were low, however, accounting for only 10-20% of variation in the timing of arrival and departure.

In a further study by Rees (In press.), the distribution of Bewick's Swans wintering in Gloucestershire was monitored daily during 1986-87 and the habitats selected by them recorded. The swans grazed on flooded pasture for 73% of the period and selected the areas where the highest biomass of green grass was available. There was a strong inverse relationship between usage of the Slimbridge refuge by swans and the use of these fields by other grazing wildfowl; thus, a higher usage by non-swan species tended to result in reduced usage by swans. The swans therefore tended to use fields outside the refuge area, and fed in smaller groups, as food supplies diminished.

Table 11. BEWICK'S SWAN: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Ouse Washes	4743	6164	3787	3834	5984	(Jan)	4902
Nene Washes	937	x	1400	1137	270	(Feb)	936
Martin Mere/Ribble Est.	410	415	552	639	660	(Dec)	535
Breydon Water	98	184	691	698	528	(Feb)	440
Severn Est.	475 +	414	240 +	250	339 +	(Dec)	344
Lo. Neagh/Beg	338	234	264	246	303	(Dec)	277
Walland Marsh	227	220	225	x	x		224
R. Avon: Ringwood	236	311	136	167	158	(Jan)	202
Walmore Common	154	211	200	112	137	(Feb)	163

+ from WWT annual swan reports (e.g. Rees *et al.* 1990).

Whooper Swan *Cygnus cygnus*

Breeding Whooper Swans in 1989 fared less well than Bewick's, with just 13.3% young on the Ouse Washes and 10.2% young in Ireland (Rees *et al.* 1990), which is probably attributable to a late thaw in the highlands of Iceland in the spring. The previous breeding season was also relatively poor for this species (Salmon *et al.* 1989), and it is hardly surprising therefore that the overall numbers recorded in Britain and Northern Ireland in 1989-90 were relatively low (Tables 1 & 2). Furthermore, both the November and January indices (Table 5) fell to levels lower than those of the previous season. WWT studies of breeding Whooper Swans in Iceland aim to further our understanding of the factors influencing the breeding fortunes of this species.

The 686 Whooper Swans on the Ouse Washes in January (Table 12) was the greatest concentration of the species ever recorded in England or Wales (Rees et al. 1990). Sadly though, thick fog on the evening of 3 December resulted in some 50 swans (including Bewick's) being killed close to this site by collision with power-lines during the evening flight to roost, which has prompted the Trust to collect further information on power-line casualties and highlight the areas where the birds are most at risk. Although not qualifying for inclusion in Table 12, more than 170 swans occupied the Loch of Skene (406, January), Loch Spiggie (257, November) and Loch of Sabiston (172, December). If present on a regular basis, these sites would be internationally important for Whooper Swans.

Table 12. WHOOPER SWAN: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. Foyle	2597	1030	1288	1960	519	(Jan)	1479
Lo. Neagh/Beg	723	1266	1105	1192	1088	(Feb)	1075
Upper Lo. Erne	876	821	669	582	726	(Feb)	735
Ouse Washes	330	520	582	603	686	(Jan)	544
Lo. of Harray	26	108	485	1010	817	(Nov)	489
Lo. Eye/Cromarty Fth.	405	461	500	275	(183)	(Mar)	410
Martin Mere/Ribble Est.	238	243	429	406	572	(Nov)	378
Lo. of Strathbeg	508	406	202	225	264	(Nov)	321
Solway Est.	301	278	132	446	277	(Nov)	287
Wigtown Bay	281	120	212	75	511	(Mar)	240
Lo. Leven	210	199	222	222	220	(Dec)	215

Bean Goose *Anser fabalis*

By far the largest concentration of Bean Geese in Britain is present in the Yare Valley, Norfolk, and numbered 315 in December and 344 in January. Elsewhere, the Carron Valley (Central) supported 116 in December (Simpson 1990) and 10 or more birds were recorded on the Swale (17, February), Wash (14, November), Morecambe Bay (13, January), Blagdon Lake (10, February) and Fannyside Loch (10, January). Smaller numbers appeared at numerous other localities.

Pink-footed Goose *Anser brachyrhynchus*

Fox *et al.* (1989a) examined the growth in the population of the Pink-footed Goose over the years 1960-87. The population has increased from 48,000 to 172,000 during this time, a growth explained by a survival rate of 89% based on observed breeding success. They found no evidence of density-dependent factors operating on the population, and thus the growth in the population may not, as yet, be slowing down. The 1989 breeding season was relatively poor for Pink-feet with averages of 13.0% young and 1.7 young per pair present in autumn flocks (Kirby & Salmon 1990a), which compares to 25-40% young in a good season. The number counted in the November 1989 census was almost 183,000 birds and, despite being the highest annual total yet, this certainly represents a considerable underestimate of the true population size. Current difficulties in achieving an accurate total census of this species are discussed by Kirby (1990a) and Newton *et al.* (In press.). Counts earlier in the season may well provide a possible solution to the problem. There is increasing evidence that the geese are more concentrated at this time, occupying sites which are well counted, the use of which may be more predictable than later in the season. For example, a census of arrival sites in Scotland on 7/8 October revealed almost 171,000 birds. Thus, allowing for birds elsewhere, for example on the Solway and Lancashire, the total British population could have exceeded 200,000 in that month for the first time (Newton *et al.* In press.). Counts throughout Scotland at the end of March/early April produced a total count of almost 122,000 birds (Kirby & Shimmings 1990), some 5,000 more than in the previous two springs.

Table 13 lists the sites that currently hold 2,000 or more Pink-footed Geese, according to average maxima calculated over the last five seasons. Very large numbers are present in October at particularly Westwater Reservoir, Dupplin Loch and Hule Moss and these, together with the Loch of Strathbeg and Montrose Basin seem to have become progressively more important as arrival points for this species in recent years (Newton *et al.* In press.). The number in Lancashire in November 1989 (37,690) represents the second largest Pink-foot count ever made in the county, exceeded only by a count of 38,445 in December 1988 (Forshaw 1990). Other sites holding more than 2,000 in 1989-90 included Holkham Marshes (4,500, February), Redmyre Loch (3,900, November), Duns Dish (2,800, November) and Kinmount Ponds (2,570, December).

In the analysis by Fox *et al.* (1989a), over 50% of the variation in productivity of Pink-footed Geese was related to meteorological conditions, both on the wintering grounds in the spring prior to departure and on the nesting areas. In order to investigate this phenomenon further,

detailed studies of geese staging in Iceland (including Pink-footed, Greylag and Greenland White-fronted Geese) are being undertaken and visits have been made in the last two seasons, both of which proved to be relatively cold. The birds feed on rich agricultural land prior to moving to their ultimate breeding areas, and weather may well influence the quality of the vegetation available to the geese and hence their condition.

Early results indicate that the availability of new growth on hayfields may be particularly important in influencing subsequent breeding productivity (Fox *et al.* 1989b). During cold springs, the thaw of winter snow is delayed and the geese are confined to relatively small areas. Here they forage close to snow-patch edges where protein-rich green shoots, that were until recently protected from severe night time frosts by the warm blanket of snow, have become available (Fox *et al.* In press.,a). In this way the geese select prime forage as soon as it becomes available. The studies will continue so that the behaviour of the geese can be ascertained in warm as well as cold springs.

The Trust's colour-marking project on Pink-footed Geese (see Fox *et al.* 1989c) continues at strength with another 160 birds ringed in 1989-90, bringing the total marked in Britain to 640 (Fox 1990). A further 43 have been ringed in Iceland and 21 in Greenland. There have been 943 re-sightings to date, providing valuable information on the usage of a complex of different feeding areas in Lancashire, on the interchange of birds between Lancashire and Norfolk/Lincolnshire and on spring migration through Scotland and Iceland. Seago (1990) has described both the historical and recent occupancy of the principal haunts of the Pink-footed Goose in Norfolk, the most southerly concentration of this species in Britain.

Table 13. PINK-FOOTED GOOSE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. of Strathbeg	27900	29800	20900*	30200	32150 *	(Nov)	28190
Westwater Rsr.	13780	24610	22400	40000	36250 +	(Oct)	27408
SW Lancashire	19990	16220	26695	30545	37550 *	(Nov)	26200
Slains Lo./Ythan Est.	15300	9590*	21700*	21000*	30300 *	(Mar/Apr)	19578
Dupplin Lo.	6075*	8448*	11300*	40000	31000 +	(Oct)	19365
Montrose Basin	12000*	12600*	35000*	22000*	12000	(Oct)	18720
Lo. Leven	10000	10500*	9700*	12200	18000 *	(Nov)	12080
Solway Est.	6895*	14125	11467*	9006*	16408	(Mar)	11576
Carsebreck/Rhynd Lo.	7200*	5840	11100*	15090	11200	(Oct)	10086
Wigtown Bay	17000*	3910	7000*	14000*	6007	(Mar)	9583
Scolt Head	9800	12000	4000	10180	11500	(Jan)	9496
Fala Flow	1352*	6500	6800*	3000	11920 +	(Oct)	9147
Fylde/Morecambe Bay	4000	12795	8700	7900	9150 ++	(Feb)	8509
Aberlady Bay	12500*	3000	11000*	7300*	5600 *	(Nov)	7880
Cameron Rsr.	8000*	7500*	6000*	7000*	9500 *	(Nov)	7600
Wash	8288	2712	6621	9382	8505 *	(Nov)	7102
Findhorn Bay	x	x	2211*	9800	5276 *	(Mar/Apr)	5762
Castle Lo.	13400	5000	950	2000	x		5338
Lo. of Kinnordy	x	x	4550*	2000*	8240	(Nov)	4930
Lo. Eye/Cromarty Fth.	x	(2700)	6306*	7000*	1194 *	(Mar/Apr)	4833
Hule Moss	4400*	5500*	5000	5100	25735 +	(Oct)	4351
Lour	5000*	3850*	7660*	3410*	1800 *	(Nov)	4344
Crombie Lo.	1250*	5000*	6000*	6244	1391	(Oct)	3977
Gladhouse Rsr.	3800*	3500*	2500*	3400	5400	(Oct)	3720
Beauly Fth./Munlochy	x	x	5050*	2560*	2585 *	(Mar/Apr)	3398
Lo. Mahaick	725	1000	x	6531*	5250	(Oct)	3377
Lake of Menteith	3145*	1040	2056*	6000	x		3060
Lo. Tullybelton	1650*	x	1650*	3050*	3000 *	(Nov)	2338

+from Newton *et al.* (In press.).
++ from Forshaw (1990).

European White-fronted Goose *Anser albifrons albifrons*

The total numbers of European White-fronted Geese recorded in 1989-90 reached 5,803 in February (Table 1), an almost identical number to the peak count of 1988-89, which also occurred in February. Most arrived in January and had departed before the March count (Table 3), thus remaining in Britain for only a relatively short period. Despite enormous increases in the flyway population of this species (to 300,000), fewer reach Britain because of favourable conditions in The Netherlands and Germany, particularly in mild seasons like 1989-90.

The principal sites for this species are shown in Table 14, with Slimbridge on the Severn and Capel Fleet and Elmley on the Swale supporting by far the highest numbers. Numbers at most other sites were relatively low in 1989-90 compared with previous seasons. In addition to sites in the table, Holkham Lake (246, January), the Yare Valley (170, February) and Poole Harbour (117, February) each supported numbers in excess of 100 birds in 1989-90.

Table 14. EUROPEAN WHITE-FRONTED GOOSE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Severn Est.	4300	3500	4600	3770	3200	(Jan)	3874
Swale Est.	2570	2070	1400	2050	1660	(Feb)	1950
Thames Est.	730	224	640	300	157	(Mar)	410
R Avon: Sopley	510	520	205	245	(80)	(Feb)	370
North Norfolk Marshes	326	232	290	281	264	(Jan)	279
R Tywi: Dryslwyn	298	175	175	x	49	(Feb)	174
Alde Complex	350	140	11	139	0		128
Minsmere	23	119	142	180	45	(Feb)	102

Greenland White-fronted Goose *Anser albifrons flavirostris*

The world population of this species breeds in west Greenland and winters exclusively in Ireland, north and west Scotland and at two sites in Wales. Their numbers have been censused annually by the Greenland White-fronted Goose Study (GWGS) and the Wildlife Service of the Office of Public Works in the Irish Republic. In 1989-90, the census revealed 26,716 birds, compared with 27,341 in autumn 1988 and 24,455 in autumn 1987. The British total in autumn 1989 was 14,434, with 59.3% of those recorded on Islay, the most important winter resort (GWGS 1990). There was 19.3% young amongst British wintering flocks in 1989, a level similar to that of the two previous years. Fewer young were found in Ireland in 1989-90, with 15.9% at their main resort in Wexford and 15.1% elsewhere. However, Wexford held proportionately more young in both 1987-88 and 1988-89 than did any British site.

Sites supporting at least 100 Greenland White-fronted Geese on average are shown in Table 15 and all qualify as nationally important for this sub-species. The qualifying level required for international importance is 220 and eight sites currently qualify as such. No other sites held numbers exceeding this level in 1989-90.

Coll and Tiree hold internationally important concentrations of Greenland White-fronted Geese, and their status on these islands has been recently reviewed (Fox *et al.* 1989c). Here, the numbers are increasing and they are benefiting greatly from the current low intensity agriculture that characterizes the whole of each island. Elsewhere, however, there are declines in many of the smaller, more remote, flocks on the Scottish islands and northern mainland. On the Outer Hebrides, for example, the species has decreased from perhaps as many as 500 birds in the 1950s to a maximum of 85 in 1987-88 (Cunningham *et al.* 1990). The reasons for this, and similar declines in other areas, remain obscure, but may well be linked with reductions in feeding areas and human disturbance (Norriss & Wilson 1988). The loss of these flocks would drastically reduce the range of Greenland White-fronted Geese in Britain and would result in an unwelcome concentration of the population in just a few areas only.

Table 15. GREENLAND WHITE-FRONTED GOOSE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Islay	6393	6490	7888	7588	8826	(Dec)	7437
Rhunahaorine	852	733	817	1116	914	(Mar)	886
Machrihanish	590	716	944	907	1005	(Dec)	832
Tiree	708	760	759	728	987	(Mar)	788
Stranraer	530	740	550	393	770	(Dec)	597
Coll	548	405	400	647	671	(Dec)	534
Loch Ken	297	300	370	342	550	(Nov)	372
Endrick Mouth	300	230	240	300	300	(Mar/Apr)	274
Westfield	200	165	163	200	209	(Mar)	187
Loch Heilen	100	144	157	162	305	(Nov)	174
Danna/Keils	110	136	197	200	224	(Nov)	173
Lismore/Benderloch	84	170	215	76	120	(Nov)	133
Colonsay/Oransay	78	128	137	165	120	(Dec)	126
Ynyshir	108	95	127	124	111	(Oct)	113

N.B.including data extracted from Greenland White-fronted Goose Study (1990).

Greylag Goose *Anser anser*

Three groups of Greylag Geese are present in Great Britain in winter: the non-migratory native population occupies the far north and west of Scotland; the Icelandic-breeding population winters largely in Scotland with a few entering the far north of England and Ireland; and the feral, introduced population which resides mainly in England and Wales, but also in parts of south-west, central and eastern Scotland.

Greylag Geese in the Western Isles form a large part of the remaining native British population, and numbers on these islands have apparently more than doubled since the 1960s to a post-breeding population of 1,971 in November 1989, when 32% juveniles were present. The Trust has been monitoring numbers and breeding success of this population for several years now, and some preliminary results of this work have been published recently. Examination of historical records revealed that the principal breeding concentration of native Greylags has moved over last twenty years or so from South to North Uist. Despite this, comparisons of clutch and brood sizes found that both were significantly smaller on North Uist, probably because, as the population expanded, more young birds were present in North Uist and they layed smaller clutches than the older, more experienced birds of South Uist (Paterson *et al.* 1990).

Like the Pink-footed Goose, the population of Icelandic-nesting Greylag Geese has expanded greatly from a mere 30,000 in 1960 to 105,000 in 1987, such growth being attributable to an average survival rate in excess of 91% (Fox *et al.* 1989a). Also, as in Pink-feet, most (70%) of the variation in breeding success could be explained by meteorological conditions (precipitation, temperature and wind-speed) experienced on wintering and spring staging areas. Autumn age counts of Icelandic Greylags in 1989 revealed 12.3% juveniles overall and 2.2 young per pair on average, suggesting that they bred moderately well (Kirby & Salmon 1990a). The autumn census in November revealed just over 83,500 birds and ca. 64,400 were found in the spring (Kirby & Shimmings 1990). The former constitutes the lowest census return for over six years and the population is certainly being under-estimated. The spring count was considerably higher than the 43,800 recorded at the same time in 1989. Apart from the sites included in Table 16, Corby Loch (2,600, March) and the Loch of Lintrathen (2,490, October) supported numbers that if held regularly would be internationally important for Icelandic Greylag Geese.

Scientists from Aberdeen University have published the results of recent investigations into both actual goose grazing damage, by Greylags and Pink-feet (Patterson *et al.* 1989), and simulated goose damage (Abdul Jalil & Patterson 1989). Yields of winter cereals were significantly reduced by goose grazing, and the amount of weed present was significantly increased. However they conclude that whilst goose damage in north-east Scotland is undoubtedly occurring it is, at present, a local rather than a national problem.

Based on the calculations of Owen & Salmon (1988) the feral Greylag population is likely to

number in excess of 20,000 birds, which is far greater than the 13,000 or so counted in September 1989 (Table 1 & 2). The Trust is planning to survey the feral Greylag population in 1991 and the results of this census will show whether the population has continued to expand by the amount predicted.

Table 16. GREYLAG GOOSE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Dinnet Lo./R. Dee	19900*	8200*	10800	18000*	15800	(Nov)	14540
Inner Moray Fth.	5550	12556*	17450*	12311*	9271	(Oct)	11428
Lo. Eye/Cromarty	10000*	4774*	4042*	19259*	11193*	(Nov)	9854
Lo. of Skene	8500*	4200*	10000	8700*	13305	(Dec)	8941
Lo. Spynie	6000*	7750*	9000	12000	3350	(Dec)	7680
Tay/Isla Valley	18295*	3685*	3663*	6331*	2959*	(Nov)	6987
Lo. of Strathbeg	4600*	6250	9700	6900	7050*	(Nov)	6900
Drummond Pond	7500*	7225*	5000	4160*	1800*	(Nov)	5137
Caithness Lo.	3334*	5879*	4995*	2787*	2958*	(Mar/Apr)	3991
Haddo House Lo.	1100	4320	3500	5000	4700*	(Mar/Apr)	3724
Lindisfarne	3500*	4500*	3800	5000*	1700*	(Nov)	3700
Dornoch Fth.	3450	4389*	3406*	4261*	2407	(Oct)	3561
Lo. of Clunie	12000*	1600*	1500*	1545*	855*	(Mar/Apr)	3500
Hoselaw Lo.	5700	3000	220	3600	3200	(Dec)	3144
Carsebreck/Rhynd Lo.	2920*	4450*	3150*	2470*	2150*	(Nov)	3025
Stranraer Lo.	2900*	3500*	2800*	(1000)*	2400*	(Nov)	2900
Fedderate Rsr.	2700*	2500*	2750*	3300*	2700*	(Mar/Apr)	2790
Holborn Moss	2200*	3000	3000*	2500*	3200	(Dec)	2780
Lo. Leven	3000*	2100	2250	2400	1200*	(Nov)	2190
Lo. of Lintrathen	2000	1200	1800*	3050	2490	(Oct)	2108

Canada Goose *Branta canadensis*

The maximum numbers of Canada Geese recorded in Britain (34,015) and Northern Ireland (335) in 1989-90 (Tables 1 & 2) were similar to those in 1988-89, and similarly the September/January index did not change a great deal (Table 5). Regional index values, however, suggest marked increases in the numbers of Canada Geese particularly in the south of England and south Wales (Salmon *et al.* 1989).

Eleven sites qualify for inclusion in Table 17 by regularly supporting over 600 birds. Most held considerably fewer in 1989-90 than expected from earlier seasons. In addition to these sites, Radwell Gravel Pits held 675 Canada Geese in November 1989.

Not surprisingly, there has for a long time been considerable debate concerning the effects on birds of the fitting of neck collars to aid the recognition of individual birds over long-distances. Neck collars were fitted to 165 Canada Geese in southern England. The geese was not adversely affected by the collars, with collared and uncollared birds having very similar behaviour and time budgets (Johnson & Sibly 1989). Moreover, breeding success tended to be higher in collared birds, but this was attributed to greater age and experience. The rates of retention of collars were 76.3% for the first year and 55.5% overall for the two years of the study.

The WWT will survey the moulting population of Canada Geese in Britain in 1991 and, in collaboration with the Ministry of Agriculture, is investigating potential control measures and the local population dynamics of the species.

Table 17. CANADA GOOSE: MAXIMA AT MAIN RESORTS

1985/86	86/87	87/88	88/89	89/90	(Mth)	Average	
Kedleston Park	1350	1600	2000	1000	1080	(Nov)	1406
Stratfield Saye	1750	1850	1400	400	1350	(Nov)	1350
Bewl Water	1150	1500	1150	1100	1000	(Sep)	1180
Livermere	1102	874	x	x	x		988
Abberton Rsr.	821	539	1122	1156	1240	(Sep)	976
Rutland Water	691	856	1181	1102	483	(Sep)	863
Lackford Gp.	856	834	x	x	x		845
Twyford Gp.	381	282	1202	792	847	(Sep)	701
Clumber Park	663	918	588	562	550	(Sep)	656
Shavington Park	847	676	800	638	299	(Sep)	652
Harewood Lake	655	607	651	625	595	(Dec)	627

Barnacle Goose *Branta leucopsis*

Aerial and ground surveys of the Greenland population of the Barnacle Goose, which winters in northern and western Scotland and western Ireland, were completed in March 1988 (Fox *et al.*, In press.,b). Numbers in Scotland had increased by 22% since the last survey in 1983 and a 71% increase in Ireland has taken the total population from 26,467 in 1983 to 34,544 in 1988. The Scottish component of this population winters mainly on Islay and here they numbered 25,279 in December 1989, 23,826 in February and 23,020 in April 1990. The numbers of juveniles present in the Islay flocks, averaging just over 18%, indicated that the birds had bred well in 1989, probably leading to the relatively high numbers in 1989. Other records of flocks attributable to this population included 770 on Tiree (December), 350 at Keils/Danna in November, 343 on Coll in December and 59 at Strangford Lough in September. The Skomer/Marloes Mere flock, which is thought to be from this population, was not recorded in 1989-90, though 50 were present nearby on the Taf Estuary in January.

Counts of Greenland Barnacle Geese on Coll and Tiree made over the six years from 1982-83 to 1987-88 indicate a probable population of around 700 geese, mostly confined to sites in the east and north of Tiree and in south-west Coll (Newton & Percival 1989). Observations of ringed birds, though relatively few, seem to show that the birds exhibit a number of different strategies of movement and interchange between Coll, Tiree and nearby Islay. Some birds apparently remain on Tiree throughout the winter, others stage regularly on Islay in autumn before moving to Tiree and others occasionally wander from Islay to Tiree in midwinter, possibly in search of better grazing. There is the possibility also that birds using Coll and Tiree in spring are able to achieve better pre-migratory condition than those remaining on Islay, which may cause the relatively high incidence of such movements noted in this species (Newton & Percival 1989).

Svalbard Barnacle Geese, which winter at Caerlaverock, are one of the most extensively studied goose populations in the world, and the WWT continues to pursue a detailed understanding of what makes this population tick. Numbers have increased from 300 individuals in the 1940s to 12,100 in 1988, but since 1980 the growth rate has slowed considerably. There has been an increase in the number of non-breeding birds, and an increase in female mortality during summer and on migration. The reasons for these density-dependent effects are proving difficult to quantify. One possible explanation infers competition for nesting places. However, Prestrud *et al.* (1989) have shown that nesting space per se is not limiting. Perhaps of greater significance is competition for food on the breeding grounds (e.g. Owen & Black 1989) and perhaps on staging areas also.

On the wintering grounds, at Caerlaverock, Black & Owen (1989a) studied the mechanisms involved in the resolution of conflicts between family groups (=social units) which spend appreciable amounts of time in aggressive behaviour. The size of the social unit was the best predictor of dominance, and the effect of individuals' size and age seemed less important. The larger, more aggressive groups, could remain on the edge of the flock, thus having first choice of feeding plants and spending more time in areas of high grass biomass. Furthermore, parents devoted more time to vigilance and aggression than non-parents in the autumn and winter, and guarded goslings fed for longer periods, were attacked less and grew fatter than orphans (Black

& Owen 1989b). Parent birds that remained with young for the longest periods during the winter and spring bred most successfully, probably as the accompanying goslings spent progressively more time being vigilant and repelling neighbours, enabling the parents to increase their feeding time, and hence, breeding success.

Almost daily counts of Barnacle Geese at Caerlaverock in autumn 1989 resulted in a maximum count of 11,700 birds in October, fewer than in the previous year (Table 18). The presence of only 8% young in the flocks would explain the relatively low recorded numbers. The Forth Estuary held 300 Barnacle Geese in October, presumably birds from the Svalbard population en route to the Solway.

Flocks likely to be of feral origin were recorded at Hornsea Mere (124, December) and Stratfield Saye (73, November) in 1989-90. It was wrongly inferred in last year's report that the flock usually recorded at Bittel Reservoirs (Worcester) comprises feral birds. Indeed, there is some evidence to suggest that this group and the Skomer Island flock may be the same, thus suggesting the birds to be from the Greenlandic population. However, of 39 Barnacle Geese seen in Leicestershire in 1981, one carried a dutch ring and another had been ringed on Svalbard (but was known to reside with Siberian geese in The Netherlands). Only by catching the birds at Bittel will we stand any chance of resolving the uncertainties about the true origins of this flock.

Table 18. BARNACLE GOOSE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Islay	19200*	23900*	21900*	20800*	25297*	(Dec)	22219
Solway Est.	10400*	10500*	11400*	12100*	11700*	(Oct)	11220

Dark-bellied Brent Goose *Branta bernicla bernicla*

The British population of the Dark-bellied Brent Goose has expanded dramatically in line with a 10-fold increase in the world population (Salmon & Fox, In press., Summers & Underhill, In press.). There is no evidence as yet to suggest that population growth in this species is limited by density-dependent factors leading to poorer survival or reduced fecundity. A three year pattern of variation in breeding success is characteristic for this species, involving one good breeding season, one poor breeding season and one year in which breeding is either good or poor and cannot be predicted. In 1989, breeding performance was poor; only 22 juveniles were recorded from a total of 17-39,000 geese aged in Britain (Salmon 1989). Midwinter surveys, which were especially comprehensive in January and February 1990, resulted in an estimated maximum of 90,000 geese (Kirby & Salmon 1990b), low in comparison to counts made in the previous two winters. Table 19 lists all sites which regularly exceed that required for international importance.

A three year research project concerning the feeding ecology of Dark-bellied Brent Geese in North Norfolk was initiated in 1989-90 (Vickery 1990). The project, organized by the University of East Anglia, aims to gain sufficient understanding of the interactions between the geese and vegetation, to devise computer models which will predict the distribution and movements of the geese and the state of the vegetation throughout the winter. Forecasting of goose induced damage to agricultural land will be undertaken and suggestions for possible management regimes for the species will be outlined.

Table 19. DARK-BELLIED BRENT GOOSE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Wash	24915	17679	23236	27882	19309	(Jan)	22604
Thames Est.	16414	19847	18564	17263	12555	(Oct)	16929
N Norfolk Marshes	12592	9800	9813	12711	8350	(Feb)	10653
Chichester Hbr.	11764	9998	9721	10473	9484	(Jan)	10288
Blackwater Est.	10300	12387	7709	8363	6370	(Feb)	9026
Langstone Hbr.	8646	8567	6800	8050	7821	(Jan)	7977
Colne Est.	5265	7748	5487	5494	3966	(Dec)	5592
Hamford Water	6000	8000	3750	3942	(150)	(Jan)	5423
Crouch Est.	5185	5600	2853	5333	3109	(Feb)	4416
Pagham Hbr.	3188	2251	2551	2965	2755	(Jan)	2742
Exe Est.	3729	2500	1724	2795	2510	(Nov)	2652
Medway Est.	2653	2888	2910	1860	2805	(Jan)	2623
Swale Est.	2040	1966	2589	3032	1769	(Jan)	2279
NW Solent	2600	2170	1750	2400	2127	(Jan)	2209
Dengie	(1350)	980	2598	2445	1900	(Feb)	1981
Portsmouth Hbr.	1610	2347	2129	2062	1748	(Jan)	1979
Humber Est.	2559	2229	1263	(2000)	1660	(Jan)	1942
Deben	3360	2209	484	1002	2000	(Dec)	1811

Light-bellied Brent Goose *Branta bernicla hrota*

The principal sites for Light-bellied Brent Geese are listed in Table 20. Geese present at both Strangford Lough and Lough Foyle in Northern Ireland originate from the population breeding in arctic Canada and Greenland, whilst those at Lindisfarne are from the Svalbard population. Two other Co. Down sites held over 200 birds in 1989-90: Carlingford Lough (259, January) and the vicinity of Killough Harbour (233, December).

Detailed research by Durham University and the University of East Anglia into the feeding ecology of Light-bellied Brent Geese at Lindisfarne began in 1989-90 and will continue for three winters (Percival 1990). In periods of severe weather, the entire Svalbard population (about 4,500 individuals) may frequent this site, vacating Denmark in favour of the milder conditions that Lindisfarne has to offer. Here the geese may compete with Whooper Swans and Wigeon for the nutritious eelgrass, though the swan numbers have declined over recent years. The project will investigate how these species exploit the available, traditional, food resources and predict what might happen should large changes in bird numbers or food supply occur. In particular, a key question to address will be whether the birds might switch to feed on agricultural land if eelgrass becomes scarce.

Table 20. LIGHT-BELLIED BRENT GOOSE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Strangford Lo.	15872	14516	15031	8478	12423	(Oct)	13264
Lindisfarne	3100	3000	2000	3000	3000	(Dec)	2820
Lo. Foyle	1562	1693	2495	3700	4105	(Nov)	2711

Shelduck *Tadorna tadorna*

Numbers of Shelduck were noticeably slower to build up in Northern Ireland (Table 4) than in Britain (Table 3), perhaps because most Irish birds move to Britain to moult and do not begin to return until October. Peak counts at the main resorts (Table 21) are very variable from year to year. However, there appears to be a steady increase in the numbers of breeding/moulting Shelducks on the Severn and on the Forth. During hard weather, they move away from continental shores and seek refuge in Britain and possibly Ireland. Some move to north and west France, but this involves relatively few birds and only in the severest of conditions. Using a combination of bird report and March NWC data, Linton & Fox (In press.) have described the expansion of inland breeding by Shelducks in Britain. A rapid expansion in the incidence of nesting away from the coast occurred during the last two decades, as the overall breeding population increased. In 1986, an estimated 250-300 of the ca. 10,000 British breeding pairs (Owen *et al.* 1986) attempted to breed inland, mainly in eastern, south-eastern and central England. The interesting question of why more Shelducks are breeding inland, in presumably less favourable habitats, has yet to be investigated. Is it simply territorial exclusion from prime coastal breeding habitat or, conversely, are inland breeders exploiting new habitats in which they can breed very well? Since there is little available information on differential breeding success in Shelducks in coastal versus inland populations, it is not possible at present to say what the answer might be.

Table 21. SHELDUCK: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Wash	21309	23755	16332	15613	19460	(Nov)	19294
Dee Est.	5670	6130	4600	4896	6924	(Oct)	5644
Medway Est.	2984	5303	3300	5805	5092	(Jan)	4497
Humber Est.	4492	5427	2943	4681	4245	(Jan)	4358
Ribble Est.	3078	5055	6037	3534	3162	(Jan)	4173
Morecambe Bay	3084	3888	4433	3345	5208	(Nov)	3992
Mersey Est.	4000	2355	2225	2602	4040	(Nov)	3044
Chichester Hbr.	2556	3772	2451	2514	2717	(Jan)	2802
Thames Est.	2488	3688	1749	2351	3137	(Jan)	2683
Severn Est.	1611	2459	2707	2819	3332 +	(Jul)	2586
Forth Est.	2086	2404	2470 ++	2400 ++	2670	(Sep)	2406
Poole Hbr.	2223	3588	1439	2230	2179	(Feb)	2332
Blackwater Est.	3288	2263	1168	2000	2599	(Feb)	2264
Strangford Lo.	2221	1335	1579	3973	1867	(Dec)	2195

+Counts of breeders and non-breeders from Jones (1989).
++ Counts in August of moulting birds (D.M. Bryant, In litt.).

Mandarin *Aix galericulata*

The number of Mandarin Ducks counted on NWC sites increased sharply between November (129) and December 1990 (226), presumably reflecting a general movement from secluded streams and ponds to the larger, more regularly counted sites. The largest counts were made at the traditional sites of Cuttmill Ponds (97, December) and Woburn Park Lakes (55, December). Smaller numbers frequented Virginia Water (27, October) and Witley Park (25, November).

Davies & Baggott (1989) have studied egg-laying, incubation and intraspecific nest parasitism in Mandarin Ducks in southern England. In other waterfowl, such nest parasitism has been shown to be disadvantageous due to the larger number of nest desertions produced. Desertion, however, was very uncommon in the Mandarin, which readily incubated abnormally large numbers of eggs with little effect on hatching success. Further studies will aim to quantify the costs and benefits of this reproductive strategy for this cavity-nesting species.

Wigeon *Anas penelope*

Despite a reasonably high maximum count of Wigeon in Britain in 1989-90 (Table 1) both the October and January indices reached levels lower than the previous year (Table 5). The mildness of the winter may presumably account for this as large influxes from the Scandinavian/Siberian breeding populations would not be expected. In Northern Ireland, peak numbers in 1989-90 (12,569, October) were also much lower than in 1988-89 (24,100), perhaps partly for the same reason and possibly also reflecting a reduction in the Icelandic breeding population. All sites with average five year maxima exceeding 7,500, the level required for international importance, are listed in Table 22. The Ouse Washes held by far the largest concentration recorded in 1989-90, the count of 53,615 being the highest recorded at this site for over 10 years. Numbers at the Ribble Estuary continued to increase and the count of 13,480 at Abberton represents the maximum recorded there since the cold winter of 1984-85. Peak counts from Lindisfarne and Lough Foyle in 1989-90 were disappointingly low, as is a steady deterioration in numbers on the Mersey Estuary. Other sites supporting more than 7,500 Wigeon in 1989-90 were Martin Mere (8,000) and the Nene Washes (7,958), both in February.

Two recent studies by the Trust have focussed on Wigeon. The first examined Wigeon trends in considerable detail at a single site, whilst the second, which is on-going, is aimed at understanding patterns in Wigeon movements. Peak counts of wintering Wigeon at Strangford Lough have fallen from 20,000 in the early 1970s to just 2,000 in recent years, whilst use of the site by Light-bellied Brent Geese has increased. Is it possible, therefore, that the two species are in direct competition for food, namely eelgrass *Zostera?* The analysis has revealed a number of reasons why competitive interaction between these species has not been a major factor in the decline of Wigeon at this site. These include parallel increases in both populations prior to 1975, the lack of any inverse correlation between the numbers of each species, and the absence of geese in areas where Wigeon have declined the most (Fox *et al.* 1990a). Whilst the cause of the Wigeon decline cannot be identified unequivocally, based on present day information, the evidence suggests that the dramatic increase in human disturbance could have had some major contributory effect. Mitchell & Owen (1990) provide results from the first two seasons of detailed investigations into Wigeon movements. The available evidence suggests that birds wintering in Scotland comprise a mixture of Icelandic and continental birds, which is contrary to earlier beliefs that all Scottish wintering Wigeon were Icelandic. Also, a surprisingly high degree of site-faithfulness is apparent, at least to certain quarters, both within- and between-winters. It is important to remember though, that both of the study winters have been relatively mild and the results collated to date may not reflect the extreme movements associated with periods of cold weather.

Table 22. WIGEON: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Ouse Washes	34495	42175	38672	30968	53615	(Dec)	39985
Ribble Est.	24150	24462	35000	41809	43541	(Jan)	33792
Lindisfarne	12495	18000	22000	28000	7500	(Sep)	17599
Dornoch Fth.	14925	15029	14194	10299	13861	(Oct)	13662
Lo. Foyle	12262	12220	11997	22000	7797	(Oct)	13255
Cromarty Fth.	12364	8871	8392	8158	9686	(Dec)	9494
Swale Est.	6845	10714	9750	6801	8625	(Jan)	8547
Abberton Rsr.	10180	10000	2453	5704	13480	(Sep)	8363
Mersey Est.	11650	12000	6000	4630	4000	(Dec)	7656

Gadwall *Anas strepera*

Fox & Salmon (1989b) have analysed winter status and distribution of Gadwall in Britain and Ireland. The population has risen dramatically since 1960 and had reached approximately 6,000 birds by 1985-86. A relatively faster rate of increase (12-17% per annum) has occurred during the midwinter months than during September, suggesting that increased immigration of foreign breeding birds has been responsible. The expansion in Britain appears to be related to the proliferation of lowland artificial waters, such as gravel pits and reservoirs, and for this reason the Gadwall population seems likely to increase still further in the years to come.

In 1989-90, the total numbers of Gadwall in Britain (Table 1) and in Northern Ireland (Table 2) reached their highest ever levels, and the December index confirmed the continuation of the upward trend in numbers (Table 5). The main resorts for Gadwall are shown in Table 23, and a staggering 18 further sites held more than 150 birds at some time in 1989-90. These were Eyebrook Reservoir (502, September), Chichester Harbour (428, January), Nene Washes (302, March), Buckden/Stirtloe Pits (272, December), Little Paxton Gravel Pits (244, October), Fen Drayton Gravel Pits (236, December), Langtoft Gravel Pits (234, January), Ditchford Gravel Pits (225, December), Fairburn Ings (209, November), Hickling Broad (188, October), Shepperton Gravel Pits (186, January), Cotswold Water Park West (179, January), Tattershall Pits (174, January), Bucklands Pond (174, January), Richmond Park (171, December), Eversley Cross/Yateley Pits (162, January), Summerleaze Gravel Pits (161, January), Cheddar Reservoir (153, January). If the numbers of Gadwall continue to increase in this way, many more sites in Britain can be expected to qualify as internationally important for them in the near future.

Table 23. GADWALL: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Rutland Water	1577	1031	1387	1805	1606	(Sep)	1481
Abberton Rsr.	169	140	160	784	846	(Sep)	474
Gunton Parks	327	266	389	461	496	(Sep)	388
Severn Est.	321	262	322	290	384	(Dec)	316
Ouse Washes	255	356	277	229	379	(Mar)	299
Cheshunt Gp.	215	105	185	200	335	(Dec)	208
R. Avon: Blashford	96	45	90	333	366	(Dec)	186
Lo. Leven	195	250	140	154	163	(Oct)	180
Stanford Meres	245	316	67	110	133	(Jan)	174
Hornsea Mere	235	70	281	77	157	(Dec)	164
Thrapston Gp.	215	105	185	181	106	(Nov)	158

Teal *Anas crecca*

The midwinter index for Teal in Britain increased dramatically during 1989-90 reaching its highest level since the cold winter of 1984-85, which is somewhat surprising given the mildness of the winter. However, perhaps cold weather is not the only important factor causing large numbers of Teal to resort to the British Isles, as the species shows very marked variations in wintering distributions between all winters, be they mild or cold (Ridgill & Fox 1990).

Very large numbers of Teal were present at sites in North West England in 1989-90, with the Mersey, Ribble, Dee and Woolston Eyes together supporting a very large proportion of the total British population. Also, Abberton Reservoir and the North Norfolk Marshes supported much higher numbers than is usual. Not included in the table is the Somerset Levels, from which Delany (1990b) reports the presence of over 4,500 Teal in late December 1989. Floods on the Somerset Levels, wherever they develop and at whatever time during the winter, attract large numbers of waterfowl, and such numbers would be relatively easy to maintain by sympathetic management of water levels there.

Table 24. TEAL: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Mersey Est.	4300	8350	12730	9670	12300	(Dec)	9470
Ribble Est.	3076	6177	3435	6417	9709	(Nov)	5763
Dee Est.	5720	2940	3640	4670	9825	(Nov)	5359
Ouse Washes	3177	3551	2753	3870	4920	(Dec)	3654
Martin Mere	3400	2600	4700	4300	2600	(Nov)	3520
Derwent Ings	2573	3620	3750	3300	x		3311
Woolston Eyes	1530	3000	3500	3500	4000	(Dec)	3106
Hamford Water	5000	(366)	1700	1975	(677)	(Sep)	2892
Cleddau Est.	2680	2224	2688	3243	2586	(Jan)	2684
Severn Est.	3383	2515	2451	1253	3402	(Dec)	2601
Thames Est.	2100	2130	2393	1996	3342	(Sep)	2392
Abberton Rsr.	1200	2731	1042	1850	4225	(Oct)	2210
N Norfolk Marshes	787	1389	770	2337	5538	(Dec)	2164
Lo. Neagh/Beg	2290	2173	2619	2155	1576	(Dec)	2163
Dornoch Fth.	2033	2697	1666	2307	1761	(Dec)	2093
Swale Est.	1727	1286	3030	2353	2040	(Dec)	2087
Humber Est.	2904	1975	1241	2875	1425	(Sep)	2084

Mallard *Anas platyrhynchos*

The numbers of Mallard recorded on NWC sites in Britain varied extremely little during early and midwinter in 1989-90 (Table 3). However, in Northern Ireland, there was a steady and consistent decline such that only 50% of the number counted in September was present in December (Table 4). A similar pattern was apparent in 1988-89 also (Salmon *et al.* 1989) and could perhaps be explained both by dispersal from large waters (e.g. Loughs Neagh/Beg) to smaller ponds and marshes in late autumn and early winter, and by emigration into the Republic and beyond (see Hutchinson 1989).

Seventeen sites currently support over 2,000 Mallard on a regular basis and these are ranked in Table 25. Only the top three sites qualify as nationally important for this species and no site comes anywhere near the 20,000 required for international recognition. Both Grafham Water (2,410) and Lindisfarne (2,030, January) also held more than 2,000 Mallard in 1989-90.

Table 25. MALLARD: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Humber	6311	6422	10040	4940	4184	(Jan)	6379
Ouse Washes	7815	4216	5553	4905	4856	(Jan)	5469
Lo. Neagh/Beg	3778	5282	4054	5560	6438	(Sep)	5022
Wash	5949	5852	5448	2910	4254	(Jan)	4883
Morecambe Bay	4615	3625	4527	4670	4496	(Sep)	4387
Dee Est.	4450	5325	3880	4105	3505	(Dec)	4253
Martin Mere	4600	3600	3200	3900	3600	(Dec)	3780
Severn Est.	3227	3549	4263	3916	3074	(Sep)	3606
Derwent Ings	5240	3000	3420	3000	3000	(Feb)	3532
Lo. of Strathbeg	3450	2650	3450	3300	1460	(Dec)	2862
Solway Est.	1821	2629	3188	2666	2185	(Jan)	2498
Lo. Foyle	2965	3300	2274	2000	1889	(Oct)	2486
Thames Est.	2595	2546	1726	2637	2732	(Nov)	2447
Forth Est.	2165	2082	2609	2434	2182	(Sep)	2294
Lo. Leven	1737	2300	1060	2710	2800	(Sep)	2121
Abberton Rsr.	2100	2700	1471	1458	2796	(Oct)	2105
Rutland Water	2832	1816	1635	1535	2464	(Sep)	2056

Pintail *Anas acuta*

For the second year in succession, there was a distinct peak in the number of Pintail occupying British NWC sites in October, followed by a second peak in December or January (Table 3), though a single peak in December is more usual (Owen *et al.* 1986). It will be interesting to see whether this represents a long-term change in habits by the species and, if so, to attempt to establish which birds are involved in the early passage and where they are moving to. Table 26 lists the sites reaching, on average, the qualifying level for international importance for this species. The number on the Dee in October was particularly noteworthy and represents almost 50% of all the Pintail counted in Britain at this time. Two further sites, the Ribble Estuary (1,621, January) and Nene Washes (883, February), supported over 700 in 1989-90, the count at the former site probably including birds recorded on the Dee earlier in the season and representing an all-time record for the site.

Marked declines in the numbers of Pintail frequenting Loughs Neagh and Beg have occurred over the 1965-1988 period, contrary to a general pattern of increase in Britain and Europe as a whole (Winfield *et al.* 1989). The authors suggest this is probably due to changes in their winter distribution, and point out that at the same time as the species declined on Lough Beg (in the early 1970s) there was a marked increase in the numbers at the Mersey Estuary.

Table 26. PINTAIL: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Dee Est.	6800	4620	9550	8435	11945	(Oct)	8270
Mersey Est.	9000	6000	8050	4288	8000	(Dec)	7068
Wash	2866	4562	7715	6541	2757	(Jan)	4888
Morecambe Bay	2890	2072	2140	1662	1962	(Dec)	2145
Burry Inlet	1180	2085	2017	1800	2306	(Jan)	1878
Martin Mere	1500	1200	1370	2600	1500	(Sep)	1634
Ouse Washes	1300	1803	1080	1228	1818	(Mar)	1446
Duddon Est.	820	1102	1289	2200	873	(Jan)	1257
Medway Est.	480	1042	1011	927	700	(Jan)	832
Solway Est.	101	1022	1003	1165	550	(Feb)	768

Shoveler *Anas clypeata*

Both October/November and January indices (Table 5) revealed increases in the British population in 1989-90, with the total numbers counted in Britain (8,157) and in Northern Ireland (287) exceeding last year's counts by 17% and 15%, respectively. In both countries, Shovelers reached maximum abundance early in the autumn and declined thereafter (Tables 3 & 4).

Table 27 shows the sites that have held over 250 Shoveler, on average, over the last five seasons. Very large numbers were present at Abberton Reservoir in October 1989 which, together with the Ouse Washes, Rutland Water and Loch Leven, holds in excess of the 400 birds necessary for international recognition for the species. In 1989-90, Wraysbury Reservoir (601, December), Fiddlers Ferry (464, September), Dungeness (294, September) and Fairburn Ings (282, September) each supported sizeable concentrations.

Table 27. SHOVELER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Ouse Washes	505	445	1443	523	696	(Mar)	722
Rutland Water	655	525	285	729	372	(Sep)	513
Abberton Rsr.	379	522	240	418	829	(Oct)	478
Lo. Leven	177	780	391	540	285	(Sep)	435
Chew Valley Lake	190	390	440	475	490	(Oct)	397
Swale Est.	403	257	603	348	224	(Mar)	367
Woolston Eyes	510	475	230	167	300	(Sep)	336
Thames Est.	631	178	207	258	300	(Feb)	315
King George VI Rsr.	365	270	361	333	87	(Sep)	283

Pochard *Aythya ferina*

The number of Pochard wintering in Britain in 1989-90 increased over that found in the previous year, according to both the total numbers counted (Table 1) and the January index (Table 5). In Northern Ireland, however, the number recorded was less than in 1988-89, due largely to a relatively small reduction in the numbers at Loughs Neagh and Beg. This site remains, however, of outstanding international importance for this (and other) species, the current average maxima for the site exceeding the appropriate qualifying level by 766%. The maximum count in 1989-90 at Rostherne Mere was very low and the peak count at Dudgrove was much reduced for the second year in succession. The exceptionally high numbers of Pochard counted at Chew Valley Lake in 1988-89, apparently the result of higher than normal water levels, were not sustained. In addition to the sites included in the table, Loch Watten (1,091, February) held over 1,000 Pochard in 1989-90.

Table 28. POCHARD: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. Neagh/Beg	17436	16348	24072	39811	36380	(Dec)	26809
Abberton Rsr.	2024	3000	2102	2739	2271	(Aug)	2427
Ouse Washes	1975	1511	3750	1129	2964	(Feb)	2266
Cots. Water Pk (East)	1806	1578	3291	1352	1147	(Dec)	1853
Severn Est.	1652	2070	1701	2026	1742	(Jan)	1838
Lo. of Boardhouse	627	2402	3755	723	1327	(Oct)	1767
Rostherne Mere	1900	2850	2395	1151	120	(Dec)	1683
Kingsbury/Coton	1500	2000	1775	1408	1387	(Dec)	1614
Dudgrove Gp.	1235	1124	2805	847	754	(Feb)	1353
Lo. of Harray	1549	1569	1043	1372	1011	(Nov)	1309
Cots. Water Pk (West)	1138	1176	1119	1538	1329	(Nov)	1260
Poole Harbour	1800 +	1200 +	1177 +	685 +	1020 +	(Jan)	1171
Chew Valley Lake	410	1080	650	2450	625	(Sep)	1043

+ collated from county records by S. Aspinall.

Tufted Duck *Aythya fuligula*

The maximum number of Tufted Ducks recorded in Northern Ireland in 1989-90 (30,402, Table 2) was appreciably higher than the peak count of 18,100 recorded in 1988-89 (Salmon *et al.* 1989). This reflects the fact that the numbers on Lough Neagh, though declining initially, have recovered considerably over the last decade. Winfield *et al.* (1989) have studied trends in the waterfowl occupying this site and discuss the introduction of the Roach into the Lough in the 1970s, which subsequently increased in numbers up to the mid-1980s, and then declined because the fish population became infested by parasites. This, they suggest, may be the answer to the trends observed for the Tufted Duck (and other waterfowl) on Lough Neagh, as fish and birds may compete for the same invertebrate foods. Further testing of this hypothesis is underway.

Table 29 shows Tufted Duck maxima at the main resorts and the increase on Loughs Neagh and Beg, particularly over the last three seasons, is obvious. Noteable increases have also occurred at Kilconquhar Loch over recent years. Three sites not qualifying for inclusion in the table supported over 600 Tufted Ducks in 1989-90: Loch Watten (711, December), Pitsford Reservoir (697, November) and Upper Lough Erne (620, February).

Table 29. TUFTED DUCK: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. Neagh/Beg	6442	8943	19603	16642	29393	(Dec)	16205
Rutland Water	3000	3301	3237	5582	3709	(Sep)	3766
Abberton Rsr.	2200	3375	3463	3987	4387	(Aug)	3482
Lo. Leven	3310	1800	2580	3180	2700	(Sep)	2714
Kings. Water Pk/Coton	1620	1300	2271	1405	1794	(Dec)	1678
Lo. of Harray	1447	987	1142	1920	1992	(Jan)	1498
Severn Est.	1757	1490	1101	990	997	(Jan)	1267
Staines Rsr.	807	3313	303	387	547	(Sep)	1071
Wraysbury Gp.	630	1101	(426)	1447	683	(Jan)	965
Ouse Washes	675	1078	1847	470	528	(Mar)	920
Walthamstow Rsr.	894	1347	760	721	721	(Jan)	889
Kilconquhar Lo.	407	288	477	1570	1250	(Jan)	798
Cots. Water Pk (West)	1011	413	524	1322	464	(Mar)	767
Hanningfield Rsr.	460	790	870	655	530	(Sep)	661
Besthorpe/Girton Gp.	450	600	560	1100	557	(Feb)	653
Chew Valley Lake	455	535	525	830	710	(Sep)	611

Scaup *Aythya marila*

All sites holding more than 130 Scaup, according to average maximum figures calculated over the 1985-86 to 1989-90 period, are listed in Table 30. Scaup appear to be declining at most sites, with perhaps the Inner Clyde providing the only exception, although the numbers involved there are unfortunately very small. Annual surveys of the Moray Firth, conducted by the RSPB under contract to BP, revealed a grand total of 263 Scaup in February, the majority residing in the Cromarty and Dornoch Firths. A count of 150 was reported in January from coastal waters between Towyn and Llanddulas, North Wales, and no other counts in 1989-90 exceeded this level. A further appraisal of the current status of this species would seem to be necessary.

Table 30. SCAUP: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Solway Est.	1400	1438	4000	3092	1562	(Feb)	2298
Lo. Neagh/Beg	1712	1586	1432	2150	1215	(Dec)	1619
Lo. Indaal	1505	817	1198	1230	442	(Nov)	1038
Forth Est.	1650	958	861	762	135	(Feb)	87
Carlingford Lo.	720	435	178	140	150	(Feb)	325
Loch Ryan	x	340	120	200	409	(Feb)	214
Dornoch Fth.	311	194	107	266	149	(Feb)	205
Lo. of Harray	163	218	137	219	164	(Jan)	180
Dee Est.	128	240	171	174	x	(Mar)	178
Belfast Lo.	344	422	44	19	29	(Jan)	172
Cromarty Fth.	120	193	155	151	126 +	(Jan)	149
Inner Clyde	99	x	80	174	267	(Jan)	155

+ RSPB/BP studies.

Eider *Somateria mollissima*

The total number of Eiders recorded in Britain in 1989-90 (50,403, November) is far greater than the peak total of 15,800 found in 1988-89. However, the main resorts of this species are covered only very irregularly and the high count of 1989-90 can be attributed to counts made in the Outer Firth of Tay, where an estimated 30,000 birds were recorded (Table 31). Elsewhere, large numbers were found on the Forth Estuary (mainly in Largo Bay, Aberlady Bay and in the vicinity of Port Seton) and the RSPB surveys of the Moray Firth produced a peak count across the whole area of 2,136 in February.

There have been a number of papers published recently focussing on the movements of Eiders in relation to their breeding grounds and their nesting-associations with gulls. Eiders breeding at the Sands of Forvie, Grampian, either remain near the colony or move to winter on the Firths of Forth and Tay, whilst Eiders breeding in Fife are largely sedentary (Baillie & Milne 1989). Northumberland breeders, like those from Forvie, either stay near their breeding areas or winter on the Forth and Tay estuaries. Males disperse more extensively than females, and some join the Baltic breeding population, probably by pairing with Scandinavian females wintering in Britain. Similarly, female Eiders that have bred in The Netherlands show almost complete faithfulness to their breeding colonies, whilst males show much lower rates of return to the colonies at which they were ringed (Swennen 1990a). Pair formation takes place in the communal winter quarters and whilst females always returned to 'home', males simply followed their mates to new areas.

The costs and benefits to Eiders nesting within gull colonies has been the focus of studies in SW Sweden over recent years. During incubation, predation on Eider nests in gull colonies was lower than on nests elsewhere, suggesting that the gulls afforded some protection to Eiders. However, recent experiments, using artificial nests, showed that a higher proportion of nests was preyed upon within than outside gull colonies during the Eider laying period (Gotmark 1989). This is because the gulls had not started laying and defending their own eggs at this time. Thus, a strong nest association with gulls would only be advantageous for species that breed at the same time or later than the gulls.

In The Netherlands, small numbers of Eiders nest in and around large colonies of Herring Gulls. Here, nesting success is high but the survival of ducklings is often extremely low (Swennen 1983), with up to 99% disappearing during their first 10 days of life. The gulls themselves are responsible for such losses, especially when ducklings were already weakened by scarcity of food (Swennen 1989). Ducklings that were able to find and remain on good feeding sites, were better able to react to predators and had a higher chance of survival.

Table 31. EIDER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Tay Est.	12000	6000	20000	x	30000	(Nov)	17000
Morecambe Bay	4346	4144	6247	5773	7604	(Sep)	5623
Forth Est.	3500	4878	4941	3977	10798	(Feb)	5619
Inner Clyde	2560	x	4325	4384	4674	(Nov)	3986
Lo. Fleet	1608	2200	902	1122	1154 +	(Oct)	3051
Lindisfarne	3020	5300	2505	2300	2000	(Dec)	3025
Murcar	5300	2500	1000	1000	2000	(Sep)	2360
Montrose Basin	1840	2772	2230	2000	2960	(Nov)	2360
Troon	(450)	(461)	3000	(402)	153	(Mar)	1577
Ythan Est.	1689	1661	1831	1315	1013	(Sep)	1502

+ RSPB/BP studies.

Long-tailed Duck *Clangula hyemalis*

The main resorts for Long-tailed Ducks in Britain are shown in Table 32. The best estimate of peak numbers in the entire Moray Firth was of 6,270 birds in November, considerably less than the estimate obtained in 1988-89. Burghead Bay was again the best part of the Firth, with 3,455 residing there in October. Elsewhere, over 192 were counted between the mouth of the Dee and the Don in November.

Table 32. LONG-TAILED DUCK: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Moray Fth.	6000	10000	(3900)	10500	6270 +	(Nov)	8193
Wide Fth.-Rousay	1200	874	x	x	x		1037
Forth Est.	312	694	898	1037	465	(Nov)	681
Bluemull Sound	712	519	x	x	x		616
Broad Bay	1000	200	210	x	100		378
Lindisfarne	72	305	386	800	294	(Dec)	371
Water Sound	212	240	240	219 ++	206	(Mar)	223

+RSPB/BP studies.
++ from Christer (1989).

Common Scoter *Melanitta nigra* and Velvet Scoter *M. fusca*

The Moray Firth surveys undertaken by the RSPB produced a maximum count of 1,607 scoters in December 1989 (with both species being involved), which compares with 2,968 counted in 1988-89 (Salmon *et al.* 1989). Burghead Bay held peak numbers in October (853), Spey Bay in February (525) and Dornoch Firth in December (512). Of the scoters that were close enough to identify to species, an average of 63% were Common Scoters. Elsewhere, 4,100 Common Scoters were recorded between Towyn and Llanddulas Bay, North Wales, in February; 2,000 in Carmarthen Bay (Taf Estuary) and 1150 off Dundrum Bay in November; and, 1,047 in the Forth Estuary in December.Only one site held over 50 Velvet Scoters in 1989-90 apart from the Moray Firth. This was St. Andrews Bay were the number present reached 2,400 in January 1990.

Britain and Ireland support a small breeding population of Common Scoters numbering approximately 170 pairs. Partridge (1989) describes recent investigations by the RSPB into the decline of this species at a former stronghold in Northern Ireland, namely Lower Lough Erne. This site supported 137-167 breeding scoters in 1967 but held only 7 pairs in 1988. The study revealed strong evidence that the main problem was a deterioration of water quality, associated

with increased fertilizer and industrial inputs into the Erne catchment, which affected the aquatic invertebrates on which the scoters feed. Similarly affected were breeding Red-breasted Mergansers and Tufted Ducks.

Goldeneye *Bucephala clangula*

The main sites for Goldeneyes are listed in Table 33 and all are nationally important for this species. The qualifying level for international importance for Goldeneyes is currently 3,000 and thus only Loughs Neagh and Beg qualify. Two other sites held numbers that were greater than 250 in 1989-90: Kilconquhar Loch (644, January) and Loch of Skene (415, March). The former site also supported large numbers of Tufted Ducks in 1989-90, perhaps due to beneficial changes in water levels or food supplies there.

The numbers of Goldeneyes wintering at Girdle Ness and Greg Ness, Aberdeen, has increased steadily each year since the 1975-76 winter. The mean January maximum between 1982 and 1986 of 338 makes this flock one of the largest in Scotland (Bell 1989).

Table 33. GOLDENEYE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Lo. Neagh/Beg	4851	9906	10463	12239	11408	(Dec)	9773
Forth Est.	996	1855	1425	1608	991	(Feb)	1375
Maidens Hbr./Turnb.	(135)	x	x	x	625	(Feb)	625
Inner Moray Fth.	512	510	559	682	680 +	(Jan)	589
Inner Clyde	706	x	580	607	413	(Feb)	577
Abberton Rsr.	364	677	389	1002	362	(Mar)	559
Belfast Lo.	372	692	580	320	578	(Feb)	508
Strangford Lo.	553	280	725	289	240	(Nov)	477
Morecambe Bay	349	413	313	430	480	(Jan)	397
Blackwater Est.	329	490	228	172	518	(Feb)	347
Tweed Est.	287	340	290	408	360	(Mar)	337
Windermere	329	345	246	256	292	(Jan)	294
Rutland Water	190	243	272	385	345	(Jan)	287
Cromarty Fth.	445	275	192	133	209	(Dec)	251

+ RSPB/BP studies.

Smew *Mergus albellus*

A peak total of 57 birds were present in Britain in January and they were widely dispersed across numerous sites, mainly in central and southern England. No site supported more than seven birds at any one time.

Red-breasted Merganser *Mergus serrator*

The January index for this species suggested an overall decrease in the British wintering population (Table 5), perhaps in the order of 44%. At the principal resorts (Table 34), most sites held fewer than expected from the maxima of the last five seasons. The Moray Firth census revealed 1,548 in December with the main concentration being on the Riff Bank. At other localities, a maximum count of 259 was recorded at The Fleet/Wey in January and 240 frequented Loch Indaal in August.

Table 34. RED-BREASTED MERGANSER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Inner Moray Fth.	2450	3063	1374	1076	1080 +	(Dec)	1991
Tentsmuir	1050	600	1102	420	200	(Sep)	674
Cromarty Fth.	588	615	584	332	194 +	(Dec)	530
Forth Est.	383	546	316	437	472	(Mar)	431
Poole Hbr.	528	302	309	387	168	(Dec)	339
Strangford Lo.	305	183	213	371	303	(Nov)	275
Morecambe Bay	267	177	222	250	371	(Dec)	257
Dundrum Bay	540	104	93	255	119	(Nov)	222
Lo. Ryan	280	210	460	50	104	(Nov)	221
Duddon Est.	112	178	267	262	281	(Dec)	220
Lindisfarne	229	217	310	198	132	(Mar)	217
Langstone Hbr.	152	131	214	234	185	(Jan)	183
Belfast Lo.	x	92	209	181	234	(Nov)	179
Larne Lo.	x	92	165	181	218	(Sep)	164
Inner Clyde	156	x	253	118	112	(Feb)	160

+ RSPB/BP studies.

Goosander *Mergus merganser*

Table 35 includes all sites exceeding the level of 50 for national importance over the last five years. Only the Beauly Firth receives Goosanders in numbers sufficient to qualify it for international recognition. However, the normal build-up of numbers at this site never materialized in 1989-90, and the populations of other fish-eating species in the Moray Firth (e.g. Cormorant, Red-breasted Merganser) were also relatively low (R. Evans, In litt.). The numbers at most sites in the table are extremely variable from year to year, possibly because the birds disperse to riverine feeding grounds (which are largely not counted) during the count period. Three sites, Hirsel Lake, the R. Eden and Hay-a-Park Gravel Pits, held conspicuously large concentrations in 1989-90. Over 50 birds were present at 10 additional sites in this season. These were Corby Loch (115, November), Montrose Basin (80, September), Martnaham Loch (80, December), Loch Leven (79, January), Pitsford Reservoir (69, December), Portmore Loch (62, January), Yetholm Loch (59, December), the R. Tay between Perth and Almond mouth (56, January), Tweed Estuary (55, January) and Cobbinshaw Reservoir (50, December). The extent of this list of additional sites probably reflects an expanding population, this trend being confirmed by the January, but not the February, index for Britain (Table 5).

Goosanders have been accused of causing damage to nets at a freshwater fish farm in north Argyll, allowing fish to escape, and small numbers have been killed (Carss 1989). However, although Red-breasted Mergansers were often seen passing close to farm cages in sea lochs, they do not attack stock and consequently do not suffer the same fate. The results of this study should however be treated with extreme caution, as the findings were based only on casual observations and the attitudes of fish farm staff.

Table 35. GOOSANDER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Beauly Fth.	1700	1241	1900	1490	273	(Dec)	1321
R. Tweed: Kel./Colds.	86	145	102	91	88	(Jan)	102
Tentsmuir	(0)	70	225	8	x		101
Thrapston Gp.	75	174	66	101	44	(Mar)	92
Castle Howard Lake	154	120	57	95	25	(Feb)	90
Hirsel Lake	4	35	79	124	202	(Dec)	89
Chew Valley Lake	60	105	55	107	110	(Jan)	87
Castle Lo.	71	120	81	82	69	(Jan)	85
Eccup Rsr.	68	108	62	105	55	(Mar)	80
Lo. of Skene	57	61	92	x	99	(Feb)	77
Hamilton Low Parks	59	94	97	65	68	(Nov)	77
R. Eden: Rockc./Armathw.	x	95	29	60	111	(Jan)	74
Cromarty Fth.	238	73	35	10	5	(Oct)	72
Queen Mary Rsr.	92	171	49	26	9	(Feb)	69
Leighton/Roundhill Rsr.	27	90	65	82	x	(Nov)	66
Blithfield Rsr.	66	80	48	73	61	(Mar)	66
Beesthorpe/Girton	60	67	97	55	44	(Jan)	65
Hay-a-Park Gp.	36	15	25	53	195	(Jan)	65
R. Clyde: Lam./Hynd.	54	67	x	x	x		61
Rutland Water	89	55	44	56	45	(Jan)	58
Hoselaw Lo.	35	164	6	23	38	(Oct)	53
King George VI Rsr.	59	68	28	97	14	(Jan)	53

Ruddy Duck *Oxyura jamaicensis*

The British peak count of Ruddy Ducks in 1989-90 (2,829) exceeded that of the previous year by some 429 birds, confirming a continuation of the national increase. However, fewer were recorded in Northern Ireland in 1989-90 than in the previous year and the total number present there remains low. The main sites for Ruddy Ducks are listed in Table 36. The main increases over recent years have occurred at Eyebrook and Stanford Reservoirs, and at Farmwood Pool. Several other sites supported in excess of 80 Ruddy Ducks at some time during 1989-90: Llyn Penrhyn (118, October), Llyn Traffwll (97, September), Hilfield Park Reservoir (91, January), Swithland Reservoir (81, March), Hanningfield Reservoir (80, January) and Coton Pools (80, September).

Preliminary results from a WWT/Bristol University study on the ecology and behaviour of feral Ruddy Ducks have been published recently (Hughes 1990). Females with broods were recorded to be far more aggressive than birds of either sex in other situations, either during the spring or in winter, and most of the aggression was intraspecific. As the British Ruddy Duck population continues to expand, competition with native waterfowl may well increase. In order to investigate this, the Trust is keen to collate records of interspecific aggression involving Ruddy Ducks. If you observe such behaviour please note the following and send the details to Baz Hughes at Slimbridge: the other species involved in the incident, the initiator, the victor, any immediate effects of the interaction (e.g. desertion of the nest or movements away from the site by the loser) and any longer-term effects, such as a decline in numbers or breeding success in a particular species. Such information will be individually acknowledged and greatly appreciated.

Table 36. RUDDY DUCK: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Chew Valley Lake	680	1064	610	785	470	(Jan)	722
Blithfield Rsr.	581	570	909	640	508	(Dec)	642
Rutland Water	188	287	305	468	398	(Feb)	329
Belvide Rsr.	320	212	156	340	348	(Sep)	275
Blagdon Lake	197	603	121	173	61	(Feb)	231
Eyebrook Rsr.	221	125	230	218	302	(Jan)	219
Woolston Eyes	179	162	116	137	152	(Sep)	149
Stanford Rsr.	50	83	142	57	195	(Nov)	105
Farmwood Pool	105	72	104	79	166	(Jan)	105

Coot *Fulica atra*

The peak numbers of Coot recorded in Britain (Table 1) and Northern Ireland (Table 2) in 1989-90 exceeded the maxima of the previous season by 9,800 and 3,710 birds, possibly reflecting an increase in the overall population. The principal concentrations are listed in Table 37, all of which exceed the 1,000 required for national importance. Peak numbers recorded at most sites are very variable, but those from two, Abberton Reservoir and the western part of the Cotswold Water Park, reveal that increases may be taking place there. Nine sites, although not qualifying for a position in the table, held over 1,000 Coot in 1989-90. These were Kilconquhar Loch (1,744, December), Slapton Ley (1,620, October), the R. Avon between Blashford and Hucklesbrook (1,255, November), the Swale Estuary (1,208, February), Tattershall Pits (1,197, January), Windermere (1,179, January), Little Paxton Gravel Pits (1,136, January), Hornsea Mere (1,065, September) and Morecambe Bay (1,050, October, mainly at Cavendish Dock).

Table 37. COOT: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Abberton Rsr.	9540	8703	10274	12510	16790	(Oct)	11563
Lo. Neagh/Beg	2307	5687	5008	4821	7696	(Oct)	5104
Rutland Water	5660	4623	3062	4160	5502	(Oct)	4601
Hanningfield Rsr.	x	4930	1450	1983	4350	(Oct)	3178
Cots. Water Pk. (West)	2521	2606	2731	3033	3775 +	(Nov)	2933
Ouse Washes	2970	2388	3005	1537	2345	(Mar)	2449
Cots. Water Pk. (East)	2217	1888	2112	1680	1760	(Dec)	2186
The Fleet/Wey	2330	2684	2169	(1750)	1561	(Nov)	1967
Lo. Leven	1370	1150	1150	2270	1630	(Oct)	1548
Cheddar Rsr.	1900	2050	1300	1000	1491	(Sep)	1546
Kings. Water Pk/Coton	822	839	1747	1936	1459	(Dec)	1361
Fairburn Ings	1289	1284	1053	1511	1275	(Oct)	1282
Fen Drayton Gp.	960	1150	1021	1112	2090	(Dec)	1267
Stanford Rsr.	400	1660	400	1750	2115	(Oct)	1265
Chichester Gp.	1543	1227	1210	1011	1118	(Oct)	1222
Brogborough Gp.	1820	1300	720	979	1240	(Dec)	1212
Dudgrove Gp.	1433	1075	1377	1053	985	(Dec)	1185
Chew Valley Lake	1625	460	1180	1051	1110	(Aug)	1085
Bewl Water	1068	2013	1500	398	248	(Sep)	1045
Shepperton Gp.	1046	1263	1098	707	975	(Jan)	1018

+ from Delany (1990c).

WADERS

By R.J. Waters and R.P. Prys-Jones

The Birds of Estuaries Enquiry (BoEE) is co-sponsored by the British Trust for Ornithology (BTO), Nature Conservancy Council (NCC), Royal Society for the Protection of Birds (RSPB) and Department of the Environment for Northern Ireland (DoENI), and is organised by staff of the BTO Estuaries Unit based at Tring, Hertfordshire. Including the 1969-70 Pilot Study, the twenty-first consecutive season of co-ordinated counts for the BoEE took place between July 1989 and June 1990. Counts are made on selected dates near the middle of each month, timed to coincide with spring tides when waders congregate at discrete traditional roosting sites. Records of wildfowl from both the BoEE and the National Wildfowl Counts are analysed by the Wildfowl and Wetlands Trust and are presented in the first section of this booklet.

DATA PRESENTATION

Data presentation in this report follows that for the preceding season with only minor alterations. The period of year covered comprehensively comprises the entire winter (November-March), although additional information relating to the spring (April-June) and autumn (July-October) is provided for species with notable passage populations. The actual areas counted at each site have not altered since 1988-89 although the names of a few sites have been changed at the request of local organizers. The Ore complex has been renamed the Alde complex, and Wigtown Sands has been corrected to Wigtown Bay. The Roach part of the former Crouch/Roach site holds relatively few waterfowl and has not been counted during the past five years; hence the revised name of the Crouch. As usual, where information is available on non-estuarine sites this is also incorporated, but such sites are clearly indicated by an asterisk (*).

It is necessary to exercise caution when using BoEE count information, especially in summary form as presented here. Please refer to the section "Interpretation of waterfowl counts" (p. 4) for guidance, or contact Estuaries Unit staff at the BTO who will be happy to advise.

COVERAGE

Of the 117 estuarine sites shown in Figure 1, no winter counts for seven were received in time for incorporation here: Dart, Don, Spey, Fleet Bay, Rough Firth, Conwy and Dulas Bay. For a further six sites, only incomplete counts were carried out during the winter: Chichester Harbour, Medway, Hamford Water, Humber, Solway and Severn. Any impression that incompleteness in coverage of major sites is increasing is incorrect; introduction of new count forms (see below) merely means we are now able to assign count quality more critically. For all other sites, at least one, and normally four or five, complete counts were made during the winter.

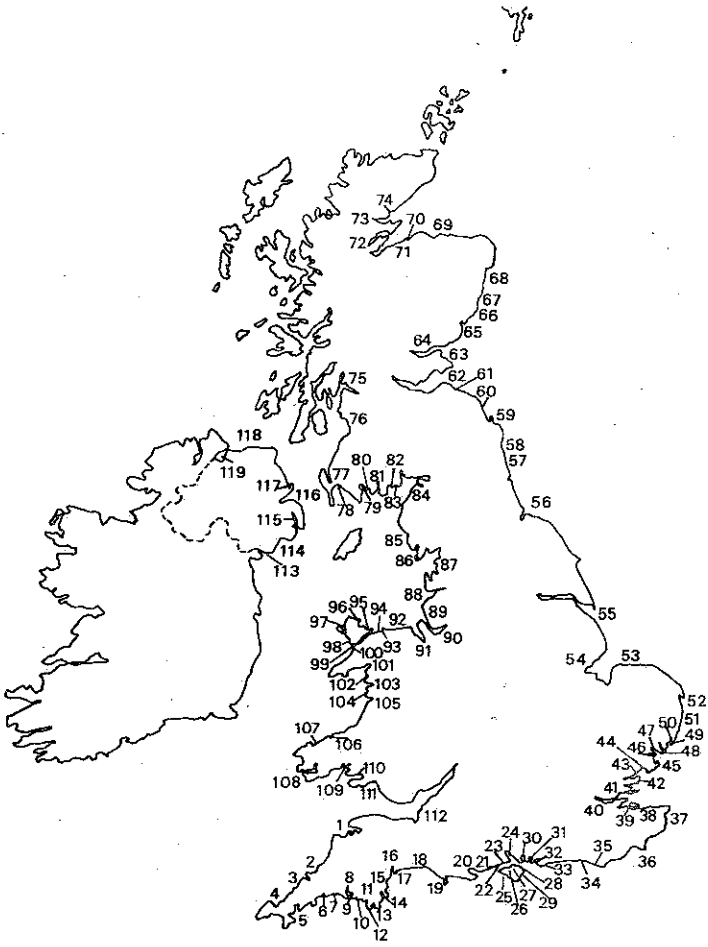

Figure 1. Map of the British Isles showing the locations of all estuaries considered in this report. Site numbers are as follows: 1 Taw/Torridge; 2 Camel; 3 Gannel; 4 Hayle; 5 Fal complex;6 Fowey; 7 Looe; 8 Tamar complex; 9 Plym; 10 Yealm; 11 Erme; 12 Avon; 13 Kingsbridge; 14 Dart; 15 Teign; 16 Exe; 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; 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 Tyninghame; 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; 113 Carlingford Lough; 114 Dundrum Bay; 115 Strangford Lough; 116 Belfast Lough; 117 Lough Larne; 118 Bann; 119 Lough Foyle.

DEVELOPMENTS IN THE ESTUARIES UNIT

An important change in Estuaries Unit staffing occurred early in 1990 with the departure of Jeff Kirby to take up a position at The Wildfowl & Wetlands Trust, Slimbridge. His replacement as National Organizer of the Birds of Estuaries Enquiry is Ray Waters, who had already taken the step into professional ornithology in December 1989 when he joined the BTO Estuaries Unit as a contract research officer in our studies of the Mersey estuary. Ray's appointment will hopefully strengthen still further the existing close amateur-professional interaction which characterizes the BTO's work on estuarine birds. His background includes an extended period of amateur involvement with BTO activities in Suffolk, including being a regular BoEE counter on the Orwell, which culminated in five years as joint BTO Regional Representative for the county.

Publications based on BoEE and Winter Shorebird Count (WSC) data relating to a number of important U.K. shorebird sites were produced by BTO staff during the 1989/90 count year. The last of three reports for the NCC reviewing bird populations on BoEE sites in south Wales appeared, the subject this time being the relatively poorly documented estuaries of the Taf, Tywi and Gwendraeth which together comprise the Carmarthen Bay BoEE site (Prys-Jones & Davis 1990). Langston (1990) analysed trends in BoEE counts on the key Northern Irish site of Strangford Lough, as part of a wider project on the conservation of its bird populations organized by the International Waterfowl and Wetlands Research Bureau (IWRB). Kirby & Tubbs (1989) provided an up-to-date overview of bird populations on the Solent in southern England, an area which comprises no fewer than eleven neighbouring BoEE sites, and Kirby (1989b) looked in detail at WSC data for the Isles of Scilly. Moser & Prys-Jones (1990) updated existing information on the status of, and threats to, waders along the North Sea and Channel coastlines for the 1990 North Sea Report. Especially pleasing, however, was a paper by an amateur closely involved in BTO studies. Mick Wright (1989) has reviewed the twenty years of BoEE counting in Suffolk, a county with both a number of important estuaries and a particularly well-coordinated system of count coverage. He illustrates clearly the key role of regular monitoring in promoting estuarine conservation. Other counties/regions could learn much from Suffolk's example.

During autumn 1989, new carbonized recording forms were introduced on which BoEE count organizers were encouraged to submit data for the various count sectors comprising their sites. The main aims of these new forms are threefold: firstly, to ensure total compatibility regarding the estuarine wildfowl data received both by the BTO and WWT; secondly, to obtain more standardized information on count conditions and disturbance factors; thirdly, to facilitate projected computerization of data at a finer-grained level within the BTO Estuaries Unit. Reception of these forms was generally good and most site organizers are now using them. Subsequently, the old count card was revised in a manner precisely compatible with the form, for use by individual counters for submitting their results to their site organizer.

The Estuaries Unit has been aware for some time that the traditional method of using BoEE data to index trends in U.K. wintering populations of waders does not make the most efficient possible use of the information available. Similar concerns have been shared by other organizations such as the IWRB and WWT regarding the interpretation of the data they collect. With support from the IWRB, we were therefore delighted to commission a review of the subject from Professor Les Underhill, a professional mathematical statistician and keen ornithologist. His report (Underhill1989) was discussed by BTO, IWRB and WWT representatives at a workshop in April 1990, at which it was agreed that the approach suggested was a great improvement on existing methods and should be implemented jointly once a number of methodological uncertainties had been resolved. The intention at present is to work towards this for the next issue of *Wildfowl and Wader Counts.*

The commercial contract side of the Estuaries Unit's work has continued to expand and diversify, producing results of considerable scientific interest as well as bringing in much needed income to help support the BTO's core activities. One result of this has been that Nigel Clark, who had been involved over a two and a half year period in major BTO studies on the Severn and Mersey estuaries, was appointed to the permanent post of Estuaries Contracts Officer. In this, he has both continued to carry out contract work himself and had responsibility for the day-to-day supervision of all estuarine commercial contract projects. During the year, Nigel produced a second report (Clark 1990) on the Severn estuary for the Energy Technology Support Unit (ETSU) of the Department of Energy. This focused on the analysis both of a second winter of low tide distribution data and of studies of habitat usage by birds throughout the tidal cycle at a number of key sites. Volunteer counters, including many who also participate in the BoEE, played a major

role in this work. Studies on the Mersey estuary continued, both in relation to the proposed tidal barrage and as a follow-up to a major oil spill which occurred in August 1989. During autumn 1989, work began on monitoring intertidal bird populations in Cardiff Bay and the neighbouring parts of the Severn estuary for the Cardiff Bay Development Corporation, in relation to the proposal to build an amenity barrage there. Further studies for ETSU involve production of a comprehensive review of the impact on bird populations of organic inputs (e.g. sewage) to estuaries and, in conjunction with the Applied Statistics Research Unit of the University of Kent, a statistical investigation of the levels of monitoring required to substantiate changes in estuarine bird populations.

A total of 69 requests for data was received during the 1989-90 season, well up on recent levels. As usual, the majority of these requests concerned the evaluation of the importance of particular sites or the provision of information in reponse to development proposals, and the most frequent user was the NCC. In addition, the Estuaries Unit provided both NCC and RSPB with comprehensive summaries of BoEE results for use for conservation purposes. The Estuaries Unit's "Shorelines" feature in *BTO News* continued as a regular feature throughout the 1989-90 season, carrying major items on wader studies both abroad (Arctic Norway and the former German Democratic Republic) and in the U.K. (the Burry, Cleddau, Hayle, Mersey, Solent and Wash), as well as a report on the role of estuary conservation groups.

UNITED KINGDOM POPULATION TOTALS

Table 38 shows the total populations of each wader species counted in each winter month of 1989-90 in both Britain and Northern Ireland. The numbers of BoEE sites covered in each month are also given. (N.B. Site numbers given in the 1988-89 report were too high as a result of an error). Recorded totals of the highly cryptic Jack Snipe and Snipe are likely to be considerable underestimates of the populations of these species actually present on the BoEE sites covered, but for other species the figures should provide relatively reliable population estimates.

In 1989-90, average numbers of waders recorded throughout the winter months were similar to the 1988-89 counts but January's count of over 1.6 million birds is an all-time high. Over the mid-winter period (December-February), few species showed large differences in numbers compared with 1988-89. However, Lapwing and Golden Plover were substantially more numerous than in 1988-89, which itself produced unusually high numbers of both these species. The likely cause of these high numbers was the extremely mild winter throughout the U.K. Record peak numbers of over 1,000 Avocet and over 8,000 Black-tailed Godwit probably also had the same cause. A decline in Grey Plover numbers from the record-breaking high of last season seems to have been a result of low breeding success in the Arctic in the summer of 1989. Ringed Plover numbers were particularly erratic during the winter; interpretation of this is difficult, however, as under 30% of our wintering Ringed Plovers occur on estuaries. Spotted Redshank are not widely recorded in the BoEE, but were down in numbers with 1988-89.

Table 38. TOTAL NUMBERS OF WADERS RECORDED BY BOEE COUNTS IN THE UNITED KINGDOM DURING WINTER 1989/90

BRITAIN	November	December	January	February	March
Oystercatcher	257,218	246,681	269,757	236,065	145,567
Avocet	482	770	1,112	836	353
Little Ringed Plover	0	0	0	0	3
Ringed Plover	9,948	9,511	11,661	7,942	3,758
Kentish Plover	0	0	0	1	0
Golden Plover	48,795	34,407	68,418	33,037	14,592
Grey Plover	26,026	23,878	33,454	37,321	31,395
Lapwing	157,965	143,849	235,087	141,161	15,434
Knot	188,366	202,924	300,705	219,620	104,771
Sanderling	5,892	5,177	5,477	4,558	4,373
Little Stint	7	3	4	3	4
Curlew Sandpiper	1	1	0	0	0
Purple Sandpiper	810	1,538	1,972	1,860	1,142
Dunlin	346,674	392,040	451,634	375,570	154,070
Ruff	145	48	128	66	207
Jack Snipe	20	17	29	18	9
Snipe	2,884	2,330	3,303	2,179	1,762
Woodcock	1	3	4	4	0
Black-tailed Godwit	6,328	4,210	6,714	8,033	5,175
Bar-tailed Godwit	27,893	40,724	39,960	41,533	16,871
Whimbrel	4	2	2	1	2
Curlew	63,553	47,047	72,388	66,306	58,684
Spotted Redshank	85	51	74	40	58
Redshank	70,950	68,944	81,627	71,548	56,874
Greenshank	189	125	190	132	124
Lesser Yellowlegs	1	0	0	0	0
Green Sandpiper	48	27	32	23	23
Wood Sandpiper	0	0	1	0	0
Terek Sandpiper	0	0	1	1	1
Common Sandpiper	19	23	17	13	12
Spotted Sandpiper	0	1	1	1	1
Turnstone	14,806	15,839	16,840	15,785	15,540
Grey Phalarope	2	0	0	0	0
Total	1,229,112	1,240,524	1,600,592	1,263,657	630,807
No. of sites counted	129	144	145	138	130

NORTHERN IRELAND

Oystercatcher	14,897	7,632	16,018	11,501	6,834
Ringed Plover	1,520	865	1,248	816	298
Golden Plover	9,868	4,236	12,581	8,711	7,166
Grey Plover	85	89	277	82	92
Lapwing	15,932	17,863	28,899	16,481	640
Knot	7,460	3,375	1,697	1,656	3,051
Sanderling	8	41	37	59	90
Curlew Sandpiper	0	0	1	0	0
Purple Sandpiper	172	51	241	198	204
Dunlin	14,080	7,364	12,364	13,038	3,240
Ruff	0	0	4	2	3
Jack Snipe	10	0	0	0	1
Snipe	290	238	486	399	81
Black-tailed Godwit	221	29	190	81	138
Bar-tailed Godwit	820	777	3,084	2,688	237
Whimbrel	0	0	0	1	0
Curlew	4,437	2,995	7,371	5,046	2,610
Spotted Redshank	0	0	1	0	1
Redshank	7,800	3,096	7,255	4,777	5,983
Greenshank	94	77	97	39	50
Green Sandpiper	0	0	0	0	4
Common Sandpiper	0	0	0	0	1
Turnstone	4,672	1,844	4,083	3,722	3,484
Total	82,366	50,582	95,693	69,297	34,208
No. of sites counted	8	6	9	9	7
U.K. Total	1,311,478	1,291,106	1,696,285	1,332,948	665,015

INDICES OF WINTERING NUMBERS

The geographical coverage achieved by the BoEE varies from year to year; it is not therefore possible to derive satisfactory data on population changes between winter seasons simply by examining totals of birds counted. To overcome this problem, an index of wintering numbers has been devised, based on the January counts. The indices have been calculated by the same method as for wildfowl (see Table 5), except that 1973 is used as the arbitrary "anchor" year. Species which occur only in small total numbers are excluded. Lapwing and Golden Plover are also excluded because such a high proportion of the populations occur on inland fields; as a result, the indices are highly sensitive to cold weather movements rather than reflecting true changes in population levels from year to year.

Population changes of over 10% compared to 1989 are revealed by the January indices for Grey Plover, Ringed Plover, Bar-tailed Godwit and Knot, with only the last-named showing an increase. Possible causes of these changes are discussed in the individual species accounts. However, for all species it should be borne in mind that whereas long-term trends in index values almost certainly indicate real changes in overall wintering populations, the same cannot necessarily be concluded from short-term fluctuations.

Table 39. JANUARY INDICES FOR WADER POPULATIONS IN THE UNITED KINGDOM, 1971-90

	Mean 1971 to 75	Mean 1976 to 80	Mean 1981 to 85	1986	1987	1988	1989	1990
Oystercatcher	116	158	173	203	171	215	238	244
Ringed Plover	107	129	141	162	105	129	169	149
Grey Plover	115	157	173	221	199	299	386	326
Knot	112	84	83	92	82	88	92	119
Sanderling	129	120	107	104	85	103	81	87
Dunlin	101	93	71	68	55	64	77	78
Bar-t.Godwit	101	137	184	166	190	161	142	105
Curlew	119	103	93	75	69	108	101	110
Redshank	100	97	77	78	69	100	109	108
Turnstone	118	143	130	192	144	173	181	179

SPECIES ACCOUNTS

The tables presented in this section rank the principal sites, including all internationally important ones, for each species in the United Kingdom on the basis of the average winter maxima recorded over the last five seasons. Incomplete counts presented for individual years are bracketed. The five-year averages for each site were in the first instance calculated using only complete counts, but if any incomplete counts exceeded this initial average they were then also incorporated in order to give the best possible estimate of the average winter peak count.

Oystercatcher *Haematopus ostralegus*

After two years of pronounced increase, part of a longer-term overall rise in numbers, the U.K. Oystercatcher population index showed little change in 1989-90 from the previous winter. The total of nearly 65,000 recorded on Morecambe Bay appears to be a winter record for any BoEE site, although just pipped for the all-time record by a count there in September 1984. Seven sites continue to rank as internationally important, and these are listed in Table 40 together with the top three nationally important sites.

Our recent winters have been mild, but Hulscher (1989) has analysed mortality and survival of Oystercatchers in the Netherlands during the very cold spell of January 1987, when ringing recoveries showed there was a huge exodus of birds from the Wadden Sea into northern France. An analysis of the birds' energy reserves indicated that the reaction of Oystercatchers to severe conditions can be summarized as "wait as long as you can, hoping for better times, but save at least sufficient reserves for a flight to another area where feeding conditions may be better". Conversely, mild weather may stimulate early migration north. Oystercatchers breeding in north-east Scotland, which largely winter along the eastern and southern coasts of Britain, arrived back in early March after the exceptionally warm late winter and early spring of 1989, about ten days before usual (Picozzi & Catt 1989).

Although most Oystercatchers breeding in western Europe winter within the continent, a small proportion of birds from more northerly areas move down to the more clement conditions of west Africa. Working on the Banc d'Arguin, Mauritania, Swennen (1990b) found that Oystercatchers there fed largely on Giant Bloody Cockles. These bivalves have a fresh mass which may approach that of the Oystercatcher itself and are probably the largest prey commonly taken by any wader. They were opened by stabbing, although how the birds managed this without getting their bills crushed was unclear. No other birds present could open the cockles but, once opened by Oystercatchers, Lesser Black-backed Gulls (by day) and Grey Plovers (by night) stole some of the flesh.

Table 40. OYSTERCATCHER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Morecambe Bay	49,700	(45,395)	61,664	50,776	64,967	(Nov)	56,776
Wash	29,159	23,202	35,421	46,912	40,689	(Jan)	35,076
Dee (Eng/Wales)	38,000	24,600	28,890	27,397	33,293	(Dec)	30,436
Solway	27,235	(21,897)	(32,916)	28,536	(27,959)	(Dec)	29,161
Burry	19,420	21,390	19,334	14,980	11,862	(Dec)	17,397
Ribble	9,332	10,963	15,062	19,271	(15,046)	(Mar)	13,934
Thames	19,258	13,703	(9,438)	8,295	9,973	(Nov)	12,807
Forth	(8,121)	(8,807)	(7,574)	(7,600)	5,859	(Jan)	7,592
Duddon	6,627	6,933	6,650	6,401	8,428	(Nov)	7,007
Inner Moray Firth	6,429	8,376	5,423	4,901	5,022	(Dec)	6,030

Avocet *Recurvirostra avosetta*

The recorded wintering population of Avocets continued its recent rise, exceeding 1,000 in a month for the first time in the history of the BoEE. It will be interesting to see if this trend can be sustained through a cold winter. The Alde complex held internationally important numbers in January 1990, although its regular average still falls well below this level. However, it and four other sites are now nationally important for the species (Table 41). The total of 136 birds on the Medway in November was unprecedented so late in the year, although recorded numbers had decreased sharply by the New Year. In addition to the sites shown, the Swale (36 in March), Deben (34 in December) and Blyth (Suffolk) (33 in March) all supported over 30 birds during winter 1989-90.

Until recently, the Tamar complex was very poorly covered by BoEE counts; in consequence, adequate estimates of its Avocet population had to be derived from the literature (see Salmon *et al.* 1988). Recently, however, coverage there has been excellent so the counts given here now are the BoEE results, and thus directly comparable with those from other sites. Comparison of BoEE peak winter counts for each of the past two winters with the almost daily count data of Reay (1988, and yearly supplements subsequently) shows that they averaged 12% lower than the peak daily estimate, very much in line with results from a similar comparison using Exe data (Salmon *et al.* 1988).

About 35% of the west European breeding population of Avocet winters in west Africa, many of which use the Banc d'Arguin, Mauritania, as a spring staging post. Studies by Bloemert *et al.* (1990) suggest that this area does not function as a refuelling station, as there are no suitable feeding grounds available, but rather as a "meeting point" where Avocets on passage merge into larger flocks before migrating to Europe. Most birds did not depart before mid-April, indicating that they were from the more northerly European breeding areas, a fact confirmed by resighting of colour-marked individuals.

Table 41. AVOCET: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Alde complex	334	(411)	285	514	721	(Jan)	463
Exe	135	121	152	229	379	(Dec)	203
Tamar complex	(22)	(1)	(102)	90	185	(Feb)	138
Poole Harbour	0	59	48	65	122	(Feb)	58
Hamford Water	38	26	(64)	85	(0)		53
Medway	(2)	0	(16)	(38)	(136)	(Nov)	38
Thames	22	36	22	40	58	(Dec)	35

Ringed Plover *Charadrius hiaticula*

The January population index for Ringed Plover was 12% down in 1990 on the record level reached in the previous year. Excluded from the index calculation because of problems of incomplete coverage, however, was the remarkable total of over 2,000 birds on Chichester Harbour in January 1990, much the highest BoEE count ever made at this site. Overall, six BoEE sites currently support internationally important wintering populations of Ringed Plover; these are shown in Table 42 along with the top four nationally important sites. In addition to these, the Blackwater (613 in November), Stour (562 in December) and South Down* (529 in December) all recorded over 500 birds in winter 1989-90, the last-named being a newly covered open coast area in Northern Ireland.

Ringed Plovers wintering in western Europe comprise that proportion of the race *hiaticula* which breeds in western Europe, including southern Scandinavia. British bred birds, the population of which was reviewed by Prater (1984), tend to be either resident or short-distance migrants to the south and west; Kirby (1989c) notes that colour-marked individuals from an inland breeding site in south-east England turned up in autumn on the south Wales coast. In addition, however, there is a substantial passage through the U.K. in autumn and spring of the much larger numbers breeding further north and wintering further south. BoEE data provide only minimum estimates of site usage during these passage periods, both because population turnover may be rapid and because site coverage is relatively poor. Nevertheless, over 1,000 birds were recorded during autumn 1989 on Hamford Water (1,400 in September), the Medway (1,190 in September and 1,055 in October), the Severn (1,157 in August), Morecambe Bay (1,099 in August and 1,119 in September) and the Mersey (1,030 in August); during spring 1990, 2,700 were present in May on Morecambe Bay.

Ringed Plovers wintering as far south as west Africa comprise both individuals of the race *hiaticula* from their more northerly breeding areas in Iceland, Greenland and Canada and of the race *tundrae* from northern Scandinavia and the Soviet Union. Based on the results of studies both on the Banc d'Arguin in Mauritania and further south in Guinea-Bissau, Wymenga *et al.* (1990) suggest that birds of the race *hiaticula* predominate on the former whereas the easterly *tundrae* comprise a larger proportion of birds in Guinea-Bissau.

Table 42. RINGED PLOVER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Medway	(539)	(571)	(1,003)	(971)	(696)	(Jan)	(1,003)
Chichester Hbr.	341	624	x	924	(2,093)	(Jan)	995
Thames	821	(955)	(505)	540	922	(Nov)	809
Tiree *	555	872	x	x	x		714
Outer Ards *	693	630	710	(753)	623	(Jan)	681
Langstone Hbr.	640	460	615	542	375	(Jan)	526
Lindisfarne	716	216	480	720	311	(Dec)	488
Orwell	782	292	243	625	338	(Dec)	456
Morecambe Bay	322	(348)	554	497	410	(Jan)	446
Colne	(401)	382	469	403	511	(Nov)	433

Golden Plover *Pluvialis apricaria*

The third mild winter in a row resulted in exceptional numbers of Golden Plover in winter 1989-90 on many northern and eastern BoEE sites, whereas counts in south-west Britain and Northern Ireland were less unusual or even somewhat low. In this context, it is of interest that Fuller (1990) found that the timing and magnitude of winter Golden Plover influxes varied substantially from year to year over eight winters at an inland site in south-east Britain. The cause of this appeared to be weather conditions elsewhere in the winter range, with birds probably flying only as far as necessary to escape the low temperatures and snowfall which inhibit their feeding.

Table 43 shows that only a single BoEE site, the Humber, is internationally important for the species, but that seven additional sites are nationally important; the Taw/Torridge, in south-west Britain, no longer appears in this list after a succession of low winter totals. Eight additional sites had counts exceeding 2,000 Golden Plover in winter 1989-90: Morecambe Bay (4,506 in January),

St. Mary's Island* (3,200 in January), the Outer Ards* (3,126 in January), the Forth (2,999 in November), the Camel (2,500 in January), the Burry (2,480 in January), the Wash (2,248 in November) and the Blackwater (2,213 in February).

The occurrence of northern and southern Golden Plover in the Netherlands has been analysed by Jukema (1989) on the basis of samples of breast feathers collected from trapped birds, making use of consistent differences in feather patterning between the forms. Results indicate that both forms are present during spring, but that the southerly breeding *apricaria* migrate through rapidly in March, not returning until October. By contrast, most northerly breeding *altifrons* do not depart from the Netherlands until late April, and females may arrive back in late July and August with males following in September.

Table 43. GOLDEN PLOVER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Humber	(6,846)	(10,233)	(14,219)	(10,346)	(27,249)	(Jan)	(27,249)
Strangford Lough	7,277	6,454	7,333	9,972	7,036	(Jan)	7,614
Ribble	4,333	4,291	3,660	5,111	8,902	(Nov)	5,259
Solway	3,021	(2,323)	2,762	(4,360)	(3,706)	(Nov)	3,462
Crouch	2,420	(800)	(825)	2,860	2,502	(Feb)	2,594
Lindisfarne	1,708	1,100	1,300	4,000	3,200	(Dec)	2,261
Thames	1,410	623	(2,767)	1,832	(4,412)	(Jan)	2,208
Chichester Hbr.	2,441	1,971	x	1,850	(2,303)	(Jan)	2,141

Grey Plover *Pluvialis squatarola*

After two years of spectacular increase, the January 1990 index of Grey Plover abundance fell back by 16% relative to the previous year, but nevertheless remains at its second highest ever level. A poor breeding season in Arctic Siberia in 1989 seems to have been the cause of the decline. Nine sites are currently known to be of international importance for the species. These are listed in Table 44 together with the top two nationally important sites; complete coverage of the Humber would almost certainly show it also to be internationally important. The February 1990 count for the Medway is notable for being particularly high for this site (Table 44). In addition to the sites listed, only the Colne (1,540 in February) held in excess of 1,500 birds

It has long been presumed that Grey Plovers which visit Britain breed in the Taimyr area of the northern Soviet Union. July 1990 brought the first confirmation of this when a Polish expedition controlled a bird on eggs on Sibiriakov Island, west Taimyr, which had originally been ringed on the Wash in August 1986. Investigation of the feeding ecology of Grey Plovers on the Wash, using both direct observation and dropping analysis, has revealed a diverse diet varying considerably at different places (Durell & Kelly 1990). As would be expected from previous studies, polychaete worms, bivalve molluscs and the gastropod mollusc *Hydrobia* figured prominently, but the amphipod *Corophium* and the gastropod mollusc *Retusa* have not hitherto been recorded; most surprising of all was apparent consumption of quantities of the sea slug *Alderia.*

Table 44. GREY PLOVER: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Wash	4,600	5,512	8,38	9,054	8,840	(Mar)	7,278
Medway	(1,134)	(1,121)	(2,534)	(3,209)	(6,185)	(Feb)	(6,185)
Thames	1,947	(4,411)	4,884	8,486	(4,835)	(Jan)	5,105
Ribble	1,963	2,048	3,872	3,539	(3,111)	(Feb)	2,906
Morecambe Bay	1,846	(1,167)	1,146	3,062	(1,074)	(Dec)	2,018
Chichester Hbr.	1,243	1,531	x	2,791	(1,591)	(Jan)	1,888
Stour	1,122	1,430	1,629	1,761	2,473	(Jan)	1,683
Swale	(1,748)	(420)	1,409	(1,362)	1,730	(Mar)	1,629
Dee (Eng/Wales)	1,975	1,607	1,800	1,270	1,120	(Nov)	1,554
Lindisfarne	1,104	2,100	1,200	1,825	1,200	(Dec)	1,485
Humber	(952)	(891)	(365)	(1,425)	(1,343)	(Jan)	(1,425)

Lapwing *Vanellus vanellus*

Over 250,000 Lapwing on BoEE sites in January 1990 was an exceptional event, being over 50% up on the previous winter's high levels; the cause must presumably be sought in the recent succession of three extremely mild winters. One BoEE site, the Humber, now ranks as internationally important for the species, and four others as nationally important; these are listed in Table 45 along with other sites regularly supporting over 5,000 birds. The counts of over 30,000 on the Ribble and Humber are clear all-time records for any BoEE site. In addition to the birds present on the listed sites, the 1989-90 winter saw major concentrations in eastern England, notably on both the Wash (10,261 in January) and the neighbouring North Norfolk Marshes (7,922 in January).

Milsom *et al.* (1990) have examined whether the daily activity pattern of Lapwings varies cyclically in relation to moonphase during the non-breeding season (July to February). A lunar rhythm was detected only during the winter: during this season, Lapwings fed by day and roosted by night for most of the lunar month, but reversed this pattern during the few days around full moon. The rhythm was interrupted by low temperature, dense cloud or heavy rain at night, which suggests that the behaviour pattern is opportunistic and not endogenous.

Table 45. LAPWING: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Humber	(6,421)	(6,306)	13,165	(12,644)	(30,892)	(Jan)	22,028
Morecambe Bay	10,635	(9,520)	6,672	26,327	24,171	(Jan)	16,951
Ribble	9,445	8,9171	0,883	21,174	32,145	(Nov)	16,512
Strangford Lough	14,839	6,7401	8,057	13,592	11,826	(Jan)	13,010
Swale	(4,036)	(2,968)	11,184	(3,445)	(5,561)	(Feb)	11,184
Thames	5,200	(3,751)	(7,530)	7,988	(8,983)	(Jan)	7,425
Solway	4,810	8,456)	(7,959)	(6,883)	(6,989)	(Nov)	7,019
Dee (Eng/Wales)	8,125	5,175	5,490	5,155	11,136	(Dec)	7,016
Outer Ards *	3,900	3,880	(6,060)	6,492	5,688	(Jan)	5,204
Alde complex	2,694	(4,176)	7,815	5,205	4,635	(Jan)	5,087

The January 1990 population index for Knot rose by a very substantial 29% relative to a year earlier, but caution is required in interpreting this statistic in terms of overall population levels. Overall peak monthly counts in both winters 1988-89 and 1989-90 were very similar at just over 300,000 birds, but whereas the peak in 1989-90 was in January, that of the previous winter was in December. Knot exhibit a complex pattern of generally westerly late autumn and winter movements from moulting areas around the southern North Sea, the degree and timing of which vary between years. Thus both geographical and temporal variations in winter population concentrations occur, which a single month's index for a single country cannot adequately cope with.

Sixteen sites in the U.K. currently rank as internationally important for the species, with a further two of national importance (Table 46). A large proportion of the Knot population is, however, concentrated on just the top seven sites. The 1989-90 season saw welcome increases in BoEE count totals of Knot on the Dee (Eng/Wales) and Strangford Lough from the depressed levels of recent years, and the Wash total exceeded 100,000 for only the third winter on record.

Knot wintering in Europe belong to the subspecies *islandica,* which breeds in the Nearctic, whereas the Siberian-breeding *canutus* migrate through Europe to winter in Africa. On Ellesmere Island, in the far north of Canada, Morrison & Davidson (1990) have been studying the chronology, activity patterns and body condition of Knot arriving to breed in this extreme High Arctic area. Birds arrive at the very end of May with relatively substantial reserves of muscle protein and fat, which tide them over inclement conditions in early June when little feeding occurs. Early season food is in any event apparently scarce until insect emergence commences, consisting mostly of small seeds of various plants. Far away in west Africa, Wymenga *et al.* (1990) have used morphometrics to show that most wintering Knot in both Mauritania and Guinea-Bissau belong as expected to the subspecies *canutus.* However, in both countries there are small numbers of small-winged Knot whose measurements coincide with those of the subspecies *rogersi,* which breeds further east in the New Siberian Islands and has been thought mainly to winter in Australasia.

Table 46. KNOT: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Wash	117,886	83,340	93,666	75,921	108,570	(Jan)	95,876
Alt	42,000	46,000	40,000	45,000	51,000	(Jan)	44,800
Ribble	22,098	27,007	52,400	60,030	(45,103)	(Mar)	41,327
Humber	(23,647)	(29,247)	22,438	(38,465)	(30,894)	(Jan)	28,938
Morecambe Bay	27,954	(28,081)	23,968	25,229	(23,770)	(Feb)	26,308
Thames	16,147	(25,826)	(20,794)	30,160	(21,668)	(Jan)	24,044
Dee (Eng/Wales)	22,230	12,170	18,860	13,132	44,715	(Dec)	22,221
Forth	(4,478)	(8,145)	9,803	10,810	7,744	(Feb)	9,452
Strangford Lough	21,450	8,700	2,918	1,745	7,028	(Nov)	8,368
Dengie	5,000	10,280	5,200	6,390	(7,300)	(Nov)	6,834
Solway	4,654	(3,070)	(6,668)	(7,311)	(5,943)	(Nov)	6,144
N Norfolk Marshes	5,240	4,930	(4,200)	6,260	(6,524)	(Nov)	5,738
Tees	6,462	4,640	5,030	4,484	3,000	(Feb)	4,723
Burry	4,900	7,100	5,740	1,920	2,410	(Dec)	4,414
Duddon	750	12,000	5,500	600	2,300	(Nov)	4,230
Montrose Basin	10,000	2,000	450	2,00	4,000	(Jan)	3,690
Swale	(4,612)	(1,750)	1,904	(3,503)	(2,101)	(Jan)	3,030
Severn	(2,640)	(771)	1,419	3,150	(1,637)	(Jan)	2,403

Sanderling *Calidris alba*

As measured by the January population index, Sanderling numbers on BoEE sites were 7% higher in 1990 than in 1989. The only site of international importance for the species is the Ribble, which supports substantially greater numbers than any of the main nationally important sites also listed in Table 47. An additional site which almost certainly should figure in this table is Carmarthen Bay. At least 600, and possibly up to 1,000 Sanderling winter along its outer sandy beaches, but normally escape detection on the episodic BoEE counts conducted there (Prys-Jones & Davis 1990): coverage during winter 1989-90 was predominantly incomplete and few were noted, but well over 600 had been present in October.

Numerous Sanderling pass through the U.K. in autumn and spring en route to and from wintering sites which are known from ringing recoveries to extend to the southern tip of Africa. BoEE counts provide only minimum estimates of site usage at such times because population turnover is rapid and site coverage relatively poor, especially during the spring. As in winter, the Ribble is enormously important for Sanderling during passage periods (Mawby 1989): during autumn 1989, counts from there recorded 4,410 birds in July, 3,501 in August and 2,332 in September; during spring 1990, there were 1,461 in April and a huge concentration of 7,409 in May. Other sites recording over 1,000 birds during the 1989-90 passage periods were the Alt (1,606 in May), the Wash (1,326 in May and 1,227 in September) and Lindisfarne (1,200 in September). As usual, no spring counts were made on the Humber, known to be an important Sanderling passage site at this time.

The migration of Sanderling through Europe and Africa poses unanswered questions regarding the provenance of birds wintering in different areas, with Palearctic and Nearctic breeders apparently mingling together in a confusing fashion. Recent coordinated studies of Sanderling colour-marked at 19 locations in six countries throughout North and South America have revealed similar complexity in the New World (Myers *et al.* 1990). Birds from the same non-breeding site were observed to use markedly different migration routes and, conversely, birds from widely separated non-breeding sites often shared migration routes. Clearly, great scope still exists for studies on the migration patterns of this species, in particular focusing on birds of known breeding provenance.

Table 47. SANDERLING: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Ribble	2,038	1,193	2,801	3,574	(1,460)	(Jan)	2,401
Thanet *	x	659	722	572	604	(Mar)	639
Alt	326	727	625	429	680	(Jan)	557
Wash	427	768	572	435	471	(Jan)	534
Humber	(270)	(408)	461	(472)	(556)	(Dec)	496
Tay	750	560	362	336	312	(Nov)	464
Dee (Eng/Wales)	268	374	477	186	823	(Dec)	425
Tees	476	800	200	252	100	(Nov)	366
Duddon	238	291	447	388	457	(Nov)	364
Tiree *	305	353	x	x	x		329

Little Stint *Calidris minuta*

The only BoEE counts of more than two Little Stints in winter 1989-90 were on the Swale (3 in December and February) and Chichester Harbour (3 in March). Autumn passage numbers in 1989 were well down on those of 1988, with only the Swale (7 in August), Forth (6 in September), Langstone Harbour (5 in July) and Colne (5 in August) recording counts of five or more.

Curlew Sandpiper *Calidris ferruginea*

Only two sites, Southampton Water and the Outer Ards* recorded even a single Curlew Sandpiper in winter 1989-90. After the major influx of autumn passage birds in 1988, numbers were well down in autumn 1989, with only the Thames (15 in July), Lindisfarne (7 in September) and the Swale (6 in August) recording counts of five or more.

Purple Sandpiper *Calidris maritima*

Purple Sandpipers are not monitored adequately by BoEE counts because most birds are spread out along open rocky coasts, with under 5% of the British wintering population occurring on estuaries (Moser 1987). Considering all sites counted during the 1989-90 winter, none held internationally important numbers and only four held nationally important numbers. In rank order, these latter comprised the Tees, Spey coast* (Grampian), Rosehearty-Fraserburgh* (Grampian) and Budle Pt.-Seahouses * (Northumberland), all sites in the north-east of Britain.

Dunlin *Calidris alpina*

Essentially all Dunlin wintering in the U.K. are nominate race *alpina,* which breed in northern Eurasia, whereas passage along our shores of the races *arctica* and *schinzii* occurs during spring and autumn. After two years of recovery from a low point reached in the 1986-87 winter, the U.K. January population index of Dunlin remained almost unchanged in 1989-90 relative to a year earlier. Sites supporting internationally important wintering populations are shown in Table 48. Three sites, the Wash, Severn and Morecambe Bay, dominate the list, each holding in excess of three times the qualifying level.

Durell & Kelly (1990) have examined Dunlin feeding ecology on the Wash using dropping analysis. They identified a wide range of prey species, including bivalve molluscs, gastropod molluscs and polychaete worms. In addition, many droppings containing no identifiable remains were probably produced by birds feeding on small oligochaetes, which have no parts that remain identifiable after digestion. Also on the Wash, Kelsey & Hassall (1989) studied Dunlin foraging behaviour on a mudflat on which the invertebrate fauna was heavily dominated by oligochaetes. Bird distribution was not directly related to oligochaete density, however, as most Dunlin used tactile stimuli to locate prey in soft, wet substrates where they were more accessible.

Current knowledge of the wintering areas of the *alpina, arctica* and *schinzii* races of the Dunlin has been conveniently mapped by Smit & Piersma (1989), but the complexities of the migration patterns of the species continue to attract much study. Brenning (1989) has analysed the migrations of birds ringed in the former German Democratic Republic, whereas Goede *et al.* (1990) consider populations present in spring on the Wadden Sea. The latter authors distinguish two kinds of fattening strategy which seems to be used by different groups of *alpina* birds present in April and May respectively; they suggest that the April birds breed in northern Europe, whereas the May birds travel as far as the western part of the Taimyr peninsula in Siberia. Rosner (1990) has focused on differences in adult and juvenile Dunlin migration strategies. Whereas adults use few areas and show strong site fidelity on autumn migration, juveniles stop at more places, including ones where adults are rarely seen, stay longer at each and appear competitively inferior to adults. Based on this, a hypothesis is presented which may help explain results thus far assumed to be caused by the occurrence of different sub-populations.

Table 48. DUNLIN: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Wash	41,105	37,257	46,239	65,679	56,510	(Feb)	49,358
Severn	(34,193)	(25,410)	44,580	44,311	(44,170)	(Dec)	44,445
Morecambe Bay	33,912	(36,404)	40,409	42,987	54,838	(Nov)	43,036
Humber	(32,026)	(28,089)	(16,090)	(21,899)	(22,903)	(Jan)	(32,026)
Langstone Hbr	27,700	25,800	32,900	31,700	37,660	(Jan)	31,152
Thames	18,893	(34,987)	(23,892)	19,279	25,893	(Dec)	24,588
Chichester Hbr.	26,997	9,361	x	12,915	28,268)	(Jan)	21,885
Medway	(8,412)	14,777	(19,663)	(28,569)	(21,843)	(Feb)	21,213
Mersey	25,000	12,000	16,040	22,000	17,500	(Nov)	18,508
Stour	15,466	11,852	16,134	16,154	16,116	(Jan)	15,144
Blackwater	16,700	16,400	11,265	19,785	11,400	(Nov)	15,110
Dee (Eng/Wales)	12,230	12,300	19,490	16,772	14,710	(Dec)	15,100
Swale	(15,470)	(4,520)	13,276	(13,610)	(12,055)	(Jan)	14,118
Ribble	8,5061	7,993	12,663	16,684	(14,147)	(Feb)	13,998

Ruff *Philomachus pugnax*

The peak monthly count of Ruff at BoEE sites in winter 1989-90 was just over 200 birds, up on totals from the preceding two winters. However, the decline continued in numbers at Pagham Harbour, previously the only nationally important coastal site for the species, and its five-year average count now falls well below the qualifying level. Seven sites each held 20 or more birds in winter 1989-90: the Ribble (55 in March), Medway (40 in November), Chichester Harbour (39 in November), Breydon Water (35 in January), Crouch (29 in January), North Norfolk Marshes (29 in November) and Blackwater (22 in March). The Humber (119 in September) and Breydon Water (75 in May) were the only BoEE sites with recorded passage totals exceeding 50.

Jack Snipe *Lymnocryptes minimus*

Jack Snipe are so difficult to census that BoEE counts can provide no more than evidence of occurrence. Only Strangford Lough (10 in November) recorded a count reaching double figures in winter 1989-90. Pedersen (1989) has studied the wintering strategy of Jack Snipe in Denmark. Working in an area of waterlogged, tussocky mudflats by a stream, he recorded Jack Snipe most frequently in cold weather and suggests that they survive such periods by moving to streams when other wetland habitats freeze over. Diurnal roosting and nocturnal feeding usually took place in the same area, and day-time feeding was observed during a cold spell.

Snipe *Gallinago gallinago*

Snipe numbers counted on BoEE sites in winter 1989-90 peaked at nearly 3,800 in January, 17% up on the peak monthly count of winter 1988-89. Eight sites recorded 200 or more individuals: the Thames (388 in January), Cleddau (375 in January), Southampton Water (353 in January), Morecambe Bay (334 in November), Dee (Eng/Wales) (288 in November), Outer Ards* (284 in February), Colne (251 in February), and NW Solent (200 in November).

Black-tailed Godwit *Limosa limosa*

The U.K. wintering population of Black-tailed Godwit comprises birds of the race *islandica*, which breed mainly in Iceland. A total of over 8,100 birds recorded on the February 1990 BoEE count is a winter record, being 4% higher than that of January 1989. Eight sites currently rank as internationally important, and these are listed in Table 49 along with the top two nationally important sites; in addition, the Blackwater held 1,037 Black-tailed Godwit in March. A striking feature of the 1989-90 winter counts is that a majority of the north-west population was present

on the Dee (Eng/Wales) rather than the Ribble where it usually occurs. During autumn 1989, sites holding over 700 birds were the Ribble (peak of 2,500 in September), Medway (peak of 2,056 in September), Stour (1,577 in October), Langstone Harbour (peak of 1,289 in October), Hamford Water (1,203 in September) and the Wash (840 in October); in spring 1990, Poole Harbour recorded a count of 981 in April.

Gerritsen (1990) has presented the results of national censuses of communal roosts of Black-tailed Godwit in the Netherlands between the months of March and August in 1984 and 1985. One conclusion of the study is that counting of communal roosts before the breeding season may be a good method for estimating the breeding population.

Table 49. BLACK-TAILED GODWIT: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Ribble	2,110	560	1,497	2,490	491	(Nov)	1,429
Stour	1,660	906	1,067	1,080	(1,734)	(Feb)	1,289
Hamford Water	580	1,477	(250)	1,010	(70)	(Nov)	1,022
Poole Hbr.	682	569	874	1,099	1,451	(Feb)	935
Langstone Hbr.	906	1,019	869	761	599	(Nov)	831
Dee (Eng/Wales)	430	773	400	552	1,600	(Feb)	751
Chichester Hbr.	467	521	x	1,125	(750)	(Jan)	715
Colne	300	(445)	500	1,400	616	(Nov)	704
Exe	617	582	520	542	648	(Jan)	581
Southampton Water	407	306	(750)	427	99	(Feb)	577

Bar-tailed Godwit *Limosa lapponica*

The January 1990 BoEE index for Bar-tailed Godwit was 26% down relative to that of a year earlier, falling to its lowest level since 1978. However, this decline need not necessarily reflect a decline in the overall European wintering population, as the extremely mild weather may have resulted in a greater than usual proportion of birds wintering across the North Sea on the Wadden Sea. Fourteen U.K. sites currently support internationally important wintering populations, and a further two support nationally important ones (Table 50).

Smit & Piersma (1989) advanced the idea that the wintering area of nominate L.l.lapponica could be divided into two largely discrete parts: a western European one for birds breeding in northern Europe and a west African one for the larger numbers breeding in western Siberia. This concept fits uneasily with available Soviet recoveries of British-ringed Bar-tailed Godwit, however. Of 13 such recoveries, seven have been from the White Sea area (34o-47oE) in May and one in August (Mead & Clark 1989); all these were ringed in late summer and autumn and suggest that the Archangelsk/Nenets region is an important spring staging post for such birds. The remaining five recoveries, made between April and June, have been from much further east in Siberia (74o-88oE), yet two comprise the only Soviet recoveries to date of British wintering birds. Watch this space for further developments!

Wymenga *et al.* (1990) have reviewed information on the breeding origins of west African Bar-tailed Godwits, finding clear evidence from measurements that the vast majority of the wintering population there originates from breeding grounds in the Yamal and Taimyr peninsulas of northern Siberia. Piersma & Jukema (1990) present a detailed analysis of changes in nutrient reserve levels during spring migration of a single population of Bar-tailed Godwits studied both before departure from their wintering grounds on the Banc d'Arguin, Mauritania, and at a spring staging post in the Dutch Wadden Sea. A key conclusion is that the energy reserves laid down by the birds in Mauritania would not enable them to cover the distance between there and the Wadden Sea in one flight, as they appear to, without the birds making good use of favourable high-altitude tail winds.

Table 50. BAR-TAILED GODWIT: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Ribble	13,880	10,836	16,756	7,898	13,350	(Dec)	12,544
Wash	8,204	12,809	10,691	8,403	12,622	(Feb)	10,545
Alt	4,956	11,310	9,001	7,902	5,391	(Jan)	7,712
Lindisfarne	9,600	8,900	7,000	6,010	6,200	(Dec)	7,542
Solway	4,557	(5,761)	(2,310)	7,315	(1,874)	(Nov)	5,936
Thames	3,277	(5,066)	2,076	3,304	(3,804)	(Feb)	3,505
Forth	(4,509)	(2,663)	(3,621)	3,372	1,510	(Jan)	3,135
Morecambe Bay	4,105	2,877	3,570	1,844	858	(Jan)	2,650
Lough Foyle	3,842	3,210	651	2,520	(2,222)	(Jan)	2,555
Inner Moray Firth	2,326	3,418	2,308	1,465	1,487	(Feb)	2,200
Tay	1,540	1,615	1,200	1,835	(1,000)	(Jan)	1,547
Humber	(1,603)	(1,681)	659	(1,054)	(1,270)	(Jan)	1,253
Eden	1,664	1,800	900	892	700	(Jan)	1,191
Chichester Hbr.	1,064	985	x	890	(1,448)	(Dec)	1,096
N Norfolk Marshes	653	(782)	463	423	(1,599)	(Nov)	784
Strangford Lough	667	472	316	1,074	628	(Jan)	631

Whimbrel *Numenius phaeopus*

Wintering Whimbrel are a rarity in the U.K., and the only site holding more than one individual in winter 1989-90 was the small west Wales estuary of Traeth Bach (2 in December). Passage populations are considerably larger. Sites recording peak counts of 50 or more birds in autumn 1989 were the Medway (122 in July and 104 in August), Tamar complex (98 in July), Langstone Harbour (94 in July and 86 in August), the Cleddau (60 in July), Morecambe Bay (56 in July) and the Wash (51 in October). In spring 1990, concentrations were present in May on the Burry (70, also in April), Dyfi (64), the Wash (62), Breydon Water (57) and Swansea Bay (55).

The nominate race of the Whimbrel breeds in northern areas, from Iceland to west Siberia, and winters predominantly in west Africa. The spring concentrations in western Britain are likely to be mainly Icelandic breeders, with those in eastern Britain mainly heading for continental Europe. In west Africa, Wymenga *et al.* (1990) have found that Whimbrel wintering in Mauritania tend to have longer wings than those from Guinea-Bissau; they suggest that the former are mainly Icelandic breeders and the latter from western Siberia.

Curlew *Numenius arquata*

After dropping by 7% in 1989, the January BoEE index for Curlew was up by 9% in 1990. Six sites currently are internationally important, and Table 51 lists these and all nationally important sites with regular populations exceeding 2,000. Curlew are a widespread wintering species whose estuarine distribution pattern tends to change little from year to year, and populations on individual sites seldom fluctuate greatly.

Ens *et al.* (1990b) have studied kleptoparasitism (food-robbing) by Curlew feeding on intertidal flats in the Dutch Wadden Sea. Curlew mainly attacked other Curlew for prey, although they themseles also fell victim to food-robbing by gulls. The authors found no evidence of specialization on kleptoparasitism as a feeding strategy by individual Curlew; however, the probability of its use was greater among dominant individuals. Overall, the data showed that robbing attacks by Curlew were directed mainly on conspecifics handling large prey and appeared to be highly profitable tactics in such circumstances.

Table 51. CURLEW: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Morecambe Bay	7,715	(9,897)	12,888	9,849	10,219	(Mar)	10,167
Solway	6,041	(4,455)	(8,248)	(3,757)	(4,573)	(Nov)	7,144
Humber	(3,095)	(2,370)	4,107	(2,704)	(1,483)	(Jan)	4,107
Wash	5,149	2,265	4,814	3,796	3,295	(Mar)	3,863
Thames	2,808	(4,864)	(3,698)	3,492	(3,345)	(Jan)	3,641
Severn	(2,777)	(3,416)	4,576	2,706	(2,736)	(Jan)	3,641
Dee (Eng/Wales)	4,680	3,510	3,840	2,474	2,910	(Feb)	3,482
Lough Foyle	4,323	1,670	2,370	3,000	(1,351)	(Jan)	2,840
Forth	(2,141)	(2,161)	(2,709)	(1,306)	1,676	(Feb)	2,171
Duddon	1,971	2,131	1,761	2,163	2,300	(Jan)	2,065

Spotted Redshank *Tringa erythropus*

Peak monthly numbers of Spotted Redshank in winter 1989-90 were ca 17% down on the high level of a year earlier, but nevertheless still up on longer-term trends for this uncommon wintering species. Sites holding 10 or more wintering birds were all regular ones in western and southern Britain: the Tamar complex (26 in November), Fal complex (16 in November), Cleddau (16 in March), Dee (Eng/Wales) (11 in December), and Medway (10 in February). During 1989 autumn passage, counts in excess of 50 individuals, were made on three sites, again all regular ones: Medway (94 in July), Swale (89 in July and 70 in August) and the Wash (70 in September).

Redshank *Tringa totanus*

The January 1990 BoEE count for Redshank remained virtually unaltered from that of 1989. Twenty-three sites currently support internationally important wintering numbers and these are listed in Table 52 along with the top nationally important site. A striking omission from this table is that of the adjacent east coast estuaries of the Stour and Orwell; populations of Redshank on both have simultaneously slipped below the international qualifying level following a decrease in numbers present which began in the mid 1980s. In addition to sites listed in Table 52, the Alt held 1,550 Redshank in January 1990.

Underhill *et al.*(1990) have investigated the contentious subject of primary moult duration in the Redshank using a new statistical model they have developed. They focus on birds in eastern Scotland, where the situation is complicated by a progressive influx of post-breeding Icelandic birds and an apparent exodus of British individuals. They derive an estimate of 72 days as the average duration for an individual Redshank's moult, with a mean starting date for the mixed population of 3 August and a mean finishing date of 14 October. Investigation of possible differences in moult timing between British and Icelandic individuals must await further study.

Most Redshank wintering in Britain comprise Icelandic and British breeding birds, with continental breeders tending to move further south. In west Africa, Wymenga *et al.* (1990) found that birds wintering in both Mauritania and Guinea-Bissau are from north Scandinavian and North Sea breeding populations, with Guinea-Bissau supporting a higher proportion from north Scandinavia.

Table 52. REDSHANK: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Dee (Eng/Wales)	4,510	9,220	9,930	8,035	7,692	(Jan)	7,877
Morecambe Bay	(7,802)	(5,806)	6,575	7,151	(5,635)	(Feb)	7,176
Humber	(3,588)	(3,145)	(4,295)	(2,671)	(5,208)	(Jan)	(5,208)
Medway	(2,424)	(2,926)	(3,557)	(5,087)	(4,664)	(Nov)	(5,087)
Wash	5,566	3,346	7,501	4,619	3,497	(Mar)	4,905
Thames	3,866	(3,872)	3,563	3,280	6,040	(Nov)	4,187
Lindisfarne	4,041	3,500	3,800	3,100	3,600	(Nov)	3,608
Forth	2,475	(3,067)	(4,952)	3,464	3,563	(Dec)	3,504
Swale	(3,730)	(910)	2,492	(3,714)	(1,552)	(Jan)	3,312
Mersey	1,620	3,300	4,100	2,930	4,458	(Jan)	3,281
Severn	(1,803)	(1,908)	3,286	2,627	(1,614)	(Dec)	2,956
Inner Moray Firth	2,515	2,032	2,635	2,962	3,664	(Jan)	2,761
Strangford Lough	2,366	2,645	3,079	2,809	2,771	(Nov)	2,734
Inner Clyde	3,051	2,423	2,798	2,243	1,546	(Nov)	2,412
Solway	2,224	(964)	2,075	(1,851)	(1,966)	(Dec)	2,149
Deben	2,399	1,779	1,760	1,903	1,657	(Nov)	1,899
Montrose Basin	644	1,900	1,785	1,983	2,530	(Nov)	1,768
Cromarty Firth	2,450	1,557	1,817	1,829	1,168	(Dec)	1,764
Chichester Hbr.	1,871	1,522	x	1,770	(1,595)	(Feb)	1,721
Belfast Lough	1,387	1,341	1,999	1,646	2,153	(Mar)	1,705
Tay	1,569	1,055	2,506	1,051	2,339	(Nov)	1,704
Ribble	2,194	1,211	1,863	1,449	1,151	(Nov)	1,573
Duddon	1,232	1,463	1,829	1,878	1,219	(Feb)	1,524
Cleddau	1,213	1,508	1,148	1,603	1,629	(Nov)	1,420

Greenshank *Tringa nebularia*

The peak monthly BoEE count for Greenshank in winter 1989-90 was just under 300 birds, slightly below the peak of the previous winter. Sites recording peak winter counts of 20 or more were, as usual, all in south-west Britain or Northern Ireland: Strangford Lough (34 in March), Lough Foyle (25 in November), Tamar complex (22 in February), Taw/Torridge (21 in January) and the Cleddau (20 in November). Larger numbers occur during autumn passage, the following sites recording peak counts of 50 or more in autumn 1989: Wash (132 in September), Langstone Harbour (peak of 124 in July), Chichester Harbour (100 in September), Medway (peak of 69 in July), Stour (66 in August), Swale (65 in August), Hamford Water (58 in September), Morecambe Bay (55 in September), Taw/Torridge (54 in September), Tamar complex (52 in September) and Strangford Lough (51 in October).

Green Sandpiper *Tringa ochropus*

The only BoEE sites recording peak counts of 5 or more Green Sandpipers in winter 1989-90 were the Thames (7 in January), Carmarthen Bay (7 in November), Tamar complex (5 in January), Crouch (5 in January) and Burry (5 in November). Autumn passage counts are somewhat larger, with peaks of 20 birds being recorded on Southampton Water (July), the Thames (August) and the Colne (August).

OAG Munster (1989) have researched the winter occurrence of Green Sandpipers on sewage farms in Munster, Germany. The median date of arrival of birds was mid July and of departure was early April, indicating the birds are present for 8-9 months per year. A high return rate of colour-ringed birds suggested strong site fidelity, and population changes were correlated with the severity of the previous winter.

Common Sandpiper *Actitis hypoleucos*

Wintering Common Sandpipers are uncommon in the U.K., and only four BoEE sites had peak counts exceeding two individuals: the Tamar complex (5 in November and December), Taw/Torridge (3 in January), Southampton Water (3 in January) and the Thames (3 in January and February). Larger numbers occur during autumn passage, with both Morecambe Bay (79 in July) and the Severn (55 in July) recording counts of over 50 birds in 1989.

Turnstone *Arenaria interpres*

The January BoEE index for Turnstone remained essentially unchanged in 1990 relative to that of a year earlier. Eleven sites currently qualify as internationally important for their wintering populations, and these are listed in Table 53 along with the top site of national importance. In addition to those listed, the new BoEE site of South Down* (1,190 in December) as well as Jersey* (877 in February) both recorded peak counts exceeding 700 birds in winter 1989-90.

In addition to Turnstone which winter in the U.K., substantial numbers are present in spring and autumn en route to and from more southerly wintering areas. BoEE data can only provide minimum estimates of site usage during passage periods, however, because of problems posed by poorer site coverage and population turnover. Counts exceeding 700 Turnstone were recorded in autumn 1989 on Morecambe Bay (peak of 1,693 in August), Medway (peak of 1,086 in September), Dee (Eng/Wales) (peak of 1,010 in September), Thanet* (peak of 912 in October), and the Wash (peak of 874 in September); in spring 1990, Morecambe Bay had counts of 2,015 in April and 937 in May and Thanet* recorded 780 in April.

Turnstone have been attracting much attention in the literature recently, a particularly noteworthy contribution being that of Summers *et al.* (1989) who provide a major review of the populations, migrations, biometrics and moult of birds wintering along the entire east Atlantic coastline. In particular, they concentrate on a series of comparisons of the Canadian-Greenland breeding population, which winters mainly in western Europe, and the Siberian breeding population, which winters partly in southern Africa. Birds wintering in southern Africa show no mid winter fattening, unlike those in Britain, begin depositing fat reserves for spring migration about six weeks earlier, and have a longer, less synchronized period of primary moult starting about six weeks later. Between the above two Turnstone breeding populations is a third one centred on Fennoscandia and west Russia, which migrates predominantly to west Africa in winter. Wymenga *et al.* (1990) find that whereas a proportion of wintering birds in Mauritania are from the Canadian-Greenland population, there is no evidence that these latter birds extend south to Guinea-Bissau. Ens *et al.* (1990a) have analysed spring migration of Turnstone from the Banc d'Arguin, Mauritania, focusing on the timing of migration and patterns of change in body mass. Together, these three papers provide an essential framework on which further research into this species' migration can be based.

Whitfield (1990) has looked in detail at individual feeding specializations of Turnstone wintering on a rocky shore in south-east Scotland. He identifies six foraging techniques and shows that there were significant differences in their use by individuals both between and within flocks of stable membership. A given individual's use of the available techniques tended to remain similar across the two winters of study. Overall, both environmental factors and individual differences in competitive ability and feeding skill appeared important in determining the pattern of feeding behaviour adopted.

Table 53. TURNSTONE: MAXIMA AT MAIN RESORTS

	1985/86	86/87	87/88	88/89	89/90	(Mth)	Average
Outer Ards *	1,949	1,803	1,990	1,775	2,336	(Nov)	1,970
Morecambe Bay	1,703	2,269	2,189	1,647	1,651	(Jan)	1,891
Thanet *	x	1,010	1,674	1,284	1,144	(Feb)	1,278
Forth	937	(959)	1,642	1,184	(869)	(Mar)	1,254
Wash	764	754	1,995	1,282	967	(Mar)	1,152
Tiree*	861	1,196	x	x	x		1,029
Dee (Eng/Wales)	890	721	909	960	1,185	(Mar)	933
Medway	(238)	(721)	(558)	(524)	(895)	(Nov)	(895)
Solway	824	(209)	759	(507)	(335)	(Dec)	791
Belfast Lough	1,183	929	322	575	778	(Jan)	757
Thames	630	(888)	(640)	681	(595)	(Jan)	733
Guernsey*	708	582	752	602	(664)	(Jan)	661

PRINCIPAL SITES

All estuarine sites in the United Kingdom covered by BoEE counts are listed in Table 54, ranked in order of their average peak winter counts over the five-year period 1985-86 to 1989-90. Included with them are non-estuarine sites ranking as of at least national importance in terms of the total numbers of waders they support. Information on peak counts in winter 1989-90 at all these sites is also presented.

For each of the included five winters, the peak count for each site was first calculated by listing the highest count for each species between November and March, irrespective of the month in which it was made, and then totalling these counts. The results for the 1989-90 winter are shown in the first column. The numbers in brackets following these indicate the numbers of complete and incomplete counts (before and after the slash respectively) available for each included site in winter 1989-90. Where no complete counts were performed, the peak count is itself placed in brackets to indicate that it is no more than a minimum estimate.

The average peak winter count for each site was initially calculated using only the totals from winters in which at least one complete count was conducted. However, in the few cases where totals from other winters exceeded this initial average, they were then also incorporated in order to give the best possible estimate of the average peak count. In the brackets following, the numbers of winters with at least one complete count are given before the slash and the number without after it. Sites averaging at least 20,000 and 10,000 waders are definitely internationally and nationally important respectively in terms of total wader numbers alone. Additional sites would no doubt qualify as internationally important in view of their total waterfowl populations.

Table 54. OVERALL WADER COUNTS AT BOEE SITES IN WINTER

Site No.+	Site	Peak winter count, 1989/90		Average peak winter count, 1985/86 to 1989/90	
54	Wash	248,854	(5/0)	215,870	(5/0)
87	Morecambe Bay	192,766	(3/2)	163,115	(5/0)
88	Ribble	136,312	(2/3)	113,106	(5/0)
55	Humber	(127,274)	(0/4)	94,933	(1/4)
91	Dee (Eng/Wales)	121,042	(5/0)	90,799	(5/0)
40	Thames	91,055	(2/3)	86,538	(5/0)
84	Solway	(64,935)	(0/5)	72,122	(3/2)
89	Alt	65,050	(5/0)	60,820	(5/0)
112	Severn	(56,603)	(0/5)	57,511	(2/3)
115	Strangford Lough	47,507	(5/0)	45,804	(5/0)
31	Langstone Harbour	46,096	(5/0)	41,354	(5/0)
62	Forth	35,728	(3/2)	37,629	(4/1)
32	Chichester Harbour	(45,106)	(0/5)	36,883	(3/1)
39	Medway	(41,500)	(0/5)	36,412	(1/4)
110	Burry	29,227	(5/0)	35,590	(5/0)
38	Swale	30,433	(1/4)	34,993	(2/3)
59	Lindisfarne	26,754	(5/0)	30,864	(5/0)
90	Mersey	31,200	(5/0)	26,996	(5/0)
46	Stour	29,282	(4/1)	25,642	(5/0)
86	Duddon	27,163	(5/0)	24,299	(5/0)
43	Blackwater	25,363	(3/2)	24,083	(5/0)
44	Colne	25,923	(5/0)	20,735	(5/0)
70/71	Inner Moray Firth	21,152	(3/0)	19,959	(5/0)
53	N Norfolk Marshes	29,838	(2/3)	18,537	(5/0)
42	Dengie	17,426	(3/2)	17,565	(5/0)
56	Tees	15,053	(5/0)	15,681	(5/0)
*	Outer Ards	19,855	(4/0)	15,651	(5/0)
47	Orwell	16,860	(3/2)	15,437	(5/0)
119	Lough Foyle	14,460	(2/2)	15,215	(5/0)
16	Exe	16,190	(4/1)	14,482	(5/0)
75	Inner Clyde	13,951	(2/3)	13,038	(5/0)
116	Belfast Lough	13,521	(4/0)	12,854	(5/0)
65	Montrose Basin	15,379	(4/1)	12,828	(5/0)
94	Lavan Sands	7,424	(4/0)	11,699	(3/2)
24	Southampton Water	14,112	(4/1)	11,519	(5/0)
49/50	Alde complex	11,879	(1/4)	11,429	(5/0)
64	Tay	10,417	(2/3)	11,274	(5/0)
20	Poole Harbour	9,287	(2/3)	10,969	(5/0)
108	Cleddau	10,209	(5/0)	10,947	(5/0)
1	Taw/Torridge	8,860	(3/2)	10,878	(5/0)
72	Cromarty Firth	8,317	(3/0)	10,365	(5/0)

30	Portsmouth Harbour	12,844	(2/3)	9,854	(5/0)
63	Eden	7,238	(4/1)	9,499	(5/0)
48	Deben	9,790	(5/0)	9,429	(5/0)
41	Crouch	11,877	(5/0)	9,354	(5/0)
8	Tamar complex	9,813	(5/0)	8,989	(2/3)
45	Hamford Water	(373)	(0/1)	8,620	(3/2)
33	Pagham Harbour	7,127	(5/0)	8,099	(5/0)
73	Dornoch Firth	6,401	(3/0)	7,224	(5/0)
109	Carmarthen Bay	7,662	(1/4)	7,028	(3/1)
79	Wigtown Bay	7,062	(4/1)	6,912	(5/0)
114	Dundrum Bay	9,908	(1/4)	6,910	(5/0)
22	NW Solent	6,821	(4/1)	6,192	(4/1)
111	Swansea Bay	5,193	(5/0)	6,100	(3/2)
36	Rye Hbr/Pett Levels	7,906	(5/0)	5,635	(5/0)
2	Camel	6,996	(3/2)	5,553	(4/0)
52	Breydon Water	9,869	(5/0)	5,462	(5/0)
113	Carlingford Lough	3,925	(2/0)	4,983	(5/0)
74	Loch Fleet	3,630	(3/0)	4,803	(5/0)
68	Ythan	8,623	(4/0)	4,790	(4/0)
61	Tyninghame	4,546	(5/0)	4,536	(5/0)
97	Inland Sea	4,897	(5/0)	4,311	(5/0)
23	Beaulieu	4,305	(5/0)	4,198	(4/0)
37	Pegwell Bay	5,596	(5/0)	4,168	(5/0)
93	Conwy	x		3,859	(4/0)
5	Fal complex	3,640	(4/1)	3,748	(3/2)
76	Irvine	6,088	(3/0)	3,667	(5/0)
118	Bann	2,752	(5/0)	3,321	(5/0)
82	Auchencairn Bay	6,337	(4/1)	3,223	(4/0)
117	Lough Larne	3,249	(4/1)	3,148	(5/0)
105	Dyfi	3,308	(5/0)	3,108	(5/0)
51	Blyth (Suffolk)	3,259	(5/0)	3,080	(5/0)
34	Adur	3,037	(5/0)	2,919	(5/0)
26	Newtown	4,098	(4/1)	2,845	(5/0)
4	Hayle	2,389	(5/0)	2,821	(5/0)
92	Clwyd	4,101	(5/0)	2,618	(4/0)
85	Irt/Mite/Esk	2,225	(5/0)	2,474	(5/0)
77	Loch Ryan	2,915	(5/0)	2,467	(5/0)
13	Kingsbridge	1,820	(3/0)	2,110	(5/0)
95	Red Wharf Bay	1,838	(3/0)	1,738	(5/0)
98	Cefni	1,601	(4/0)	1,738	(5/0)
35	Newhaven	2,204	(5/0)	1,618	(5/0)
100	Foryd Bay	982	(2/1)	1,538	(5/0)
21	Christchurch Harbour	1,084	(5/0)	1,512	(5/0)
99	Braint	1,107	(4/0)	1,344	(5/0)
19	The Fleet/Wey	759	(5/0)	1,197	(4/1)
78	Luce Bay	1,487	(2/0)	1,107	(2/0)
29	Brading Harbour	1,326	(5/0)	1,068	(5/0)

96	Dulas Bay	x		984	(2/0)
104	Dysynni	789	(5/0)	960	(5/0)
60	Tweed	599	(3/0)	912	(5/0)
83	Rough Firth	x		858	$
57	Blyth(Northumberland)	1,148	(4/1)	816	(5/0)
9	Plym	938	(5/0)	815	(5/0)
81	Kirkcudbright Bay	810	(5/0)	810	(1/0)
27	Medina	853	(5/0)	782	(5/0)
58	Coquet	449	(4/0)	754	(5/0)
103	Mawddach	712	(5/0)	716	(5/0)
18	Axe	1,239	(5/0)	628	(5/0)
3	Gannel	623	(3/2)	623	(1/1)
66	Dee (Scotland)	358	(2/0)	575	(4/0)
106	Teifi	168	(2/0)	410	(5/0)
12	Avon	308	(4/1)	398	(5/0)
15	Teign	393	(4/0)	378	(5/0)
25	Yar	301	(5/0)	346	(4/0)
102	Artro	201	(5/0)	340	(5/0)
107	Nyfer	280	(5/0)	293	(4/0)
28	Wootton	383	(5/0)	280	(3/0)
67	Don	x		261	(3/0)
17	Otter	202	(5/0)	233	(5/0)
7	Looe	126	(4/0)	195	(5/0)
14	Dart	x		169	(4/0)
6	Fowey	169	(1/0)	166	(3/0)
11	Erme	113	(5/0)	159	(5/0)
10	Yealm	142	(4/0)	146	(5/0)
69	Spey	x		60	(1/0)
80	Fleet Bay	x		26	(2/0)

+ see Figure 1
* non-estuarine site
x no count
$ 1984-85 data given as no counts subsequently

The following non-estuarine sites were also counted at least once in 1989-90: Aln, Alnmouth-Boulmer, Amble-Chevington, Arran (Cordon, Kildonan, Kingscross), Ayr-Prestwick, Beadnell-Howick, Blyth-Seaton Sluice, Boulmer-Howick, Budle Pt.-Seahouses, Burghead, Carnoustie-Easthaven, Clwyd coast, Colonsay, Cornelian Bay, Cuckmere, Isle of Cumbrae, Deveron, Doon, Eye, Glyne Gap-Galley Hill, Loch Gruinart, Guernsey, Helford, Holy Loch, Hunterston, Loch Indaal, Jackson's Bay, Jersey, Lochdon, Loch Gilp, Lossie, Maiden's Harbour, Orkney (Ireland, Newark, Widewall), Newbiggin-Blyth, Norman's Bay, Rosehearty-Fraserburgh, Saltwick Bay, Seahouses-Beadnell, South Down, Spey coast, St.Mary's Island, Thanet, Troon-Barrassie, Tyne.

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Appendix 1.
INTERNATIONAL AND NATIONAL IMPORTANCE

Criteria for International Importance have been agreed by the Contracting Parties to the Ramsar Convention on Wetlands of International Importance (Ramsar Convention Bureau 1988). Under one criterion, a wetland is considered Internationally Important if it regularly holds 1% of the individuals in a population of one species or subspecies of waterfowl, while any site regularly holding a total of 20,000 waterfowl also qualifies. Britain and Ireland's wildfowl belong to the north-west European population (Pirot et al. 1989), and the waders to the east Atlantic flyway population (Smit & Piersma 1989). A wetland in Britain is considered Nationally Important if it regularly holds 1% of the estimated British population of one species or subspecies of waterfowl. Table 55 gives the current qualifying levels among wildfowl and waders for both these categories of importance. NB: The category of National Importance applies to Great Britain only; equivalent criteria and figures have not yet been produced for Ireland.

With the addition of Bolivia, Burkina Faso, Chad, Czechoslovakia, Ecuador, Guatemala, Guinea-Bissau, Kenya and Sri Lanka since last year's booklet, 60 countries are now Contracting Parties to the Ramsar Convention. They have listed a total of 508 sites covering more than 30,000,000ha. Four new Ramsar sites have been designated in the United Kingdom since the publication of last year's booklet, all of them in Scotland: Fala Flow (Midlothian), Feur Lochain (Islay), Glac-na-Criche (Islay) and Loch-an-Duin (Western Isles). In addition, the United Kingdom has designated a large site in the Caribbean Dependent Territory of the Turks and Caicos Islands. During 1990, the UK designated seven new Special Protection Areas (SPAs) under the EC Directive on the Conservation of Wild Birds. These comprised three of the four new Ramsar sites listed above (not Loch-an-Duin) and four non-wetland SPAs, again, all in Scotland. A total of 45 Ramsar sites and 40 SPAs have now been designated by the UK. They are as follows (excluding the Turks and Caicos Islands):

(R) = Ramsar site only; (S) = SPA only; the remainder have dual designation.

Abberton Reservoir (R)
Abernethy Forest (S)
Ailsa Craig (S)
Alt Estuary
Bridgend Flats
Bridgwater Bay (R)
Bure Marshes (R)
Cairngorm Lochs (R)
Chesil Beach/Fleet
Chew Valley Lake (S)
Claish Moss (R)
Coquet Island (S)
Cors Fochno/Dyfi (R)
Dee Estuary
Derwent Ings
Din Moss/Hoselaw loch
Eilean na Muice Duibhe (Duich Moss)
Fala Flow
Farne Islands (S)
Feur Lochain
Firth of Forth Island (S)
Glac-na-Criche
Gladhouse Reservoir
Grassholm (S)
Gruinart Flats
Handa Island (S)
Hickling Broad/Horsey Mere (R)
Holburn Moss
Irtinghead Mires (R)
Laggan Peninsula (S)
Langstone/Chichester Harbours
Leighton Moss
Lindisfarne (R)
Loch-an-Duin (R)
Lochs Druidibeg/a'Machair/Stillgary
Loch Eye
Loch Leven (R)
Loch of Lintrathen (R)
Loch Lomond (R)
Loch of Skene
Loughs Neagh/Beg (R)
Martin Mere
Minsmere/Walberswick (R)
Moor House (S)
North Norfolk Coast
Orfordness/Havergate (S)
Ouse Washes(R)
Pagham Harbour
Priest Island (S)
Rannoch Moor (R)
Ribble Estuary (part) (S)
Rhum (S)
Rockcliffe Marshes
Rostherne Mere (R)
Silver Flowe (R)
Skomer Island (S)
Swale Estuary
The Wash
Upper Severn Estuary

Table 55. QUALIFYING LEVELS FOR NATIONAL AND INTERNATIONAL IMPORTANCE

	National (G.B.)		International
Great Crested Grebe	100		?
Mute Swan	180		1,800
Bewick's Swan	70		170
Whooper Swan	60		170
Bean Goose	+*		800
Pink-footed Goose: Iceland/Greenland	1,100		1,100
European White-fronted Goose	60		3,000
Greenland White-fronted Goose	100		220
Greylag Goose: Iceland	1,000		1,000
Barnacle Goose: Greenland	200		320
Svalbard	100		100
Dark-bellied Brent Goose	900		1,700
Light-bellied Brent: Canada/Greenland	+*		200
Svalbard	30*		40
Shelduck	750		2,500
Wigeon	2,500		7,500
Gadwall	50		120
Teal	1,000		4,000
Mallard	5,000		50,000**
Pintail	250		700
Shoveler	90		400
Pochard	500		3,500
Tufted Duck	600		7,500
Scaup	40*		1,500
Eider	700		20,000**
Long-tailed Duck	200		20,000
Common Scoter	350		8,000
Velvet Scoter	30*		2,500
Goldeneye	150		3,000
Smew	+*		150
Red-breasted Merganser	100		1,000
Goosander	50		1,250
Coot	1,000		15,000
Oystercatcher	2,800		9,000
Avocet	5*		700
Ringed Plover	230	(passage: 300)	500
Golden Plover	2,000		10,000
Grey Plover	210		1,500
Lapwing	10,000		20,000**
Knot	2,200		3,500
Sanderling	140	(passage: 300)	1,000
Purple Sandpiper	160		500
Dunlin	4,300	(passage: 2,000)	14,000
Ruff	15*		10,000

Continued

	National (G.B.)		International
Snipe	?		10,000
Black-tailed Godwit	50		700
Bar-tailed Godwit	610		1,000
Whimbrel	+	(passage: 50)	700
Curlew	910		3,500
Spotted Redshank	2*		?
Redshank	750	(passage: 1,200)	1,500
Greenshank	4*		?
Turnstone	450		700

\+ British population too small for a meaningful figure to be obtained.

* Where 1% of the British wintering population is less than 50 birds, 50 is normally used as a minimum qualifying level for national importance.

** A site regularly holding more than 10,000 wildfowl or 20,000 waders qualifies as Internationally Important by virtue of absolute numbers.

Sources of qualifying levels for International Importance: for wildfowl see Pirot *et al.* (1989) and for waders see Smit & Piersma (1989); see Scott (1982) for species they do not cover.

Sources of qualifying levels for National Importance: for wildfowl see Owen *et al.* (1986), updated where necessary from NWC data, and for waders see Moser (1987); see Prater (1981) for species they do not cover.

Appendix 2.
LOCATIONS OF INCLUDED NATIONAL WILDFOWL COUNT SITES

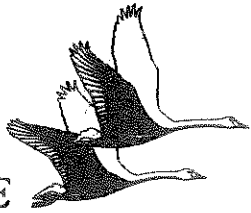
The locations of all count sites or areas mentioned in the wildfowl section of this booklet are given here, except those of estuaries which can be located on Figure 1 (p.45). They are listed in alphabetical order.

Aberlady Bay, Forth Estuary	NT	4581	Lothian
Abberton Reservoir	TL	9717	Essex
Alton Water	CT	1546	Suffolk
Belvide Reservoir	SJ	8610	Staffordshire
Besthorpe/Girton Gravel Pits	SK	8165	Nottinghamshire
Bewl Water	TQ	6733	East Sussex
Blagdon Lake	ST	5150	Avon
Blithfield Reservoir	SK	0524	Staffordshire
Bluemull Sound	HP	5502	Shetland
Borth/Ynyslas	SN	6092	Dyfed
Broad Bay	NB	4733	Western Isles
Brogborough Gravel Pit	SP	9739	Bedfordshire
Buckden/Stirtloe Gravel Pits	TL	2066	Cambridgeshire
Bucklands Pond	ST	4769	Avon
Burghead Bay	NJ	0966	Grampian
Caerlaverock, Solway Estuary	NY	0464	Dumfries & Galloway
Cameron Reservoir	NO	4711	Fife
Carron Valley	NS	6884	Central
Carsebreck/Rhynd Lochs	NN	8609	Tayside
Castle Howard Lake	SE	7170	North Yorkshire
Castle Loch	NY	0881	Dumfries & Galloway
Cheddar Reservoir	ST	4454	Somerset
Cheshunt Gravel Pit	TL	3602	Hertfordshire
Chew Valley Lake	ST	5659	Avon
Chichester Gravel Pit	SU	8703	West Sussex
Clumber Park Lake	SK	3674	Nottinghamshire
Cobbinshaw Reservoir	NT	0158	Lothian
Corby Loch	NJ	9214	Grampian
Cotswold Water Park	–		Gloucestershire/Wiltshire
Crombie Loch	NO	5240	Tayside
Cuttmill Ponds	SU	9145	Surrey
Derwent Ings	SE	6938	Humberside
Dinnet Lochs	NJ	4800	Grampian
Ditchford Gravel Pits	SP	9468	Northamptonshire
Drummond Pond	NN	8518	Tayside
Dudgrove Gravel Pit	SU	1899	Gloucestershire
Dungeness	TR	0619	Kent
Dun's Dish	NO	6460	Tayside
Dupplin Loch	NO	0320	Tayside
Eccup Reservoir	SE	2941	West Yorkshire
Elmley, Swale Estuary	TQ	9467	Kent
Endrick Mouth, Loch Lomond	NS	4388	Strathclyde
Eversley Cross/Yateley Pits	SU	8061	Hampshire
Eyebrook Reservoir	SP	8595	Leicestershire
Fairburn Ings	SE	4627	North Yorkshire
Fala Flow	NT	4258	Lothian

Fannyside Loch	NS	8073	Strathclyde
Farmwood Pool	SJ	8073	Cheshire
Fedderate Reservoir	NJ	8652	Grampian
Fen Drayton Gravel Pits	TL	3470	Cambridgeshire
Fiddlers Ferry	SJ	5585	Cheshire
Gladhouse Reservoir	NT	2953	Lothian
Grafham Water	TL	1568	Cambridgeshire
Gunton Parks	TG	2234	Norfolk
Haddo House Lake	NJ	8734	Grampian
Hamilton Low Parks	NS	7257	Strathclyde
Hanningfield Reservoir	TQ	7398	Essex
Harewood Lake	SE	3144	West Yorkshire
Hay-a-Park Gravel Pits	SE	3658	North Yorkshire
Hickling Broad	TG	4121	Norfolk
Hilfield Park Reservoir	TQ	1595	Hertfordshire
Hirsel Lake	NT	8240	Borders
Holborn Moss	NU	0536	Northumberland
Holkham Lake	TF	8843	Norfolk
Holkham Marshes	TF	8644	Norfolk
Hornsea Mere	TA	1947	Humberside
Hoselaw Loch	NT	8031	Borders
Hule Moss	NT	7149	Borders
Kedleston Park	SK	3141	Derbyshire
Keils/Danna	NR	7182	Strathclyde
Kilconquhar Loch	NO	4801	Fife
King George VI Reservoir	TQ	0473	Surrey
Kingsbury Water Park/Coton Pools	SP	2096	Warwickshire
Kinmount Ponds	NY	1468	Dumfries & Galloway
Lackford Gravel Pit	TL	7971	Suffolk
Lake of Menteith	NN	5700	Central
Langtoft Gravel Pits	TF	1111	Lincolnshire
Largo Bay, Forth Estuary	NO	4101	Fife
Leighton/Roundhill Reservoirs	SE	1678	North Yorkshire
Lismore/Benderloch	NM	8441	Strathclyde
Little Paxton Gravel Pits	TL	1963	Cambridgeshire
Livermere	TL	8771	Suffolk
Llyn Penrhyn	SH	3176	Gwynedd
Llyn Traffwll	SH	3276	Gwynedd
Loch Bee	NF	7743	Western Isles
Loch Eye	TH	8379	Highland
Loch Heilen	ND	2568	Highland
Loch Indaal	NR	3060	Strathclyde
Loch Ken	NX	6870	Dumfries & Galloway
Loch Leven	NO	1401	Tayside
Loch Mahaick	NN	7006	Central
Loch of Boardhouse	HY	2725	Orkney
Loch of Clunie	NO	1144	Tayside
Loch of Harray	HY	2915	Orkney
Loch of Kinnordy	NO	3655	Tayside
Loch of Lintrathen	NO	2754	Tayside
Loch of Sabiston	HY	2922	Orkney
Loch of Skene	NJ	7807	Grampian
Loch of Strathbeg	NK	0758	Grampian
Loughs Neagh & Beg, N. Ireland	–		Down/Antrim/Derry/ Tyrone/Armagh

Loch Spiggie	HU	3716	Shetland
Loch Spynie	NJ	2366	Grampian
Loch Tullybelton	NO	0034	Tayside
Loch Watten	ND	2256	Highland
Lour	NO	4746	Tayside
Ludham	TG	3719	Norfolk
Machrihanish	NS	6922	Strathclyde
Maidens Harbour/Turnberry	NS	2108	Strathclyde
Martin Mere	SD	4105	Lancashire
Martnaham Loch	NS	3917	Strathclyde
Minsmere	TM	4666	Suffolk
Murcar, Aberdeen	NJ	9510	Grampian
Nene Washes	TF	3300	Cambridgeshire
Ouse Washes	TL	5394	Cambridgeshire
Outer Ards Peninsula, N. Ireland	–		Down
Pitsford Reservoir	SP	7669	Northamptonshire
Portmore Loch	NT	2550	Borders
Queen Mary Reservoir	TQ	0769	Surrey
Radwell Gravel Pits	TL	0157	Bedfordshire
Ranworth/Cockshoot Broads	TG	3515	Norfolk
Redmyre Loch	NO	2833	Tayside
Rhunahaorine	NR	7049	Strathclyde
Richmond Park	TQ	1972	Greater London
R. Avon : Blashford-Hucklesbrook	SU	1408	Hampshire
R. Avon : Fordingbridge	SU	1617	Hampshire
R. Avon : Ringwood	SU	1408	Hampshire
R. Avon : Sopley	SZ	1498	Hampshire
R. Clyde : Lamington-Hyndford	NS	9839	Strathclyde
R. Eden : Rockcliffe/Armathwaite	NY	4758	Cumbria
R. Soar : Leicester	SK	5805	Leicestershire
R. Tay : Perth-Almond mouth	NO	1221	Tayside
R. Test : Leckford	SU	3637	Hampshire
R. Tweed : Junction Pool-Coldstream	NT	7737	Borders
R. Tweed : Kelso-Coldstream	NT	7737	Borders
R. Tywi : Dryslwyn	SN	5720	Dyfed
R. Welland : Spalding	TF	2516	Lincolnshire
Rostherne Mere	SJ	7484	Cheshire
Rutland Water	SK	9207	Leicestershire
St. Andrews Bay	NO	5118	Fife
St. Benets Levels	TG	3815	Norfolk
Scolt Head, N. Norfolk coast	TF	8046	Norfolk
Shavington Park	SJ	6338	Shropshire
Shepperton Gravel Pits	TQ	0767	Surrey
Slains Lochs/Ythan Estuary	NK	0230	Grampian
Slapton Ley	SX	8243	Devon
Slimbridge, Severn Estuary	SO	7105	Gloucestershire
Somerset Levels	–		Somerset
Staines Reservoir	TQ	0573	Greater London
Stanford Meres	TL	8695	Norfolk
Stranraer Lochs	NX	1161	Dumfries & Galloway
Stratfield Saye	SU	7061	Hampshire
Summerleaze Gravel Pits	SE	8982	Humberside
Swithland Reservoir	SK	5513	Leicestershire
Tattershall Pits	TF	2057	Lincolnshire

Tentsmuir	NO	5024	Fife
Thrapston Gravel Pit	SP	9979	Northamptonshire
Towyn-Llanddulas	SH	9679	Clwyd
Tremadog Bay	SH	5532	Gwynedd
Troon	NS	3130	Strathclyde
Twyford Gravel Pit	SU	7875	Berkshire
Upper Loch Erne, N. Ireland	H 3	231	Fermanagh
Virginia Water	SU	9769	Berkshire
Walland Marsh	TQ	9824	Kent
Walmore Common	SO	7425	Gloucestershire
Walthamstow Reservoir	TQ	3589	Greater London
Water Sound	ND	4694	Orkney
Westwater Reservoir	NT	1252	Borders
Wide Firth-Rousay	–		Orkney
William Girling Reservoir	TQ	3694	Greater London
Windermere	SD	3995	Cumbria
Witley Park	SU	9239	Surrey
Woburn Park Lakes	SP	9632	Bedfordshire
Woolston Eyes	SJ	6588	Cheshire
Wraysbury Reservoir	TQ	0274	Surrey
Yare Valley	TG	3504	Norfolk
Yetholm Loch	NT	8027	Borders
Ynyshir, Dyfi Estuary	SN	6896	Dyfed



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