Population estimates of birds wintering in Britain and Ireland

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INTRODUCTION

This report has been compiled in response to a request from the Nature Conservancy Council for estimates of the total numbers of each species of bird in winter in Britain. It complements the report on sizes of breeding populations compiled by Hudson and Marchant (1984).

The species accounts are taken from the texts submitted for the forthcoming The Atlas of Wintering Birds in Britain and Ireland (Lack in press). This book contains the results of a major survey organised by the British Trust for Ornithology and the Irish Wildbird Conservancy. The fieldwork was based on the 10-km squares of the National Grids, and was conducted, largely by amateur observers, between the middle of November and the end of February in each of three winters 1981/82 to 1983/84. Observers were asked to count the birds they saw and to note how long they spent in the field. These timed counts were subsequently standardised to those for a six hour 'day'. This was achieved by calculating, for each species, the slope of a double-logarithmic plot of number of birds seen on time spent in the field. Corrections were then made only where this regression was statistically very highly significant. Supplementary records of birds seen at times other than during timed visits were also accepted. These were especially of the more elusive species, but included counts of flocks and at roosts.

The species considered in this report are only those which are mapped in the main section of the book. This includes all species which occurred in at least fifteen 10-km squares in Britain and Ireland over the course of the survey period, except for four seabirds (Arctic Skua Stercorarius parasiticus, Great Skua S. skua, Sandwich Tern Sterna sandvicensis and Grey Phalarope Phalaropus fulicarius) most individuals of which spend the winter at sea and further south, and four species which are primarily summer visitors to Britain and Ireland (Swallow Hirundo rusticola, House Martin Delichon urbica, Wheatear Oenanthe oenanthe and Whinchat Saxicola rubetra), a few individuals of which stayed till after the start of the survey period. Lady Amherst's Pheasant was recorded in only eight squares but is included as it was on the original recording card.

A total of 101 authors contributed to the book. Each was asked to include in their text an estimate of the population occurring in winter in Britain and Ireland and to explain briefly how the estimate was obtained. For the present report the relevant paragraphs from the texts have been extracted and edited appropriately.

Authors have varied considerably in how they reached their estimates of population size. There are several sources of data, and there is considerably more information available for some species than for others. The major sources of information are:

a) The Winter Atlas data. The Winter Atlas maps display the relative abundance of birds in the 10-km squares, and the unit used is the number of birds seen in a day. (Where more than one count was available for a square the largest was used.) In the majority of cases the count plotted will not be the total number present in the square. Authors have, however, used the Atlas figures as guidance for their estimates, and have consulted the maps to ensure that allowance was made for all parts of the two countries where the species occurs, and not just those covered by other surveys or information.

b) Other surveys. Good estimates of the total numbers of many wildfowl and waders are available from the National Wildfowl Counts (and Goose Counts) (see Owen et al 1986) and the Birds of Estuaries Enquiry (see Prater 1981). For a few other species some data from special surveys were available.

c) The Breeding Atlas. Sharrock (1976) gives an estimate of the total number of pairs of each species breeding in Britain and Ireland. These in turn were derived from a variety of sources. Authors for the Winter Atlas texts have often used this figure as a starting point for their estimates of winter numbers. Allowances are then made for any recent changes, for non-breeding and young birds and for migrant individuals, both immigrants and emigrants.

For most species, authors have been able to use one or more of these in reaching an estimate of total numbers. For a few species, though, authors have been able to make little more than a guess, and for a very few even this was found impossible. This last particularly involves some of the seabirds which spend much of the winter out at sea.

It must be remembered that some species are very mobile in winter and the numbers present may vary considerably both from one winter to the next and within winters. Variations occur particularly with differences in temperature, a subject which is covered fully by two recent reports on cold weather movements of wildfowl and waders (Baillie 1984, Baillie, Clark and Ogilvie 1985). The Winter Atlas also contains some information on, and examples of, distributions which differed over the three survey winters. In general, many wildfowl and waders and those species which are primarily winter visitors, are more abundant in Britain and Ireland with colder weather, and those species which are at the northern edge of their range, are less common in colder weather. However, each individual species follows its own pattern. Where large differences existed between or within winters the texts below have noted the fact; indeed most authors give a range of values for their population estimate.

It will be seen that the estimates given here include all of Ireland, as did those in the Breeding Atlas. In some cases especially where the situation is very different between the two islands, authors have discussed the two populations separately and given separate estimates. In addition to the maps the Winter Atlas includes, for each species, the number of squares in each level of abundance for Britain and Ireland separately. These figures are available from the author on request.

SPECIES ACCOUNTS

RED-THROATED DIVER Gavia stellata

It seems not unreasonable to estimate a wintering population of the order of 12,000-15,000 birds in Britain and Ireland - a sizeable proportion of the western Palearctic population. There is, however, an autumn peak of about 20,000 derived largely from native breeding birds and immigrants to the east coast from Scandinavia.

BLACK-THROATED DIVER Gavia arctica

Assuming the population estimate in the Breeding Atlas of about 150 pairs in the mid 1970s to have shown a slight decrease, and that 20-30 young are produced, in early September there should be some 250-300 birds available for dispersal down the coasts of western Britain and Ireland. By the end of that month, immigrants from Scandinavia reaching the east coast of Britain have increased the numbers and suggest a peak autumn population of about 1,400-1,800 birds. As numbers do not fall greatly following post-autumnal dispersal, it is likely that the wintering population is of the order of 1,300 birds, though this number may drop in late winter, possibly as a result of a moult migration to the Brittany coast.

The main wintering grounds of the western Palaearctic breeding population lie in the Baltic area (with possibly some Scandinavian breeders moving to the Black Sea) and down the west coast of Europe. As the seas surrounding Britain and Ireland lie well to the west of this main migration route, they support only a small proportion of the total European stock.

GREAT NORTHERN DIVER Gavia immer

In recent winters, Heubeck and Richardson (1980) estimated some 300-400 Great Northern Divers around Shetland; with numbers not far short of this figure in Orkney, and probably many more in the Outer Hebrides (Scottish Bird Reports). Bearing in mind that this could be a considerable underestimate due to the range factor, and that Lea (1980) suggested a possible 500 around the Orkney coast alone, it is difficult to estimate a wintering population of less than 1,000-1,500 birds off the Scottish coasts. Allowing at least another 1,000-1,500 for Ireland, and the same number for the rest of Britain, gives a wintering total of some 3,500-4,500 birds. Considering the wintering range on the Continent this is likely to be about 75% of the western Palaearctic population in winter.

The origin of such numbers is somewhat puzzling, for the Icelandic population has only been estimated at 100-300 pairs, giving, with birds of the year and a small British summering population, a potential reservoir of no more than 1,000 individuals in all. This suggests a much larger easterly movement of birds from Greenland (or even mainland Canada) than has hitherto been supposed, or else an extremely large ratio of non-breeding birds.

LITTLE GREBE Tachybaptus ruficollis

The Breeding Atlas estimated that there were 9,000-18,000 pairs. On average, 75% of pairs breed (K.Vinicombe) and produced an average of 1.73 young per pair (Vinicombe 1982). Assuming that one youngster per pair remains alive in mid winter, a maximum population of 25,000-50,000 birds could be expected. Adding the maximum counts from the Winter Atlas data gives a total of just over 11,000. Assuming the Breeding Atlas estimate to be of the right order, this large discrepancy would suggest two possibilities: either there really is a widespread winter exodus or, because of their secretive nature, a large proportion of Little Grebes remained unrecorded. Probably both are contributing. With a huge world range, extending right across Europe, southern Asia and Africa, the British and Irish population must inevitably represent only a tiny proportion of the world population.

GREAT CRESTED GREBE Podiceps cristatus

The species' breeding population in Britain has reached its highest recorded level and by 1975 had risen to 6,000 birds. This upward trend has continued in most counties in the 1980s.

The winter population in Britain and Ireland seems likely therefore to be between 7,000 and 10,000 birds, but, during periods of very hard weather on the Continent, movements may possibly increase the figure to over 20,000 birds. Similarly, during prolonged freeze-ups in Britain, there is dispersal of overwintering birds southwards to France and westwards to Ireland.

In Europe there has been a comparable increase in breeding populations and a northwards spread into Scandinavia. The populations are dispersive and migratory. Wintering concentrations include counts of 22,000 on the three largest Swiss lakes and 20,000 on the IJsselmeer in the Netherlands. The Finnish and Russian populations normally migrate southeastwards in autumn towards the Black Sea, but Britain and Ireland clearly receive a large influx of winter visitors from western Europe.

RED-NECKED GREBE Podiceps grisegena

Estimates have been made of about 100 Red-necked Grebes wintering in Britain and Ireland (Chandler 1981), while (Prater 1981) recorded an average of 80 or so during 1969-1975. Totals for individual winters of between 120 and 170 are obtained from the Winter Atlas survey. Since Red-necked Grebes are fairly conspicuous birds of open water, often remaining at the same locality for several days, if not weeks, most individuals are likely to have been recorded. Indeed, the above totals may perhaps be over-estimates for birds will not only have moved about during the winter, but some returning passage birds can arrive as early as late February to swell the numbers (Chandler and Osborne 1977). Generally, no more than three appear in Ireland, in some winters none at all.

There do not appear to be any estimates of the European winter population of this species, but taking the total number of breeding pairs given by BWP, and assuming an average productivity of one offspring per pair, a potential total of about 10,000 birds may be suggested.

SLAVONIAN GREBE Podiceps auritus

Except perhaps at some of the more remote Scottish coastal localities, most birds of this comparatively conspicuous species, with its traditional wintering sites, will have been recorded during the Atlas period. Slavonian Grebes tend to remain at particular sites for extended periods, so that although there may be some duplication of records over each winter period, it is probably sufficient to estimate numbers directly from the yearly maps. These give a total of about 400 birds in Britain, and perhaps 30 to 40 in Ireland. Virtually all occur in sheltered coastal waters. These numbers are much less than the 670 per year quoted by Prater (1981), which appears excessive.

About 5,000 pairs breed in western Europe (BWP), suggesting 15,000 birds as a possible European wintering total.

BLACK-NECKED GREBE Podiceps nigricollis

Black-necked Grebes are fairly conspicuous birds frequenting sheltered open water localities, and like Slavonian Grebes they also occur regularly at the same sites in successive years. Thus the number based on the Winter Atlas surveys probably gives a reasonably reliable estimate of 120 Black-necked Grebes in Britain and Ireland in winter. This is precisely the same as the total estimated by Prater (1981). It seems probable that autumn numbers in Britain may be considerably greater than this.

The European breeding population fluctuates from year to year, but the total numbers are small, perhaps only 500-1,000 pairs (BWP). Thus the potential European wintering population is probably of the order of only 2,000 birds.

FULMAR Fulmarus glacialis

It is difficult to arrive at an estimate of the total numbers wintering in Britain and Ireland, but it is clear that the entire breeding population could be wintering in British and Irish waters. Based on the estimated breeding populaton for Britain and Ireland of 305,000 occupied sites in 1969 and 1970 (Cramp et al 1974), and a continuing increase of about 7% per annum, the numbers now breeding will be over 600,000 pairs. Macdonald (1980) suggests that the proportion of non-breeders in the population associated with cliffs in winter is between 30 and 50%. This leads to an estimate of 1.6 - 1.8 million Fulmars in British and Irish waters in winter.

GANNET Sula bassana

The breeding population of the Gannet in Britain and Ireland was estimated to be over 140,000 pairs in 1971-1974. Numbers are still growing and now there are probably more than 150,000 breeding pairs.

In winter the numbers of Gannets in British and Irish waters is impossible to estimate precisely but may be slightly fewer than the number of breeders.

CORMORANT Phalacrocorax carbo

The wintering population is almost certainly mainly native: birds breeding in Shetland rarely reach our mainland, though Orkney birds regularly fly over the narrow Pentland Firth to the Scottish mainland. In Britain and Ireland there are approximately 8,000 breeding pairs of Cormorants which will lead to a wintering population of 20,000 to 25,000 birds. In western Europe the largest populations are the 14,500 pairs in Norway and 1,500 pairs in the Netherlands.

SHAG Phalacrocorax aristotelis

The last complete census of Shags was during Operation Seafarer in 1969-1970 when 31,600 pairs were located (Cramp et al 1974). It is thought that since then there has been a small increase. As few move into or out of Britain for the winter and allowing for non-breeding birds and birds of the year, the mid winter population is likely to be between about 100,000 and 150,000.

BITTERN Botaurus stellaris

Although a full census of wintering Bitterns has not been attempted Bibby (1981) says that between 30 and 100 birds are reported away from their breeding areas each winter with a record 189 in 1978/79. The total winter population in most years is likely to be between about 50 and 150 depending on the severity of the weather. The British population is small compared with that of mainland Europe, where, excluding Russia, the breeding population was estimated to be 2,500-2,700 pairs in 1976 (Day 1981).

GREY HERON Ardea cinerea

The resident breeding population of Britain and Ireland is of the order of 10,000 pairs. Annual production varies but may average about 20,000 young, which number progressively declines over the next two or three years before the survivors start breeding. In most mid winters the Grey Heron population could be about 30,000 birds. This figure does not include the unknown number of immigrants from the northern and western European seaboards, which arrive in late autumn and early winter. Some of the immigrants from Scandinavia may return to their natal areas in spring.

The Grey Heron is rapidly expanding its range in Europe. Nevertheless the substantial population of Britain and Ireland may be considered important because it is resident.

MUTE SWAN Cygnus olor

The census carried out in April/May 1978 put the population at around 18,000 birds. By spring 1983 it had risen slightly to about 19,000 (Ogilvie in press). This means that the winter population is likely to be just under 20,000. The detailed figures have revealed catastrophic declines in some areas, for example from over 1,000 to less than 100 on the Lower Thames in 20 years, being balanced by increases elsewhere, especially in the fly-fishing regions of the country.

The Mute Swan is common and widespread in NW Europe, centred particularly on Denmark and the Baltic, with an estimated population of about 130,000 (Atkinson-Willes 1981).

BEWICK'S SWAN Cygnus columbianus bewickii

Numbers in the past are not very well known, but it is suggested that England saw an increase from a few hundred in the 1950s to over 1,500 by 1970, while over the same period there was a decrease in Ireland from 1,500 to 700-1,000 (Ogilvie 1972). However, there were over 2,000 in Ireland in 1975/76 (Merne 1977) and numbers in Britain increased to probably over 5,000 in 1982/83 (Salmon 1983). A full European census in 1983/84 showed Britain and Ireland to hold half the 16,000-16,500 birds in winter, though some of the increase is probably due to better coverage and counting.

WHOOPER SWAN Cygnus cygnus

Our Whooper Swan population has never been fully censused, but Boyd and Eltringham (1962) recorded about 2,000 in Ireland, about 2,000 in Scotland and about 500 in England and Wales, and estimated the total population to be 5,000-6,000. The Icelandic population has been estimated recently at 10,000-11,000 birds (Gardarsson and Skarphedinsson 1984) and as only about 800 of these are thought to winter there the British and Irish wintering population may be much higher than indicated above. At some of the main sites there have been fluctuations in recent years. In 1982 there were marked increases in Shetland, Aberdeenshire and the Ouse Washes, but these may be due to better counting (Salmon 1983).

The wintering population in NW Europe (excluding Britain and Ireland) numbers about 14,000 birds, mainly in the Baltic except in severe winters when there is a southerly movement. At least 25,000 winter in the Black and Caspian Seas area (Atkinson-Willes 1981), and 400 have been recorded recently in Greece (Ogilvie 1972).

BEAN GOOSE Anser fabalis

Between 200 and 300 Bean Geese currently winter in Britain but in a severe winter up to double this number may cross the North Sea. There were over 400 in Norfolk alone in January and February 1979, during a cold spell (Seago 1980).

The Bean Goose breeds right across the northern part of Europe and Asia, from Norway to the Bering Sea, with a population believed to number at least 250,000. The few wintering in Britain are therefore a tiny fraction of the world population.

PINK-FOOTED GOOSE Anser brachyrhynchus

The Pink-footed Goose population has been closely monitored by a series of regular winter counts organised by the Wildfowl Trust for the past 35 years. The first census in 1950/51 revealed a total of 30,000 birds and their numbers have increased steadily, and almost without interruption, ever since to reach 101,000 in November 1983 for Britain. Numbers in Ireland are usually less than 100.

The only other population of Pink-footed Geese breeds in the Svalbard archipelago and winters in the Netherlands. This population currently numbers about 28,000 birds. Thus Britain holds more than 75% of the world's wintering Pink-footed Geese.

WHITE-FRONTED GOOSE Anser albifrons

The number of Greenland-breeding birds in Britain and Ireland is currently 16,000-17,000 (Ruttledge and Ogilvie 1979, D. Stroud, J. Wilson, D. Norriss), about 9,000 of which winter in Ireland and 7,200-7,300 in Britain, mainly Scotland (Stroud 1984). The numbers of European White-fronted Geese reaching Britain vary from winter to winter. A high level of about 7,000 was recorded in 1981/82 due to severe weather on the Continent (Ogilvie 1982), while in 1982/83 peak counts at the main sites totalled about 5,500 birds (Salmon 1983). However, up to 13,000 have been recorded in the past - in (1969/70) (Ogilvie 1978).

Britain and Ireland are the wintering grounds for the entire Greenland population, but England and Wales receive only a fraction of the NW European wintering population which has risen to over 200,000 birds.

GREYLAG GOOSE Anser anser

Icelandic Greylags are censused by the Wildfowl Trust each autumn in early November, after all have arrived from the breeding grounds. Numbers in Britain and Ireland have increased markedly since the first census, in 1960, accounted for 26,500 birds. In the 1970s, an average of 65,000 were counted and numbers continued to rise to a record 95,000 in 1981. Since then there has been a slight decline owing to indifferent breeding seasons.

The British/Icelandic population is one of several in NW Europe, though most are not as discrete. A population of mixed Scandinavian and central European origin numbers over 100,000 and winters mainly in Spain. Greylags from eastern Europe winter around the Mediterranean, chiefly in N Africa.

SNOW GOOSE Anser caerulescens

Apart from a full-winged flock, of both colour phases, on Mull, up to 30 birds may be wandering around Britain each winter, with less than 5 in Ireland.

CANADA GOOSE Branta canadensis

Adding the maximum counts for each square from Winter Atlas fieldwork the total comes to 65,000, but White-Robinson (1984) has shown for a series of 10-km squares in N Nottinghamshire that the maximum count at all known feeding and resting sites was 920 compared with the Winter Atlas estimate of 1,870 for the same squares. Since White-Robinson was fairly certain that the real figure was no more than 1,000 birds, this suggests that the Winter Atlas figure overestimated the local population by about 90%. Applying this correction to the national figures gives an estimated British population of about 34,000.

A survey of Canada Geese in Britain and Ireland during the breeding season was undertaken in 1953, 1967,and 1976 (Ogilvie 1976). The results of these counts indicate that the population is growing by about 8.5% per year, a figure close to that estimated by Parkin and McMeeking (1985) for Nottinghamshire. Regular Wildfowl Trust count data, combined with these census results, led to an independent estimate of 30,000-35,000 birds during the winters of Atlas fieldwork (Owen et al 1986).

The majority of Europe's Canada Geese is to be found in Britain and Ireland, although there are in excess of 30,000 in Scandinavia (Fadricius 1983). The number of birds in western Europe pales into insignificance alongside the North American populations which is estimated to exceed 3 million birds (Bellrose 1976).

BARNACLE GOOSE Branta leucopsis

After seriously declining earlier this century all three populations have increased in the last 20 years. Birds breeding in Greenland and wintering exclusively in NW Scotland and Ireland totalled about 11,000 in the 1950s but by 1977/78 had increased to around 33,000. Numbers wintering on the main haunt, Islay, increased from 3,000 to 24,000 (Ogilvie 1978). More recently there has been some decrease and in March 1983 there were only 25,000, with 14,000 on Islay. Birds breeding in Spitzbergen winter exclusively on the inner Solway Firth. Up to the 1930s several thousand Barnacle Geese wintered, but by 1948/49 were reduced to under 400 birds, due to heavy shooting pressure and severe wartime disturbance. After being given legal protection throughout its range in the 1950s and with its wintering grounds safeguarded, numbers have recovered. At the end of the Winter Atlas period (1983/84) there were 8,400 and a good breeding season in the following summer took this population to a record 10,500 (C.R.G.Campbell and M.Wright).

The Siberian breeding population wintering in the Netherlands and West Germany increased from around 20,000 in the 1950s to 50,000 in 1975/76 and reached about 60,000 in 1983/84. Thus the total world population of Barnacle Geese in 1983/84 was about 93,000 birds, of which 33,000 (35%) wintered in Britain and Ireland.

BRENT GOOSE Branta bernicla

Numbers of all three populations crashed in the early 1930s due in part to a disease of eel grass. Only one population (B.b.bernicla) has fully recovered to its pre 1930s level, and it is only in Scotland (eg the Cromarty Firth) that significant numbers have not yet returned. However, 45% of the world total of this population is found in Britain in winter. The counts given below are taken from Ogilvie and St. Joseph (1976) and Wildfowl Count Data.

	B. b. hrota			B. b. bernicla	
	Canadian/Irish Population total	Spitzbergen/Lindisfarne British total	Population total	British total	Population total
1955/57	6000	-	4000	7400	16500
1963	12000	2000	2000	15200	22800
1973	16000	470	c2000	41000	51800
1983	c12000	610	3400	92600	203000

EGYPTIAN GOOSE Alopochen aegyptiacus

Adding the maximum count for each 10-km square gives a total of 505 Egyptian Geese in Britain, of which 429 were found in Norfolk. This compares with the estimated 1963 total of 300-400 (Atkinson-Willes 1963).

SHELDUCK Tadorna tadorna

In recent winters, between 60,000 and 65,000 Shelducks have been counted in mid winter in Britain, a considerable increase over the 50,000 level recorded regularly up to the early 1970s. This probably results in part from an increase in the breeding population in Britain, but may also reflect more birds moving westwards from the Wadden Sea in response to the more frequent severe winters of recent years. The Irish wintering population is between 6,500 and 8,000 birds. The whole western European population is of the order of only 120,000-130,000 birds, so Britain and Ireland hold just over half of these.

MANDARIN {Aix galericulata

Population estimates vary widely, due most likely to under recording even in its strongholds. A current, but speculative, estimate of 850-1,000 pairs (Davies 1985) greatly exceeds the estimated population level in the Breeding Atlas of 250-400 pairs.

Whilst the British population increases, there have been reports over the last 20 years of a decline in the Mandarin's status in the eastern Palearctic although the extent remains undefined at present. Perhaps the continued survival of the species may one day depend on the birds now established in Britain.

WIGEON Anas penelope

The Wildfowl Counts show an average maximum in Britain of about 200,000, with up to 250,000 in some years. There is a less recent estimate of over 100,000 for Ireland (Hutchinson 1979), and the total in NW Europe has been put at about half a million birds (Owen et al 1986). The numbers in Britain have shown no trend overall since 1960, but there have been changes in distribution, largely linked to the creation of reserves. Thus there has been a significant increase in numbers on protected sites and a decrease on unprotected areas. This has resulted also in a continuation of the move from coastal to inland habitats.

Britain and Ireland are crucially important wintering areas for NW European Wigeons, jointly holding more than half the total at peak

times. Another half a million or so birds, not entirely isolated from the NW European group, winter around the Mediterranean and the Black Sea (Atkinson-Willes 1976).

GADWALL Anas strepera

Data from the National and International Wildfowl Counts show that in Britain and Ireland the wintering numbers have increased markedly over the last 25 years, and probably now exceed 4,000, while in NW Europe as a whole they have reached 6,000-7,000 (Owen et al 1986). These comprise about three quarters of the breeding population with their young and a small influx from Iceland, the Netherlands, Scandinavia and central Europe.

TEAL Anas crecca

In Britain there has been a marked increase in the number of Teals counted in winter in the last decade with the 5 year average peak increasing from 64,000 to 88,000 (Owen et al 1986). The number of Teals not included in the counts is probably substantial owing to their widely dispersed nature. The total population estimates in Britain lie between 100,000 and 200,000 of which about 85% are immigrants. For Ireland, Hutchinson (1979) estimated a peak winter count in normal winters of between 30,000 and 50,000.

The Teals breeding and wintering in Britain and Ireland form part of a NW European stock which is thought, from international wildfowl counts, to number at least 200,000 (Scott 1980). In view of the uncertainty surrounding the likely British wintering peak, this can be regarded as a minimum estimate. There is another, much larger population wintering in the Mediterranean-Black Sea region, which has been estimated at around 750,000 (Atkinson-Willes 1976, Scott 1980).

MALLARD Anas platyrhynchos

Estimates of the winter population are difficult to make and vary widely. For Britain, Owen et al (1986) have used the National Wildfowl Count data, allowing for the innumerable small waters which are unrecorded, to produce figures of 300,000 for the post-breeding population and 400,000-500,000 for the January peak. They admit, however, that these are still likely to be underestimates, since as many as 400,000 hand reared Mallards may be released on to flight ponds each autumn and 700,000 are shot annually (Harradine 1981). Nevertheless, an annual mortality rate of 48% for adults (Boyd 1962) and the existence of at least a small turnover within the season mean that the true peak population of Mallards in Britain is unlikely to be much in excess of 500,000. There was no discernible trend in the numbers wintering in Britain between 1960 and 1982 (Owen et al 1986). Hutchinson (1979) put the Irish total for January at 20,000-50,000, with considerably more in autumn. There are an estimated 4-5 million Mallards in the western Palearctic, with 1,500,000 in NW Europe (Atkinson-Willes 1976).

PINTAIL Anas acuta

The NW European wintering population increased from about 50,000 in the early 1970s (Atkinson-Willes 1976) to 75,000 at the end of the decade (Scott 1980). In Britain there was a parallel increase after a period of relative stability in the 1960s, and the present wintering population exceeds 25,000 (Owen et al 1986). The total numbers in Ireland were thought to peak (in November) at about 7,000 in the 1970s (Hutchinson 1979).

SHOVELER Anas clypeata

At the time of the November peak there are about 9,000 Shovelers in Britain and 8,000 in Ireland. In Britain the numbers decline steadily during the winter, only 5,000-7,000 nowadays being present in February and March, compared with perhaps 8,000-10,000 in the 1960s, when the spring passage was much larger. In Ireland, there may be as few as 4,000 by January, although there is evidence of an increase in spring.

About 20,000 Shoveler winter in NW Europe, but some 25,000 pairs breed in the region and winter further south. NW Europe therefore probably supports about 100,000 birds during the course of a year, allowing for non-breeders, while a further 150,000 reach the Mediterranean region from eastern Europe. Thus the numbers in Britain and Ireland are less significant on an international scale than those of most other wildfowl.

RED-CRESTED POCHARD Netta rufina

Allowing that some birds were almost certainly recorded in more than one square over the three seasons, the current winter population is probably in the range 50-100. The small though definite increase during the last half century can be attributed more to a rise in the number of escapes and their progeny than to a genuine increase in the number of immigrants. Britain is clearly on the very fringe of the range of this species, the NW European wintering population of which was estimated by Atkinson-Willes (1972) to be 9,000.

POCHARD Aythya ferina

The number of Pochards wintering in Britain and Ireland has increased very considerably in recent decades. The situation in Ireland is obscured by a paucity of counts from Lough Neagh. There was a peak count of 37,000 in winter 1965/66, with only 11,000 the following winter. Again there were 41,000 in 1979/80 and 11,000 in 1980/81. The British peak was probably around 35,000 in the late 1970s, and probably under half that in the mid 1960s (Hutchinson 1979, Owen et al 1986). The peak total in Britain is now put at around 50,000, and with a further 30,000 or more in Ireland.

The NW European population of Pochards is estimated to be about 250,000 with a further 750,000 in the Mediterranean-Black Sea region, and perhaps another 450,000 further east (Scott 1980). The largest concentrations in NW Europe are in the Netherlands, with a rather dispersed distribution elsewhere.

RING-NECKED DUCK Aythya collaris

From 1976 to 1980 there were respectively, 6, 25, 13, 29, and 35 new birds seen each year. The total fell to 12 in 1981, and the same number the following year, dropping further to 7 in 1983 (British Birds annual rarities reports).

Ring-necked Ducks have appeared in small numbers on the Continent in recent years, though nowhere are they equal to the numbers in Britain.

FERRUGINOUS DUCK Aythya nyroca

In Britain both the species and its hybrids occur in late autumn flocks of Pochards, suggesting that wild birds may get caught up with Pochards, or, more likely, that some escapes are of Continental origin. In winter, wild individuals north of southern France are extremely rare and the numbers in Britain are probably less than 20.

In favourable conditions, as many as 45,000 birds may winter in southern USSR, and 75,000 around the Black Sea and in parts of the Mediterranean.

TUFTED DUCK Aythya fuligula

Tufted Ducks have increased enormously in Britain in the last hundred years and are still increasing. The nesting population is now put at over 7,000 pairs (Owen et al 1986). Similarly in Ireland, there are now thought to be at least 2,000 pairs (Hutchinson 1979). The mid winter peak has roughly trebled since the early 1960s, and now stands at just over 60,000 (Owen et al 1986). This could be accounted for in large part by the growth of the breeding population, but because many of our breeders move out of Britain for the winter, it seems more likely that there has been a genuine growth in numbers of immigrants coming to replace them. The picture in Ireland is confused by the mid winter presence on Lough Neagh of over 30,000 birds in the mid 1960s. There have been few if any complete counts since and it is not known whether such large numbers still occur there. Elsewhere in Ireland, a peak winter population of up to 25,000 has been estimated (Hutchinson 1979).

The NW European population of Tufted Ducks is put at over 500,000; there are a further 350,000 in the Mediterranean-Black Sea region; and at least half a million in Asia (Scott 1980).

SCAUP Aythya marila

On the basis of recent detailed studies and wildfowl counts, the peak mid winter population in Britain and Ireland is likely to be of the order of 5,000-10,000. The wintering population in NW Europe has been estimated at around 150,000 (Atkinson-Willes 1976).

In the 1960s and 1970s though, there were up to 30,000 at Leith in the Firth of Forth, and for 15 years the average annual peak was over 10,000. This flock has, however, now almost entirely disappeared after a change in the method of disposal of the Edinburgh sewage.

EIDER Somateria mollissima

British Eider populations have been increasing since the end of the last century, and at Forvie (Aberdeenshire) winter numbers increased at an average rate of 4% per annum between 1953/54 and 1977/78. Recently local decreases have occurred in Shetland and in the Firth of Forth. The table gives regional numbers of wintering Eiders, estimated from Winter Atlas counts, the Winter Shorebird Count and published sources.The total of 72,400 is probably within 10,000 birds of the true value. The Eider has a mainly Arctic distribution, and the British population is at the southern edge of its range in Europe, which is thought to have a wintering population of about 2 million Eiders (Atkinson-Willes 1978).

Northumberland	5,300
E Scotland (to Grampian)	29,000
E Scotland (N of Grampian)	3,400
N Scotland	1,000
Orkney	5,000
Shetland	8,800
W Scotland	3,200
SW Scotland	7,700
Walney	4,400
Wales and W England	1,100
S England	300
E England	1,200
Ireland	2,000
Total	72,400

LONG-TAILED DUCK Clangula hyemalis

Basing the assessment of total numbers on the limited data available from the main sites it seems probable that in recent years the peak winter population of Britain and Ireland has been about 20,000. This is considerably higher than the 10,000 estimated by Prater (1981). It is unclear whether this represents a real increase, but better coverage has undoubtedly been a significant factor particularly in the Moray Firth. The European wintering population is probably more than 500,000, mainly off N Norway and in the Baltic (Atkinson-Willes 1978) and the population in Britain and Ireland is at the southwestern limit of the winter range.

COMMON SCOTER Melanitta nigra

The wintering population was estimated by Prater (1981) to be at least 35,000 but, even allowing for poor coverage at some sites, this would now seem to be a high figure, and on the basis of recent peak counts, 25,000-30,000 for Britain and Ireland would seem to be more likely. Although numbers have been consistently high in the Moray Firth over the last 10 years they appear to have been more variable elsewhere (eg Carmarthen Bay), and formerly important sites (eg St Andrews) are now less used.

The winter population in the western Palearctic has been variously estimated at between 500,000 and 1.5 million.

VELVET SCOTER Melanitta fusca

The peak wintering population of Britain and Ireland is believed to vary considerably from year to year, depending largely on the size of the flocks within the Moray Firth. Occasionally up to 10,000 may be present but 2,500-5,000 is probably the more usual number. This apparent increase in the total population (Prater 1981) reflects the more intensive coverage at the principal site.

The winter population in western Europe has been estimated to be between 150,000-200,000 and the main known wintering areas are in eastern Danish and southern Norwegian waters.

GOLDENEYE Bucephala clangula

On the basis of known peak numbers at principal sites and their widespread occurrence inland and along the coast it is likely that the peak population in Britain and Ireland is of the order of 10,000-15,000. The European wintering population has been estimated at around 200,000.

At most sites numbers are at their highest in December and January, but in hard weather numbers at many coastal sites tend to increase, as those birds wintering inland are displaced. Flocks may then occur in estuaries or off coasts where they are otherwise uncommon.

The origin of the birds wintering in Britain and Ireland is mainly Scandinavia and western Russia (ringing data).

SMEW Mergus albella

In the 1950s Atkinson-Willes (1963) concluded that the British winter population was 'a few hundred birds'. But by 1981-1984 the average numbers from the January Wildfowl Counts had fallen to only 62.

It is difficult to estimate the number of birds from the winter distribution map. Adding the totals suggests that there are between 150 and 350 birds but although Smews are conspicuous they are very mobile, and individuals and groups may visit a number of different waters during the winter. So there is likely to be considerable duplication of records. Allowing for this, the typical winter total nowadays in Britain and Ireland is thus likely to be no more than 100 birds, of which 10-15 will be in Ireland.

These numbers are a small proportion of NW Europe's winter total of Smews. The total count has fluctuated considerably in recent years, but is probably more than 10,000 birds. (International Waterfowl Research Bureau, unpublished).

RED-BREASTED MERGANSER Mergus serrator

The actual numbers recorded during the Winter Atlas survey suggest a typical single winter total of about 9,500 birds in Britain and 1,700 in Ireland. This is likely to be an over estimate since the totals are derived from the maximum numbers recorded in each 10 km square during each winter; but this source of error is at least in part balanced by the probably incomplete recording of the more remote

coasts. Perhaps there are about 11,000 Red-breasted Mergansers wintering in Britain and Ireland. This compares with Ogilvie (1975) who suggested that 5,000 to 10,000 birds winter in Britain and Ireland as a whole, while Owen et al (1986) estimated a total of 7,000-10,000. Hutchinson (1979) quoted mid winter numbers of 2,000-3,000 in Irish coastal waters. In comparison, the NW European winter total probably exceeds 30,000 (International Waterfowl Research Bureau, unpublished).

GOOSANDER Mergus merganser

The total winter populationfrom Winter Atlas data for Britain and Ireland in each of the three years was close to 8,000 with 5,000 of them being in northern England and Scotland. These numbers compare with estimates of the British winter population of about 5,000 made by Owen et al (1986), suggesting that there is some duplication in the Winter Atlas records, but showing that their figure of 5,000 is certainly not an over-estimate.

In comparison, the northwestern European winter total is over 100,000 (International Waterfowl Research Bureau, unpublished).

RUDDY DUCK Oxyura jamaicensis

The growth of the population of this North American species has been fairly accurately monitored. Hudson (1976) considered that about 70 escaped from Slimbridge between 1952 and 1973. By 1965, there were about 6 breeding pairs, increasing to some 25 pairs by 1972. By 1975, the post breeding population was in the region of 300 to 350 birds and the species was increasing at around 25% a year. By 1978/79, the total had doubled to about 770 (Vinicombe and Chandler 1982) and, by 1980/81, had doubled again to 1,570. Increased mortality during the winter of 1981/82, was followed by an immediate recovery and the population in the following winter was in the region of 1,380 (Salmon 1983), rising to 1,800 a year later. There are only a very few records in Ireland

RED KITE Milvus milvus

The British population has increased very slowly under protection. Its lowest ebb was in the early years of the present century, when it may have numbered no more than a dozen birds (Salmon 1970, Davis and Newton 1981). The rate of increase accelerated markedly during the 1960s and 1970s, apparently due to reduced losses of full grown birds by poisons or the gun, since the poor breeding productivity did not improve (Newton et al 1981). However, there has been a pause in this increase in the early 1980s, and spring numbers since 1980 have been rather static at around 110-120 birds, with autumn numbers about 130-140. The British birds probably represent about 5% of the world population, the main strongholds being in W Europe, especially in Germany and Spain.

MARSH HARRIER Circus aeruginosus

Present winter numbers cannot be accurately estimated. The population is still very small compared with mainland Europe, but there is nothing to prevent numbers increasing except perhaps persecution by

man, which is already taking place.

HEN HARRIER Circus cyaneus

Davenport (1982) assessed that England held 753 Hen Harriers during the early 1979 hard weather influx. The roost survey in January 1984 accounted for 173 at 61 sites in a mild winter. If all sites were known, complete coverage could conceivably have revealed 300 birds. On the basis of recent breeding population estimates, adjusted for mortality and partial emigration, Scotland may hold 400 wintering birds, Ireland less than 150 and Wales perhaps 50 giving a total for Britain and Ireland of 900 birds which is a significant and integral part of the European population as a whole.

GOSHAWK Accipiter gentilis

Goshawks are still scarce in Britain and Ireland, and the current population is probably derived exclusively from birds escaped or released from captivity. The exponential population increase probably slackened once fewer Goshawks were imported in the early 1980s (Marquiss 1982). Nevertheless to judge from recent reports of breeding birds the population in 1983 could have been 100 pairs. Production has been low at about 1.6 young per pair but the survival of juveniles may be high as the population is expanding. On this basis the wintering population for 1983/84 may be tentatively estimated at about 300 individuals. This population is of little international importance as the species is widespread and Goshawks are relatively abundant.

SPARROW HAWK Accipiter nisus

Known nesting densities suggest a breeding population in the early 1980s of around 25,000 pairs in Britain. If the overall density is similar Ireland will hold about another 8,000-9,000 pairs. To these at least another 30,000-35,000 non-breeders should be added, and about 65,000 young (based on a mean breeding success of 2 young per pair), giving a total resident population at the end of each summer of about 170,000 birds, reduced to about 100,000 individuals by spring. These figures exclude the small number of migrant Sparrowhawks, which winter in Britain. The Sparrowhawk occurs across the Palearctic region from Ireland to Japan, so the British stock represents a tiny fraction of the total world population.

BUZZARD Buteo buteo

Tubbs (1974) estimated the 1970 breeding population at 8,000-10,000 pairs, and the 1983 Buzzard Survey appears likely to produce a similar figure. Newton (1979) showed an average breeding success of one young per pair (range 0.5-1.6). Thus as ringing recoveries indicate that most mortality occurs during January-May, the December population in Britain and Ireland is probably of the order of 24,000-30,000 birds. British and Irish Buzzards, which almost alone in Europe appear to be holding their own, and might even increase but for shooting and poisoning, may be considered a significant part of the western population.

ROUGH-LEGGED BUZZARD Buteo lagopus

Except in influx years more than 20 records in a winter is exceptional. The most recent influx, 1974/75, proved to be the largest on record, with up to 100 wintering. During the three Winter Atlas years the species was not particularly abundant in Britain or Ireland, and only in 1982/83 is it likely that as many as 20 individuals were present throughout the winter months.

With a Fennoscandian population often in excess of 5,000 breeding pairs, Britain and Ireland never hold a significant proportion of wintering birds.

GOLDEN EAGLE Aquila chrysaetos

In 1982 the first complete survey of the Golden Eagle breeding population in Britain was conducted (Dennis et al 1984). A total of 424 home ranges was occupied by pairs and another 87 by single birds. During the 1982 breeding season at least 210 young were reared to fledging or 0.52 young per pair. This figure is within the range of 0.4-0.8 young per pair given by Newton (1979). How many of these young die by the following December and the number of 'floating' immature birds is not known. These figures give an estimate of the December population of 1,000-1,200 birds.

Dennis et al (1984) calculated that the British population comprised 20% of the W European breeding population. In the virtual absence of emigration and immigration in Britain, and only limited dispersive movements amongst the W European population (BWP), the winter figure is probably about the same. With the possible exception of the racially separate Spanish birds, the Golden Eagle population in Britain comprises substantially the largest number found in any one country in W Europe.

KESTREL Falco tinnunculus

Estimating the wintering numbers with any accuracy is difficult and they may fluctuate, as the number of British emigrants probably varies (Snow 1968). This may also apply to winter visitors, the numbers and densities of which are, in any case, largely unknown. The British breeding population has been estimated as between 30,000 and 80,000 pairs with presumably a very much smaller number in Ireland. Annual production was put at 2.5 young per pair that bred by Brown (1976) and mortality at 60% in the first year by Snow. With the winter movements which take place these figures suggest a mid winter population of the order of 100,000 birds in Britain and Ireland.

MERLIN Falco columbarius

The total number wintering in Britain and Ireland probably includes the great majority of the breeding population supplemented by some Icelandic birds. Making broad estimates for the number of young per breeding pair being alive in winter plus those birds too young, or failing to breed, the native population might be 2,000-3,000 birds in mid winter. Such wide limits might be sufficient to embrace the

wintering numbers here with some gains and losses from movement. This would make an average number of birds per occupied square of 2-3 which seems reasonable considering that at any one time many such squares probably held no Merlins at all, while more than 10 would be a very high density.

PEREGRINE Falco peregrinus

The 1981 surveys gave an estimated total of at least 1,000 occupied breeding territories in Britain and Ireland, of which about 90% were held by pairs and the rest by single Peregrines. With breeding success probably averaging around 1.25 young per territorial pair, probably well over 1,000 young Peregrines fledge annually nowadays. Adult survival is generally good now that pesticide hazards are much reduced and, allowing for a non-breeding adult surplus, total population at the onset of winter is probably at least double that of the breeding population, with over 4,000 birds. The British and Irish Peregrine population is now one of the largest in Europe and is still increasing slowly under relaxation of previous adverse pressures and influence of a favourable trend in food supply (Ratcliffe 1984).

RED GROUSE Lagopus lagopus

In 1911 the average annual bag in Scotland, England and Wales was estimated at about 2.5 million birds shot (Leslie 1911), so the total including Ireland would probably have been almost 3 mil)/*\n wumbers have since declined greatly due to a variety of causes; reduced keepering, with consequent poorer moor management, overgrazing by increases in numbers of sheep and red deer, increases of tick-borne disease, losses of moorland habitat to forestry and agriculture, and increased predation. The annual bag for Britain and Ireland now has been estimated at 260,000-660,000 (Harradine 1983). The area of heather moorland is roughly 2-2.5 million hectares, but Red Grouse occur at low numbers over other ground, such as deer forests in the west Scottish Highlands.

PTARMIGAN Lagopus mutus

In a good winter the population of Scotland is probably 10,000-15,000 birds, but like the Red Grouse, the numbers fluctuate greatly from year to year, and Watson (1965) noticed a cyclical tendency with peaks about every ten years or so in the Cairngorms. Spring density varies from absence on some hills in trough years, up to 65 pairs per sq km on the richest ground in peak years. Breeding success varies from almost nil locally in summers with severe snowstorms, up to three or more young reared per old bird.

BLACK GROUSE Tetrao tetrix

A reasonable guess would place the total number at the lower end of Parslow's (1973) 10,000-100,000 category, as in the Breeding Atlas. but numbers may increase or decrease by over 100% in a few years. In NE Scotland on an area of mixed moorland and woodland, there are at present one cock and two hens per sq km in spring, but at least twice

as many cocks were present in recent years.

CAPERCAILLIE Tetrao urogallus

Observed winter densities in different forests have varied from less than 5 to over 30 birds per sq km. This leads to an estimated population in Scotland of a few thousand. It thus forms a minute fraction of the world population, whose distribution more or less coincides with that of the Scots Pine. They seem to breed best in open forest with mature trees and plenty of blaeberry on the ground (Moss et al 1979). Such forests are relatively scarce but may be crucial to the continued survival of our Capercaillie population.

RED-LEGGED PARTRIDGE Alectoris rufa

Reduced shooting pressure enabled a rapid increase in the Red-legged in the late 1950s to equal the numbers of Grey Partridges. In parts of the eastern counties densities of up to 20 pairs per sq km were common. Shooting of Red-legged Partridges was organized in its own right, especially since about 1974, when releases of this species began to increase in popularity. Now about 400,000 are shot annually. Later, wild stocks stabilized or even, as on the South Downs, declined. Most areas of arable land now have less than 5 pairs per sq km.

GREY PARTRIDGE Perdix perdix

From being the most numerous species of bird on farmland in parts of eastern England, with densities up to 350 per sq km in the best localities at the start of winter, it is now unusual to find more than 70 birds per sq km, with an average being around 20. Spring stocks average about 5 pairs per sq km for the arable areas, fewer in predominantly grass areas, although in especially favoured areas up to 25 pairs per sq km can still be found. The average early autumn stock in Britain and Ireland is put at less than one million, though formerly there was at least three times this number shot.

The Grey Partridge has the doubtful distinction among birds of having declined in no less than 29 countries.

PHEASANT Phasianus colchicus

The wild population in winter in Britain is probably about 8 million and the Game Conservancy estimates that 15 million Pheasants are released annually. Of these about 45% are shot annually and of the remainder about half are lost through unknown causes, such as predation, during late winter. During the last two decades the numbers of Pheasants reared and released per sq km has more than doubled in some regions. The Common Birds Census index suggests that the breeding population is steadily increasing but the numbers of wild birds shot, according to the National Game Census, may not have changed during the last two decades (Tapper 1982). In Ireland the situation is unclear.

GOLDEN PHEASANT Chrysolophus pictus

Generally the feral Golden Pheasants seem to be holding their own with perhaps 1,000-2,000 birds. The species is never likely to spread far from its present centre, because of its very sedentary habits and the fragmented nature of coniferous woodland in lowland England.

LADY AMHERST'S PHEASANT Chrysolophus amherstiae

Britain is probably the only place in the world where perhaps 200-500 of this fabulous bird live in a feral state. Its wild range in China, Tibet and Burma is small, inaccessible and its status there is perhaps precarious. So every effort to encourage and study Lady Amherst's Pheasants in Britain is to be welcomed.

WATER RAIL Rallus aquaticus

Attaching numbers to such a secretive and enigmatic species is a difficult task. The Breeding Atlas suggested a summer population in Britain and Ireland of 2,000-4,000 pairs: it seems most probable that these remain during the winter, and that their numbers are considerably augmented by incoming migrants. There is little factual evidence on population changes, though land drainage may have some adverse impact.

MOORHEN Gallinula chloropus

The Breeding Atlas suggested a British and Irish Moorhen population of 300,000 pairs, based on a conservative estimate of 100 pairs per occupied 10-km square. On this basis, even without allowing for the influx of migrants, the winter population would be in excess of a million birds. Britain and Ireland are thus important for the Moorhen in a European context, both because of the large resident population and because the area is used as a wintering ground by birds from other countries.

COOT Fulica atra

The recent expansion of possible habitats through gravel extraction in southern Britain may have boosted breeding populations locally (Parslow 1973), but their effect on the wintering population is less certain. With some winter influx from the Continent we might expect that the population would exceed the 10,000 - 100,000 pairs present in summer and, indeed, the Winter Atlas estimates would suggest a total of 200,000 birds as not at all unreasonable.

OYSTERCATCHER Haematopus ostralegus

As Oystercatchers are fairly easy to count, we have good estimates of population size through the Birds of Estuaries Enquiry. The British and Irish wintering population is presently estimated as 300,000 birds (Salmon and Moser 1984). Thus Britain and Ireland together probably hold in excess of 45% of Europe's Oystercatchers.

AVOCET Recurvirostra avosetta

In the mid winter period of 1983/84 there were about 385 birds in Britain. This follows a fairly steady increase in the total numbers of Avocets wintering in Britain and Ireland until 1980/81. A sharp increase in 1981/82 is largely attributable to the increased Suffolk population. Since 1980/81 the British wintering population has represented over 50% of the total of adults and juveniles at the end of the previous breeding season.

Over the period 1978-1983 an average of about 34,400 Avocets have been counted in January on the Atlantic coasts of Europe, mainly in France and Portugal though 600 or so have been wintering on the North Sea coast of the Netherlands and Germany. Britain is at the northwest extremity of the wintering range.

RINGED PLOVER Charadrius hiaticula

The Winter Atlas map suggests that the total numbers of Ringed PLovers in Britain and Ireland may be more than 20,000. and the results of the BTO/WSG Winter Shorebird Count, suggest that it is 25,000 to 30,000 birds. This contrasts with Prater's (1981) estimate of about 5,000, but the Birds of Estuaries Enquiry did not cover all non-estuarine coasts which are often very important for this species. It appears that most birds are of the British and Irish breeding populations.

Many more Ringed Plovers winter in SW Europe and Africa, where this species forms a much higher proportion of the shorebird community (Pienkowski 1981). Britain and Ireland are on the northern edge of the species wintering range, but the coasts are obviously of great importance to the locally breeding birds and short distance migrants.

GOLDEN PLOVER Pluvialis apricaria

An approximate total of 695,000 Golden Plovers was recorded in the Winter Atlas with more than 300,000 each in both Britain and Ireland. This total was derived by summing the peak counts in each square. Previous estimates of numbers have been of the order of 200,000 in each country (Hutchinson 1979, Fuller and Lloyd 1981). The Atlas estimates are probably high because they may include double counts of flocks which moved from one locality to another in response to hard weather. Nevertheless, flocks can be difficult to find and it is likely that many were overlooked during Atlas fieldwork. The wintering populations of Britain and Ireland may each be in the range of 200,000-300,000.

GREY PLOVER Pluvialis squatarola

Grey Plovers have a complex pattern of seasonal movements and it is therefore difficult to estimate the total number of Grey Plovers visiting Britain and Ireland during the whole non-breeding period.

The recent Birds of Estuaries Enquiry estimates of 14,000-18,000 Grey Plovers in January constitute perhaps one third of the European winter population of about 50,000 (BWP). Britain and Ireland are at the northern edge of the range of the Grey Plover in mid winter. Large number of Grey Plovers also occur on the Wadden Sea in autumn and

spring and in W France, Iberia and W Africa in mid winter, with mainly males in the north of the range and females in the south.

LAPWING Vanellus vanellus

It is difficult to estimate numbers of Lapwings wintering in Britain and Ireland because the species is so widespread and mobile. The sums of the peak counts made in each square during the Winter Atlas were approximately 2,050,000 for Britain and 550,000 for Ireland. These totals must not be treated as population estimates because there may have been much double counting of birds which moved in response to hard weather, particularly in the 1981/82 winter. On the other hand Atlas fieldworkers undoubtedly missed many flocks. Even if the Winter Atlas counts overestimated numbers by 50% the combined British and Irish population would well exceed 1,000,000 birds. Despite the problems of estimating numbers the Lapwing is certainly the most abundant wintering wader in the country.

KNOT Calidris canutus

The Birds of Estuaries Enquiry has shown that since the late 1960s, there has been a decline in the total numbers of Knots of Greenland and Canadian origin. Peak numbers in Britain and Ireland of 400,000 in 1971/72 declined to 230,000 in 1973/74. Annual monitoring by the Estuaries Enquiry since then has revealed no evidence of a recovery to the former levels.

SANDERLING Calidris alba

According to Prater and Davies (1978), about 10,000 Sanderlings winter in Britain and another 2,000 in Ireland. The index of Sanderling numbers derived from the Birds of Estuaries Enquiry, is highly variable from year to year but shows no long-term trend. The winter total represents about 50% of the numbers estimated to winter in the whole of western Europe, but less than 10% of the whole western Palearctic migration flyway population, most of which winter on the coasts of Mauritania, Namibia and South Africa.

LITTLE STINT Calidris minuta

Although increasing in numbers, there are fewer than 30 Little Stints wintering in Britain and Ireland, where they are on the extreme northern edge of the winter range. In Iberia, where a considerable increase in overwintering birds has also been recorded during the past 20 years, approximately 600 remain each winter, mainly in Portugal (BWP).

PURPLE SANDPIPER Calidris maritima

Atkinson et al (1978) have estimated the British (not including Ireland) winter population at between 14,500 and 23,000. The value of 14,500 was based largely on casual records and may represent only 35% of the actual population. Thus the upper modified figure of 23,000 is probably a better estimate. No surveys of this species have yet been

done in Ireland, therefore the figure of 806 birds is based on minimum counts, but could well be much higher.

Purple Sandpipers winter further north than any other arctic-breeding wader and can be found within the Arctic Circle of Norway, in Iceland and SW Greenland. Thus, Britain and Ireland are in the southern part of the winter range. The populations to the south of Britain are relatively small; only about 2,000 in France and they occur regularly in small numbers in northern Spain and Portugal.

DUNLIN Calidris alpina

Winter counts indicate the population size of the nominate race (from N Scandinavia and USSR) to be about 1.5 million while that of the other E Atlantic populations (Greenland, Iceland, Britain, Ireland and Baltic basin) to be about 1 million (BWP), and of all these about half a million spend the winter in Britain and Ireland.

Britain and Ireland are extremely important areas for Dunlins, holding about half of the W European mid winter population and probably many other individuals of E Atlantic populations during migrations.

RUFF Philomachus pugnax

Prater (1973) estimated that the population was about 1,200 in 1966-1971, and comparing his map of England and Wales with the Winter Atlas suggests there has been a an increase since then especially in central and NE England. A comparison of the Birds of Estuaries Enquiry total of 670 Ruffs for the winter of 1983 (Salmon 1983), with the Winter Atlas map shows that just over half the dots coincide. From these sources it is estimated that there was a maximum of about 1,400 Ruffs in Britain and Ireland during the Atlas years, but as this is the northern edge of the wintering range, one can expect large fluctuations in numbers from year to year or from month to month, depending on weather conditions.

JACK SNIPE Lymnocryptes minimus

Inevitably there is rather little information on the Jack Snipe's population size and status. Few countries have produced any estimates of breeding pairs and for the winter non-breeding population there are few reliable data, largely because the species is so readily overlooked. Some indications are available from sportsmens' bags, however, since the proportion of Jack Snipe in the total snipe bag gives some indication of its relative abundance. Sportsmen, however, do tend to go for marshy habitats which are the main Jack Snipe habitat whereas the Snipe occurs in many others as well. The British Association for Shooting and Conservation has estimated that some 10,000 Jack Snipe were being shot annually by its members alone in the early 1980s. This was based on a sample of 1,541 birds, from throughout the country, in which there was one Jack Snipe for every 8 Common Snipe, but this is probably an overestimate, perhaps a substantial one. With a probable wintering population of Common Snipe in Britain and Ireland totalling many hundreds of thousands it is thus possible that the corresponding winter population of Jack Snipe is 100,000. However, the Winter Atlas records it in only 788 squares with

an average of 2 or 3 birds seen in each. Even allowing for considerable under-recording this suggests the population is unlikely to be much greater than 20,000. There is no information on whether the population of this elusive species has changed but it must be related to the availability of suitable marshy habitats.

SNIPE Gallinago gallinago

Estimates of the autumn and winter population in northwestern Europe are difficult to make, but it has been estimated that 20-30 million birds pass through northwestern Europe in the late summer (Hepburn 1984). For Britain and Ireland an indication is given by the size of the annual sportsmens' bag. Since at least 85,000 are estimated to be shot each year (Harradine 1983) the wintering population must be many hundreds of thousands. Their behaviour makes them easily overlooked until disturbed.

WOODCOCK Scolopax rusticola

Reliable censusing techniques have not been developed for Woodcocks hence an estimate of the overwintering population of both islands is not possible. The population is undoubtedly large as the Game Conservancy's National Game Census gave an average 0.88 to 7.25 Woodcocks bagged annually per sq km, and the annual estimated bag for Britain is around 200,000 birds (Tapper and Hirons 1983). The mild oceanic climate of Britain and Ireland, particularly of the western extremities, provides the ideal overwintering conditions for migratory Woodcocks from NW Europe, with Ireland of particularly strategic importance during severe winters.

BLACK-TAILED GODWIT Limosa limosa

The winter population in Ireland was estimated at about 8,000-10,000 birds in the years 1971-1975 (Hutchinson 1979) and in Britain there are presently perhaps another 4,000-5,000 (Birds of Estuaries Enquiry reports). There are no more recent estimates of numbers in Ireland.

BAR-TAILED GODWIT Limosa laponica

The number wintering in Britain and Ireland was estimated at nearly 60,000 in the mid 1970s, but has fluctuated considerably since then, partly (it is supposed) in response to fluctuations in breeding success in the Arctic, but certainly in relation to the severity of the winter conditions in the Wadden Sea. The total western European wintering numbers have been estimated as about 100,000, but another 600,000 winter along the coast of NW Africa, chiefly on the Banc d'Arguin in Mauritania. (The eastern Siberian race Limosa lapponica baueri winters in SE Asia and Australasia).

WHIMBREL Numenius phaeopus

As a wintering bird in Britain and Ireland the Whimbrel is scarce, the total probably being less than 30 in any one year. There

is no evidence of any change in winter status.

CURLEW Numenius arquata

Prater (1981) estimated that 90,000 Curlews winter on the British and Irish estuaries and suggested a total wintering population of 125,000. However, the Winter Atas counts suggest that perhaps 50,000 birds winter inland in Ireland and 5,000-7,000 inland in Britain. With the addition of a further 45,000 on the non-estuarine coasts of Britain (preliminary results of BTO/Wader Study Group Winter Shorebird count), a better estimate would be 200,000 birds. This represents well over half of the Curlews wintering on the European-African Atlantic flyway, and shows the exceptional importance of Britain and Ireland to Curlews in winter.

SPOTTED REDSHANK Tringa erythropus

The Winter Atlas map and counts for the Birds of Estuaries Enquiry suggest that in most winters between 80 and 200 Spotted Redshanks winter in Britain and Ireland. Probably fewer than 500 winter on the Atlantic coast of Europe as a whole. Numbers vary quite widely between years but there is no evidence of any recent trend in population size.

Spotted Redshanks winter mostly in Africa (but scarce south of the equator), the Mediterranean basin, India and SE Asia.

REDSHANK Tringa totanus

The wintering population of Redshanks in Britain and Ireland has been estimated at approximately 95,000 (Prater 1981). The difficulties of counting wintering Redshanks probably leads to underestimates so our wintering population probably well exceeds 100,000 birds. Figures from the 15 years of the Bird of Estuaries Enquiry have shown a steady decline in the January population levels in Britain. Declines have been particularly marked on some estuaries such as the Clyde suggesting local factors may be involved.

As a wintering area Britain and Ireland are by far the most important in Europe harbouring some 75% of the total. This is probably of the order of 15-20% of the world population of the species which almost certainly exceeds 500,000 birds and may well top the million mark.

GREENSHANK Tringa nebularia

Prater (1981) estimated a total winter population of about 600 for both islands. From the number of squares in which birds were recorded during 1981/82 to 1983/84 it can be seen that this is a substantial underestimate and one might guess at a total winter population of over 1,000, but probably less than 1,500, of which about two-thirds are in Ireland.

The Greenshank is an abundant breeding bird in Scandinavia and the USSR, but almost all these birds are believed to winter south of the Sahara (BWP). Our birds are important because they appear to represent the bulk of the Scottish breeding population and because this

population is the most westerly in Europe. Annual indices for the Birds of Estuaries Enquiry indicate that the species is maintaining its numbers but the sample is small and excludes most of the Irish winterers.

GREEN SANDPIPER Tringa ochropus

With such a secretive and mobile species it is difficult to arrive at an estimate of the wintering population. An analysis of county bird reports for the five winters preceding the Winter Atlas period indicates a maximum of around 600 birds in Britain and Ireland. This figure must however be treated with some caution. Movements between sites during the course of the winter would lead to an overestimate whilst an unknown number of birds may have not been located or reported to the county bird recorders. A realistic figure for the wintering population is therefore probably in the range 500 to 1,000 birds. This represents a very small proportion of the western Palearctic breeding population of some 450,000 pairs (T.Piersma).

COMMON SANDPIPER Actitis hypoleucos

Wintering in Britain and Ireland has been known for many years, but appears to have increased in the past three decades. Prater (1981) estimated that the total number present in estuaries in winter did not exceed 50 birds, with as many again at other sites. The results of the present survey suggest that this is an accurate assessment, but with the possibility that the Irish population is underestimated.

The normal winter range is south of the Sahara, but small numbers are recorded in the Mediterranean basin and in the maritime areas of western Europe north as far as Britain and Ireland.

TURNSTONE Arenaria interpres

The winter population of Turnstones on British estuaries may be about 11,000 and Prater (1981) estimated that the overall winter population was in the order of 25,000, excluding Ireland which probably has well over 5,000 on the rocky shores. However, detailed surveys on the open shores of eastern Scotland (between Berwickshire and Orkney) has revealed a total of 15,000 (Summers et al 1975, Tay and Orkney Ringing Groups 1984), so the total population in Britain and Ireland is probably closer to 50,000.

The Turnstone has a cosmopolitan distribution during the non-breeding season, and Britain lies in the northern part of this range. They can be found on the rocky shores of New Zealand and South Africa, and coral islands and mangrove swamps of the tropics as well as the temperate shores of the Atlantic and Pacific Oceans.

MEDITERRANEAN GULL Larus melanocephalus

The total number of birds present is confused by wandering individuals but, with over 200 recorded, the December population is probably between 100 and 150 birds in Britain and Ireland. There has been a steady increase over the last thirty years. There had been only 4 records prior to 1940 but by 1960 between 10 and 20 were recorded

annually (Sharrock 1974) and by 1963 it had become too common to remain on the list of species considered by the British Birds Rarities Committee.

The world population is increasing and may now exceed 170,000 pairs, the vast majority in the Black Sea colonies. Most of these winter in the Mediterranean (BWP). So, in the wider context, the British population is not significant.

LITTLE GULL Larus minutus

The size of the wintering population is difficult to gauge but there are probably 150-350 in the Irish Sea and about the same number in the North Sea close to the east coast of Britain. The number scattered off the south and west coasts and coasts of Ireland is probably less than 100 in total. These numbers increase substantially from March onwards as birds begin to return towards their breeding colonies from wintering areas to the south.

BLACK-HEADED GULL Larus ridibundus

Gribble (1976) showed that the resident population of Black-headed Gulls has increased greatly during this century, and the Breeding Atlas suggested a population of between 150,000 and 300,000 pairs. Gull roost counts in January 1983, gave a total of 1,877,000 Black-headed Gulls, over 1,000,000 of which were at inland sites (Bowes et al 1984). This figure must be regarded as conservative because of the problems of coverage in remote areas and it did not include Ireland. The current winter Black-headed Gull population may be of the order of 3,000,000 birds in Britain and Ireland, of which perhaps about two thirds are of Continental origin.

The Black-headed Gull is widely distributed across temperate Europe and Asia as far as the Pacific Ocean, though little is known of its numbers and movements in the eastern (and geographically major) part of its range. It seems probable, however, that a significant proportion of the breeding birds from the western part, westwards from Russia, winter in Britain and Ireland.

RING-BILLED GULL Larus delawarensis

Some 21 Ring-billed Gulls were reported in the 1981/82 winter and 35 in 1982/83. Full details from 1983/84 are still not available from British Birds Rarities Committee. Owing to identification difficulties, these totals must inevitably represent the tip of an iceberg and it seems highly probable that, in the Winter Atlas years at least, the annual British and Irish total must have reached three figures.

COMMON GULL Larus canus

Counts done for the 1983/84 winter gull roost survey gave totals of 332,253 in England and Wales (183,816 inland) and 128,849 (55,115 inland) for Scotland (Bowes, Lack and Fletcher 1984). Several large coastal roosts were not counted, so coastal figures are certainly an underestimate. Estimates derived from the Winter Atlas data give

423,000 Common Gull for England and Wales, 211,500 for Scotland and 67,500 for Ireland giving an estimated total of some 702,000 wintering. Britain and Ireland with their comparatively milder climate clearly form an important wintering area for N European breeding populations.

LESSER BLACK-BACKED GULL Larus fuscus

Since 1953, when 165 individuals were found wintering inland in England and Wales, there has been regular monitoring of numbers. These have risen steadily: 6,960 in 1963, 25,057 in 1973, to 44,564 in 1983. In January 1983 the number of Lesser Black-backs counted at all sites in Britain, excluding Ireland, was 58,144 (Bowes et al 1984), and there was an unknown but probably small numbers at coastal sites which were not covered. With a rough estimate of 5,000 to 10,000 in Ireland the total must be of the order of 70,000 birds.

HERRING GULL Larus argentatus

A series of British Trust for Ornithology enquiries based on roosts has established the numbers of this and other species of gull in winter. The last count was in January 1983, when the Herring Gull roost-counts in Britain, excluding Ireland were:

England and Wales	159,497	(inland 47,000)
Scotland	116,135	(inland 24,000)
TOTAL	275,632	(inland 71,000)

These totals are minimum figures. There were certainly several other large roosts along coasts and Scotland was rather thinly covered by this survey. Allowing for this and for those in Ireland the total population in Britain and Ireland is perhaps in the region of half a million birds.

Inland gulls in England and Wales increased from 56,000 in 1963 to 103,000 in 1973. In the 1983 survey numbers had declined to 47,000, a decrease of 54%. Bowes et al (1984) offer no suggestions about this dramatic reduction, which will clearly have to wait for future investigation.

ICELAND GULL Larus glaucoides

In a normal year, Britain and Ireland may have as few as 70-80 Iceland Gulls but recent influxes have resulted in well over 250, even over 300 in 1983 and 1984 with the majority in Scotland. Reports in widely separated areas may often refer to the same individuals, however, reducing the overall total somewhat away from the major recent concentrations, so the higher figures could be slight overestimates.

GLAUCOUS GULL Larus hyperboreus

Many of the birds wintering in Britain occur in Shetland and Orkney. Shetland may have 30-40 most winters, occasionally well over 100 or even 250. In Britain as a whole, there may be under 200 to 450-500, or sometimes rather more, each winter. In Ireland, they are

also subject to much fluctuation but the average is about 70 per year. Recent winters have brought several quite large influxes.

GREAT BLACK-BACKED GULL Larus marinus

The British population of Great Black-backed Gulls has increased since around 1880, and in 1969-1970, Operation Seafarer estimated the breeding birds in Britain and Ireland at over 25,000 pairs (Cramp et al 1974). It is difficult to estimate the extent to which the British population in winter is augmented by the Scandinavian visitors, since many of the latter feed almost entirely at sea, and the numbers present on our coasts fluctuate greatly from day to day, presumably in response to changing sea conditions. However, between them Britain, Ireland and Norway hold over 50% of the estimated 155,000 breeding pairs of Great Black-backed Gulls in the western Paleartic (BWP). Therefore, even allowing for the fact that only a proportion of the Norwegian birds overwinters in Britain, our wintering population is clearly of some international importance.

KITTIWAKE Rissa tridactyla

The winter records consist of less than 1% of the birds that would have been reported in the summer. In winter the great majority of Kittiwakes are still at sea, so it is impossible to give a total number. It will anyway vary on a daily basis.

GUILLEMOT Uria aalge

Stowe and Harris (1984) put the breeding population of Britain and Ireland at 1.1 million birds which compared with an estimated 600,000 in 1969/70 suggested that the population had increased by 5% per annum. Most recent census data suggest this rate may be slowing down in some areas. No winter population estimate is available.

RAZORBILL Alca torda

Lloyd (1976) speculated that the British and Irish breeding population was roughly 150,000 pairs, or 70% of the world population as it was then known. However, it is now realized that the Icelandic population is much larger than previously thought; but many of these birds winter in our area, hence we still have responsibility for the majority of Razorbills. No winter population estimate is available.

TYSTIE Cepphus grylle

The Breeding Atlas gives the total population as 8,340 pairs, based on the 1969/70 Operation Seafarer results. Recent surveys indicate that the real figure may be 2-3 times this value, (Ewins and Tasker 1985), ie 33,000-50,000 breeding birds. In Shetland an average of 1.2 young fledged per breeding attempt (Ewins and Perrins unpubl.), which when combined with population parameters given by Petersen (1981), gives an estimated 25,000-30,000 immature and sub-adult birds in December. As there is no evidence of emigration, and probably little immigration, the December Tystie population is estimated to be

58,000-80,000 birds around Britain and Ireland.

LITTLE AUK Alle alle

The world population of Little Auks has been estimated at 30 million, and it may be the most numerous sea bird in the world. The numbers occurring around the coast of Britain and Ireland, the southern edge of the winter range are not known, but are certainly a very small proportion of the total even in 'wreck' years.

PUFFIN Fratercula arctica

Britain and Ireland have some 700,000 breeding pairs and overall the population is increasing. But they spend the winter at sea and our offshore waters are of no consequence to wintering Puffins. They disperse widely and a guess puts the winter density of Puffins in the N Atlantic as one every 1-2 sq km of sea. East coast birds mostly remain in the North Sea (where they are joined by some Norwegian birds), but increasing numbers now go through the English Channel to the Bay of Biscay. None appear to winter in the Irish Sea.

ROCK DOVE / FERAL PIGEON Columba livia

The Rock Dove in Britain is at the northwestern edge of its range. Feral pigeons are now almost worldwide in distribution, occurring well to the north of the species' natural range in the far south of South America. Estimates of numbers of birds occurring in Britain and Ireland are very difficult to make because of complications over deciding which are feral and which are tame.

STOCK DOVE Columba oenas

The Breeding Atlas estimated a breeding population of just over 100,000 pairs in Britain and Ireland but with continued increase in the Common Birds Census index this might now be the size of the British population alone. However, summarising the totals in the Winter Atlas data correspond to only 30,000-63,000+ birds. Within Britain CBC densities decrease sharply westwards, so that in the Breeding Atlas the halving of average densities before extrapolating to all squares with Stock Doves was probably not conservative enough a downwards adjustment. Nevertheless, there is probably also a degree of under recording of Stock Doves in the course of the Winter Atlas.

WOODPIGEON Columba palumbus

It is impossible to provide an accurate figure for the number of Woodpigeons in Britain and Ireland. The species is not often counted during Common Birds Census work as the Woodpigeon's breeding period extends well beyond the normal peak of census activity. In 1965 Murton (1965) estimated that there were approximately 5.8 million birds in July in Britain rising to well over 10 million at the end of the breeding season. He obtained this estimate by using as his starting point data derived from regular population scans of a 1,050 ha study site in Cambridgeshire. Monitoring of Woodpigeon numbers on this site

is still continuing (I.R. Inglis and A.J. Isaacson) and therefore recent data can be used to provide a more up to date estimate. Assuming that the changes in Woodpigeon numbers on this site are representative, which may not be true, a rough estimate can be derived for 1983 of 4.8 million birds at the lowest point of the cycle rising to just under 10 million at the end of the breeding season. There is no information on the numbers in Ireland but the map indicates that numbers are likely to be lower than in Britain.

COLLARED DOVE Streptopelia decaocto

The British and Irish population was assessed in the Breeding Atlas as 30,000-40,000 pairs. The Common Birds Census index has indicated a continued increase to 1976, flattening out thereafter until virtual stability was reached from about 1982; but the CBC does not measure prime Collared Dove habitat, only the overspill into rural areas (Hudson and Marchant 1984). The breeding population must now exceed 50,000 pairs but there is no way of assessing reliably the upper limit. The breeding season is protracted, each pair being able to produce four to six broods per year. With juvenile mortality at 69% and annual adult mortality at 39% (Coombs et al 1981), there should be a minimum winter population of 150,000 birds.

RING-NECKED PARAKEET Psittacula krameri

The current population in Britain is about 1,000 individuals, although it should be made clear that the species is under recorded, probably because it is a feral bird and was not on the British List until 1983. Since the publication of the Breeding Atlas the Ring-necked Parakeet has increased its numbers considerably.

The Ring-necked Parakeet is a resident in the Afrotropical and Oriental Regions, where it is collected and exported through the pet trade to many European countries, including Britain, Belgium, the Netherlands and West Germany in all of which there are well established feral populations.

BARN OWL Tyto alba

The Breeding Atlas found from two to four pairs per occupied 10-km square. Barn Owls are sexually mature in their first full summer (evidence from ringing), and produce from one to six young (average brood size 3.1), but breeding is not attempted in some seasons. Allowing that three quarters of fledged young die before their first February, and that small numbers of Continental immigrants arrive in some years, one may place the mid winter population of Britain and Ireland in the order of 12,500 to 25,000 birds.

This upper limit tallies with Blaker's (1934) population estimate for England and Wales alone giving some indication of the long term decline in Barn Owl numbers that has taken place in both Britain and Ireland this century (reviewed in the Breeding Atlas). For one of the most widely distributed birds in the world, occupying most tropical and many temperate regions, our population represents a small fraction on the northern extremity of its range.

LITTLE OWL Athene noctua

Taking the Breeding Atlas estimated population of 7,000-14,000 pairs based on a conservative 5-10 pairs per occupied 10-km square, an average brood size of 2.4, that breeding is attempted in three out of every four years and that about 60% of nestlings die within four months of fledging, the mid winter British population is probably in the order of 19,000-38,000 individuals. In just over a century, since the first successful breeding attempt, the British population of Little Owls has increased substantially throughout most of England and Wales and represents an established element on the northwest fringe of its range though the species is common throughout much of central and southern Europe.

TAWNY OWL Strix aluco

The Breeding Atlas gives the population as 10,000-100,000 pairs though probably in the upper half of this range. Tawny Owls are single-brooded but fail to lay in some years of food shortage (Southern 1970). On average a pair will raise 2.3 young, and less than one-half of these young will survive so the mid winter population will be between 35,000 and 350,000 individuals. Thus the British population represents a relatively small but discrete fragment on the northwest fringe of the Tawny Owl's world range that embraces much of Europe and N Africa with an extension as far to the east as S China and Taiwan.

LONG-EARED OWL Asio otus

The overall winter population is very difficult to assess due to the difficulties of detection and the variable influx of immigrants. Invasions involving several thousands of owls occur in some winters, as in 1975/76, and can be attributed to crashes in the numbers of microtine rodents on the Continental breeding grounds. The Breeding Atlas estimated 3,000-10,000 pairs in Britain and Ireland, with from 1 to 5 young per pair (average brood size 2.4) produced most summers. With an influx from the Continent each late autumn, the mid winter population is likely to be in the range of 10,000-35,000 individuals.

SHORT-EARED OWL Asio flammeus

Taking the Breeding Atlas minimum of 1,000 pairs which may apply in poor vole years and the optimistic possibility of 10,000 pairs in peak years, that from 1-7 young (average brood size 3.8) are produced in most summers (BTO nest records), and that a sizeable number of owls arrive each autumn from the Continent, the mid winter population of Short-eared Owls is likely to be in the range of 5,000-50,000 individuals for Britain and Ireland. This represents a small fraction of the Short-eared Owl's circumpolar holarctic and discontinuous South American world population overall.

KINGFISHER Alcedo atthis

The Breeding Atlas suggests a British and Irish Kingfisher population of 5,000-9,000 pairs in summer, based on an estimated 3 to 5 pairs per occupied 10-km square. On this basis, the winter population

would be in the range of 9,000 to 15,000 birds. These include the western most part of a world population which is spread from warmer areas of Eurasia to the Oriental region.

GREEN WOODPECKER Picus viridis

There are few data on which to base an estimate of the total population of Green Woodpeckers although the Breeding Atlas concluded that there were between 15,000 and 30,000 breeding pairs. On this basis there could be 40,000 to 70,000 individuals present in mid winter. However in the absence of large scale survey data this estimate must be treated with some caution.

GREAT SPOTTED WOODPECKER Dendrocopos major

The Breeding Atlas estimated the Great Spotted Woodpecker population as 30,000 to 40,000 pairs. However, since the late 1960s there has been a rapid rise with the Common Birds Census index increasing from approximately 100 in 1966 to 250 in 1983. Allowing for the increased population over the last decade it is probable that the mid winter population is now between 150,000 and 200,000 birds.

LESSER SPOTTED WOODPECKER Dendrocopos minor

In the Breeding Atlas the British breeding population was very tentatively estimated as between 5,000 and 10,000 pairs. If this estimate is accepted then in the winter there may be approximately 20,000 to 40,000 individuals in this country. This estimate must be treated with some caution as our current knowledge of this bird is so limited that the population levels are little more than a guess.

WOODLARK Lullula arborea

At the time of the Breeding Atlas the Woodlark population was estimated at between 200 and 450 pairs. After that time the range contracted with the population reduced to its lowest in the mid 1970s. There was then a remarkable increase in numbers in the Hampshire/Surrey border area and to a lesser extent in the New Forest and the Breckland forests. Numbers were, however, reduced in Hampshire and Surrey following the severe winter of 1981/82. Total numbers now are probably much the same as they were in 1968-1972 but the distribution is more restricted.

The Woodlark is normally double-brooded and the average brood is between three and four. Thus, if the population were entirely resident, potential winter numbers would be well over 1,000 birds. Even allowing for the difficulty of locating the species, it is clear that a substantial part of the population leaves the country in winter, and the data suggest a population of 150-200 birds in winter. Britain is on the northern edge of the winter range.

SKYLARK Alauda arvensis

Winter counts on three arable farms in East Anglia in three winters gave a mean October-February density of 200 Skylarks per sq km

(range 130-280). The map shows this to be an area of comparatively high density, so if it is assumed that the average numbers of Skylarks per occupied 10-km square was 10,000 the total population for Britain and Ireland was about 25 million birds. This estimate is broadly in line with the Breeding Atlas figure of 2-4 million pairs, allowing for young of the year and winter visitors.

SHORELARK Eremophila alpestris

The map clearly indicates the very low numbers of Shorelarks currently wintering here. Allowing for birds overlooked during the survey it is still unlikely that total numbers in any of the three winters exceeded 300 birds, though this number may show a five-fold increase in years when the species is most numerous.

MEADOW PIPIT Anthus pratensis

The Breeding Atlas estimated the population at probably over 3 million pairs. Allowing two surviving young per pair, and guessing that emigration removes 80% of adults and young, the population in December could be 2 to 2.5 million, to which should be added an unknown number of winter visitors. The mid winter population of Britain and Ireland may thus lie in the range of 1-2.5 million, although the upper figure would require an average of nearly 800 birds per occupied square. Such numbers would obviously be much too high for many northern squares.

Zink (1975) has shown that most European Meadow Pipits winter in Iberia, a few passing on into North Africa. The population wintering in Britain and Ireland is certainly a small proportion of the whole. On the other hand it includes, in Scotland, the most northerly wintering of all Meadow Pipits.

ROCK and WATER PIPIT Anthus spinoletta petrosus/A. s. spinoletta

The Breeding Atlas suggested a population for the British and Irish Rock Pipit of over 50,000 pairs. This suggests a wintering population of the order of 100,000 to 150,000 birds, and there are certainly some migrants of the Scandinavian race to be added to this figure. The number of Water Pipits in any one winter is unlikely to exceed 100 or so.

GREY WAGTAIL Motacilla cinerea

The Breeding Atlas estimated the population of Grey Wagtails as 25,000 - 50,000 pairs when the population was probably high. There is evidence that Grey Wagtails have continued to spread, as a breeding species, in lowland areas since 1972. They suffer severely in cold winters though and the winter of 1981/82 took its toll. The population may therefore have been considerably reduced during the Winter Atlas years. Although numbers of birds emigrating and immigrating are unkown, Merritt et al (1970) believed the numbers of Grey Wagtails in Sussex in the winter to be similar to, or possibly less than, the breeding population. Many 10-km squares in northern Britain are unoccupied in the winter but a perhaps high estimate of 20 birds per

10-km square in the occupied squares gives a winter population of less than 25,000 birds.

PIED WAGTAIL Motacilla alba

The Breeding Atlas estimated the breeding population to be 500,000 pairs in Britain and Ireland. Because of mortality and emigration, both of which will depend on the severity of the winter, it is very difficult to estimate the numbers in Britain in December, but the population is probably in the region of 0.75 to 2 million birds.

WAXWING Bombycilla garrulus

Small numbers (up to 100 or so) of Waxwings probably arrive every year and field observations suggest that areas in Scotland and NE England are regular wintering sites. Only in invasion years do the birds occur here in significant numbers. Britain is, after all, on the extreme western edge of the bird's range and is only invaded when pressure on the food supply in continental Europe is very great.

DIPPER Cinclus cinclus

The major peak in Dipper mortality follows the breeding season and, by December, the population of Britain and Ireland would be similar to the breeding population of 60,000 birds (Breeding Atlas). This number exceeds that produced from the winter records, almost two-thirds of which refer to only up to two birds per 10-km square. However, personal observations in Wales and the Welsh borders indicate that more realistic values are 10 to 40 birds per occupied 10-km square, giving a winter estimate of 15,000 to 60,000.

WREN Troglodytes troglodytes

As a tiny bird, the Wren chills relatively rapidly and has little potential for storing fat. It is thus exceptionally vulnerable to extreme cold or conditions which prevent feeding. Owing to this vulnerability and to its high breeding potential, its numbers vary more between years than those of any other species monitored by the Common Birds Census. In a typical year, however, the estimated 4-5 million pairs in Britain and Ireland might produce a mid winter population in the range 12-20 million. The scale of immigration is too small to affect this estimate. The Wren is widespread all across the Palaearctic and the 'Winter Wren' all across North America.

DUNNOCK Prunella modularis

The breeding population is estimated to be 5 million 'pairs' (Breeding Atlas). Assuming a pair of Dunnocks produce 6 fledged young per breeding season, that half of these die before December and that half of the 35% annual mortality occurs by mid winter, the December population can be estimated as roughly 20 million birds for Britain and Ireland.

ROBIN Erithacus rubecula

Since the Breeding Atlas estimate of about 5 million breeding pairs, the Common Birds Census index for farmland has declined by about 20%. Taking account of this and other recent data, a more reasonable estimate of the breeding population during the Winter Atlas period would be 3.5 million pairs (Mead 1984). Population studies in a variety of habitats suggest that the average pair rear about two chicks to independence each year. Assuming that the net movement of Robins in and out of these islands is probably small, the December population during the Winter Atlas fieldwork may have exceeded 10 million birds for Britain and Ireland. This probably represented between 5 and 10% of the European population.

BLACK REDSTART Phoenicurus ochruros

The Black Redstart is a new addition to Britain's breeding avifauna this century and since the first regular breeding in 1923 the population has risen to 100 pairs (Morgan and Glue 1981). No such data exist for the winter numbers but counting the symbols on the map the winter population in Britain and Ireland is probably about 500 birds.

STONECHAT Saxicola torquata

In view of its sedentary, ground feeding and largely insectivorous habits and the fact that its main dispersal to winter territories is during the fine weather of early autumn, the Stonechat is extremely vulnerable to the severe cold weather. On the other hand, being triple brooded it can recover rapidly from hard winters. Few reliable data exist on which to base an accurate estimate of the winter population of Stonechats in Britain and Ireland. The Breeding Atlas suggested 30,000-60,000 pairs breeding in 1972. Field experience shows that the winter population overall is unlikely to differ widely from that of the breeding season.

BLACKBIRD Turdus merula

It has been estimated that there may be over 7 million pairs of Blackbirds breeding in Britain and Ireland. With the breeding population increased by their progeny, and with a huge influx of Blackbirds from an extensive area of northern Europe, against which must be set the comparatively small fraction of the British breeding population which migrates south to France, it seems certain that the total wintering population must easily exceed 14 million, and could well exceed 20 million individuals.

FIELDFARE Turdus pilaris

Movements make it almost impossible to put more than a very tentative figure, or rather range of figures, on the winter population of Fieldfares in Britain and Ireland. A realistic figure would depend on synchronised counts in a large number of areas, and would be valid only for the time of the counts. On the assumption that the numbers shown on the map for each square on the map were all present at the same time, and assessing the three grades of abundance as 50, 350 and

1,000, a calculated wintering population would be about a million birds.

SONG THRUSH Turdus philomelos

The Song Thrush's breeding population in Britain and Ireland has been estimated at some 3.5 million pairs. Since less than a quarter of the breeding population and young of the year migrate to the Continent in winter, and those that remain are increased by an influx of winter visitors from the Low Countries, it may tentatively be concluded that the wintering population in Britain and Ireland is not greatly different from the breeding population; 6-10 million birds would be reasonable estimate.

REDWING Turdus iliacus

Any attempt to estimate the size of the wintering population of Redwings in Britain and Ireland meets with the same problems as for the Fieldfare: the numbers vary from year to year, and also in the course of a single winter, and major shifts of population may take place in response to weather and feeding conditions. Synchronous counts over a large number of sample areas would enable a rough estimate to be made, but this would be a major piece of cooperative field work. On the assumption that the numbers shown on the map were all present at the same time, and that the three grades of abundance correspond to 50,300 and 1,000 birds, it may be calculated that the wintering Redwing population is of the order of one million birds.

MISTLE THRUSH Turdus viscivorus

Only the roughest guess can be made at the size of the wintering Mistle Thrush population. The departure of the adult population from N Britain and of many, perhaps most, of the birds of the year from the whole of Britain (but not Ireland), compensated by the arrival of an unknown, but probably not large, number of Continental immigrants, suggests that the winter population for Britain and Ireland must be appreciably smaller than the breeding population, perhaps in the range of 400,000 to 800,000 individuals.

CETTI'S WARBLER Cettia cetti

Cetti's Warblers have spread slowly north from their Mediterranean strongholds since the 1920s (Bonham and Robertson 1975). The English population increased substantially in 1975-1977, but then remained relatively stable in total numbers and distribution until 1981. In 1981/82 sustained hard frosts caused a drop in numbers in Kent, while elsewhere the population may have doubled presumably because the winter was less harsh. In the previous hard winter of 1978/79, the British population had dropped by 7%. Long periods of below freezing temperatures and prolonged snow cover are damaging. In early 1985 there were 75% reductions in Kent and Suffolk.

Assuming that the polygyny found in Dorset (Bibby 1982) is general and that at least two young per breeding male survive to December, the total early winter population was probably between 500

and 1,000 in 1982. In spite of this impressive increase, the Cetti's Warbler's dependence on a small number of main sites clearly makes it vulnerable to local extremes of winter weather.

DARTFORD WARBLER Sylvia undata

British breeding numbers were 560 pairs in 1974 and 420 in 1984. The former number is unlikely ever to be reached again because of habitat loss. At minimum, numbers have been as low as 11 pairs recorded in 1963. Using approximate breeding and mortality data, mid winter numbers during the Atlas survey were probably 1,500-1,800 birds. In the last 25 years they may have varied between 25 and 2,500. If 10-50% of the British population was abroad for the winter, recent wintering numbers in Britain would be in the range 800-1,500 birds.

Numerically, this small population is a tiny outpost of a bird with a western Mediterranean distribution where it is very abundant in scrub habitats.

BLACKCAP Sylvia atricapilla

A total population in Britain and Ireland of some 3,000 individuals in winter seems likely. It is unfortunately not possible to make any direct comparison of numbers between the 1978/79 survey and the Winter Atlas, as the former was based on old counties and the latter has not attempted to count the total number of birds present. The 1978/79 enquiry counted a minimum of 1,714 Blackcaps (Leach 1981). Since then the numbers have probably remained more or less the same, although numbers are slightly higher in more severe winters (Bland 1982).

The increase in numbers wintering in Britain is correlated with the increase in numbers and extention of range in northern Europe (Leach 1981).

CHIFFCHAFF Phylloscopus collybita

In a normal year the maximum wintering population in Britain and Ireland may be 500 but in 1982/83 there must have been at least 1,000. This is a small outpost for a bird which winters mainly in the Mediterranean region, in western parts of France and south of the Sahara.

GOLDCREST Regulus regulus

Like most small birds in temperate climates, the Goldcrest experiences wide fluctuations in population size from year to year. In an average season, however, the resident population is probably in the range 2-4 million birds in mid winter. The scale of immigration is unknown, but Continental visitors perhaps number up to a further million. Most of these come from northern Europe.

FIRECREST Regulus ignicapillus

In estimating the total numbers, it should be borne in mind that this is both an elusive species, which may easily go undetected, and an

unexpectedly mobile one which may be double-recorded in some well-watched areas. With some allowance for these factors, the average population in winter is probably in the range 200-400 birds for Britain and Ireland. Considerable variation is known to occur between winters.

Even though the British and Irish breeding and wintering numbers are similar, probably most birds wintering here are of Continental origin. Unlike the Goldcrest, the Firecrest is endemic to the W Palearctic and is absent in winter from much of its breeding range. Britain marks the most northerly point of a mainly Mediterranean and Atlantic winter distribution.

BEARDED TIT Panurus biarmicus

If breeding numbers are now slightly above the 1974 estimate of 590 pairs and if allowance is made for the very considerable breeding rate of this species, recent mid winter numbers in Britain have probably been in the range 3,000-5,000 birds. Twice as many may have wintered here in the period of large irruptions from the Continent. This may not be repeated again unless further coastal engineering works in the Netherlands again produce huge if temporary areas of reed.

The Bearded Tit is very widely but patchily distributed across the Palearctic. Even in European terms, the British population is rather small because of the restricted area of habitat.

LONG-TAILED TIT Aegithalos caudatus

Population fluctuations tend to be small except when particularly harsh conditions result in high mortality. The Breeding Atlas gives and estimate of 150,000 families for Britain and Ireland, which probably reflects 50,000 pairs each nesting on average three times, when one considers the difficulties encountered in distinguishing these birds on an individual basis. A nest success rate of 16% with an average brood size of 9, survival rates of 38% for adults and 32% for juveniles and an average of 3 adult birds per successful nest will lead to a winter population of about 96,000 birds in Britain and Ireland.

MARSH TIT Parus palustris

The Breeding Atlas estimated the British population at between 70,000 and 140,000 pairs, but since then an estimated 20% reduction has occurred. Assuming approximately 5 young fledge per pair, 60% loss of these and 25% loss of the adults by mid winter, a mean winter population of between 200,000 and 400,000 birds is estimated.

WILLOW TIT Parus montanus

Although the Marsh Tit population has dropped, there is no reason to suppose that the same has occurred in the Willow Tit since, for example, the number of Willow Tits ringed annually in Britain has almost doubled since 1972. The Breeding Atlas estimated the British population as 50,000-100,000 pairs. Assuming 5 young fledged per pair, 60% loss of chicks and 25% of adults by mid winter, a mean winter population for Britain and Ireland would be 175,000-350,000 individuals.

CRESTED TIT Parus cristatus

Following a winter of average severity the breeding population is probably around 900 pairs (Cook 1982). Assuming 5 young produced by each pair, the mid June population would be 6,300 birds. Post-juvenile mortality of tits is highly variable from year to year but, assuming a figure of 50% by December together with 25% adult mortality, the mid winter Crested Tit population is probably in the region of 3,600 birds.

COAL TIT Parus ater

The Breeding Atlas estimated the population in Britain and Ireland as about 1,000,000 pairs. Since then no significant change in abundance has occurred. Assuming an average productivity of 6 young fledged per pair, 60% loss of these by mid winter, and 25% for adults, the mid winter population would be about 4,000,000 birds.

BLUE TIT Parus caeruleus

The Breeding Atlas estimated the breeding population at something over 5,000,000 pairs. Since then a 7% reduction in numbers has occurred (Marchant 1983). Assuming that on average 7 chicks fledge per pair, and 25% survive to mid winter, and 70% of adults survive, about 15,000,000 Blue Tits would be alive in Britain and Ireland in mid winter.

GREAT TIT Parus major

The Breeding Atlas estimated the British and Irish population at something over 3,000,000 pairs. Since then the population has risen by about 11% (Marchant 1983). Assuming that 5 chicks fledge per pair (Perrins 1980) some 15,000,000 first year birds might be included in the winter population (assuming no post-fledging loss). First-year survival is about 20%, that of adults about 50% so that a mean winter population of about 10,000,000 birds would be appropriate.

NUTHATCH Sitta europaea

Assuming a British breeding population of approximately 20,000 pairs (Breeding Atlas) and an annual adult mortality of 50% (Nilsson 1982) which occur largely in the late winter and spring, an early winter population of between 60,000 and 80,000 birds seems likely.

TREECREEPER Certhia familiaris

Ringing recoveries indicate that Treecreepers are among the most sedentary of birds (Flegg 1973) and there is no evidence of winter population augmentation from the Continent. Though susceptible to high mortality during cold winters, the general Treecreeper population trend in recent decades has been upwards. Allowing for under recording, the Breeding Atlas suggested a population of 150,000-300,000 breeding pairs: it may be that the mid winter population in Britain and Ireland now lies somewhere at or just below the one million individuals mark.

GREAT GREY SHRIKE Lanius excubitor

Allowing for the fact that the map may include some duplication of birds on the move at the beginning and end of winter, and that in the years under review Great Grey Shrikes were noticebly more scarce in many of their traditional haunts, the winter population probably exceeds 150 individuals. (The estimated winter population in Sweden is 3.7 per 100 sq km.)

Britain, along with Belgium and western Germany, may provide for the Scandinavian breeding population a significant alternative to the harsher conditions in the more important wintering areas in south central Sweden.

JAY Garrulus glandarius

Results from the Breeding Atlas suggested a population of about 100,000 pairs. Jays are single-brooded and usually raise two to four young (Goodwin 1976). Allowing for about half of these dying before the end of the year (many of which are shot) and taking into account the continued increase of the species, the December population for Britain and Ireland seems likely to be 350,000 - 400,000 birds.

MAGPIE Pica pica

Because the Magpie is sedentary the mid winter and breeding season populations are probably very similar, ie 250,000 - 500,000 pairs in Britain and Ireland.

CHOUGH Pyrrhocorax pyrrhocorax

A survey in 1982 suggested a combined British and Irish population of around 1,000 pairs (Bullock et al 1983). For every breeding pair there is at least one non-breeder (ie another 1,000 birds). Assuming 2 young per pair of which only one may survive the first winter, we would expect an October population of 5,000 individuals and a total March population of 3,000 individuals. The British and Irish population appears to be stable, though the impression in Europe (ie France, Spain and Italy) is that populations there are declining.

JACKDAW Corvus monedula

There is some evidence that Jackdaws declined in East Anglia in the 1960s with a fall in the areas of grass leys (Tapper 1981), whereas in parts of the west they have increased (for example colonising Irish offshore islands where they were absent in the early 1960s). The Common Birds Census index shows a net increase in the last ten years. Assuming the Breeding Atlas estimate of 500,000 pairs, plus a probable 30% non-breeders in spring, plus 2 fledged young surviving to the winter, there may be a resident winter population in Britain and Ireland in the order of 3 million birds, swelled by an unknown number of Continental Jackdaws.

ROOK Corvus frugilegus

Nearly one million pairs of Rooks were estimated to breed in Britain and Northern Ireland in 1975 (Sage and Vernon 1978) and a population increase of 5-7% was suggested by the results of the 1980 survey (Sage and Whittington 1985). An estimated further quarter to half million pairs breed in the Republic of Ireland. Each pair rears on average a brood of two, of which only 30-40% survive to the winter and subsequently do not usually breed until their second year. When the influx of Continental Rooks is taken into account, the wintering population is likely to exceed 4 million birds.

CARRION and HOODED CROW Corvus corone

The Breeding Atlas estimated about one million pairs of crows. Several breeding studies suggest that the number of young fledged varies from 1.1 to 1.7 per pair (Coombs 1978), and the heaviest mortality probably occurs in late winter. We do not know the extent to which migrant birds increase the resident population, but a figure of about 3.5 million may perhaps be reasonable for December. This must be only a small fraction of total crow numbers in Europe and Asia.

RAVEN Corvus corax

The Breeding Atlas estimated a population of some 5,000 pairs. Allin (1968) found that about 80% of nests were successful. Using this factor and an average of the mean brood sizes reported by him and Ratcliffe (1962) implies the recruitment of close to 2.3 young a year for each breeding pair, including pairs that fail. Thus 5,000 pairs give rise to a population immediately after the breeding season of 21,000. Adding non-breeding birds gives an estimated total of some 30,000. A stable population requires an annual average survival rate of about 0.6, which gives a December total of over 20,000. Taking account of a probable net decline in the number of pairs since the Breeding Atlas, the December total is now unlikely to exceed 20,000, or an average of almost 12 birds per occupied 10-km square for Britain and Ireland. This is a significant proportion of the European population.

STARLING Sturnus vulgaris

The only estimate of the British and Irish winter Starling population is that of Potts (1967). His estimate of a minimum of 37 million was derived from densities of birds given by other authors and from the area of agricultural and urban land. Breeding populations in northern Scandinavia and Russia, whence many of our winter immigrants originate, have recently undergone marked declines that may have reduced our winter population (Feare 1984).

HOUSE SPARROW Passer domesticus

Based on sample censuses in different types of habitat in Britain Summers-Smith (1959) estimated a breeding population of about 9.5 million House Sparrows. Similar censuses in Continental Europe and the USA, suggested a ratio of House Sparrows:Man of about 0.2, which would give the current breeding population of House Sparrows as 11.8 million

in the Britain and Ireland. In mid winter the population is about 20% higher than at the beginning of the breeding season, giving a winter population of about 14 million House Sparrows. Since the early 1970s the population has probably declined slightly. On this basis it is estimated that the winter population of the House Sparrow lies between 10 and 15 million birds.

The world population of House Sparrows is probably about 500 million, making it one of the most widely distributed and numerous land species in the world.

TREE SPARROW Passer montanus

A breeding survey carried out by Norris (1960) in 1952, gave an estimate of 700,000 birds. The Winter Atlas records and a mean farmland breeding density of 3.4 pairs/sq km, derived from the CBC results, gives a value of 820,000 birds, making 800,000 birds the most likely winter population for Britain and Ireland.

CHAFFINCH Fringilla coelebs

The Chaffinch is one of our most common breeding birds, with a population in Britain of around 5 million pairs (Hudson and Marchant 1984) and there are approximately 2 million in Ireland. They normally raise only one brood of four per year, and are one of the longer lived European passerines, with mean annual survival rates around 70% for adults and 15% for first-year birds, giving a mid winter total of some 15 million Chaffinches of British and Irish origin. The number of immigrant birds is not easily calculated, but, making reasonable assumptions about breeding density and the areas from which birds reach Britain, it seems likely that between 10 and 20 million northern Chaffinches may winter here, giving a total mid winter population for the species of around 30 million birds.

BRAMBLING Fringilla montifringilla

The distribution maps for this species show considerable differences between the three years of the survey, as might be expected. This, and their wandering nature, makes it difficult to calculate a total wintering population. British ringing totals (which include birds caught on passage as well as wintering birds) often vary by a factor of two or three in successive calendar years. In the recent well documented Brambling invasion of the Merseyside area (Norman et al 1981), it was estimated that 150,000 birds visited one particular roost site in a six week period, and it is not difficult to imagine that 2,000,000 Bramblings spent part of that winter in Britain and Ireland. In some other years, by contrast, the total wintering population might be as low as 50,000 birds.

GREENFINCH Carduelis chloris

In 1972 the number of breeding pairs of Greenfinches in Britain and Ireland was estimated at one or two million pairs. In 1983 the Common Birds Census indices for farmland and woodland plots =Awere 11% and 17%, respectively, below the levels established 11 years earlier.

With an average clutch size of 5, a fledging success of about 50% (Monk 1954), probably two broods per year, and more than 50% of post-independence mortality possibly occurring between the New Year and bird-breeding season, the population in December may be about 5 or 6 million birds.

GOLDFINCH Carduelis carduelis

The Breeding Atlas suggested an overall density of 100 pairs per 10-km square, equivalent to around 300,000 breeding pairs in Britain and Ireland. The number might increase through breeding to give a population exceeding 1.5 million individuals by the end of the summer. By late winter, numbers could well have fallen to less than 30,000 individuals. The population has almost certainly declined in southern regions during the last 30 years, as a result of herbicide use and other agricultural procedures which have greatly reduced the numbers of thistles and other food plants.

SISKIN Carduelis spinus

The Winter Atlas period has included two years in which Siskins have been abundant in southern Britain (1981/82 and 1983/84). Their increase as a breeding species probably ensures that a reasonable number will now be present in most winters, but over a longer period more variation might be expected. If all British breeders remained here, the Breeding Atlas estimate suggests a minimum winter population of well over 50,000 birds. In a winter when there are many Continental immigrants, the total must be much more. Retrap and control data suggest that total numbers per 10-km square of good habitat may be of the order of 500-1,000. In some years certainly well over 150,000 Siskins must be wintering in Britain and Ireland, but probably less than half a million.

LINNET Carduelis cannabina

Britain is on the northern edge of the winter range of the Linnet and total numbers probably vary somewhat from year to year. Since the Breeding Atlas estimate of between 0.8 and 1.6 million pairs, the Common Birds Census index has decreased from about 85 to 55. So, with an average brood size of four, two broods per year, about half dying before December and about half moving away from Britain for the winter, the December population seems likely to be about 2-3 million birds.

TWITE Carduelis flavirostris

The estimated population of 20,000 to 40,000 pairs in the Breeding Atlas would generate a net input of 50,000 to 100,000 birds by December. Allowing for a slight decline in the breeding population in recent years and fluctuations in the numbers wintering on the Continent it is probable that the mid winter population in Britain and Ireland numbers between 100,000 and 150,000 birds.

REDPOLL Carduelis flammea

The Breeding Atlas proposed a population of 300,000 to 600,000 pairs in 1972. If we take the figure now to be 315,000 breeding pairs, averaging 1.5 broods per year, with 4 or 5 eggs per clutch; a fledging success of around 50%, but with significant post-fledging mortality; and a stable, or even declining breeding population, with further mortality peaking in late winter or early spring when seeds are in short supply; then the total birds alive in mid winter may be about 1,200,000. If the proportion emigrating varies between, say, 30 and 70%, the number of birds in Britain and Ireland at the end of December will range between 350,000 and 850,000.

CROSSBILL and SCOTTISH CROSSBILL Loxia curvirostra and L. scotica

There are no recent estimates for the population sizes of either Scottish or Common Crossbills. In the early 1970s Nethersole-Thompson (1975) put the population of the Scottish Crossbill at about 1,500 birds. Although numbers vary from season to season in any one area, there is no reason to believe that the total has changed much since then. The Breeding Atlas gives the population of the Common Crossbill to be about 3,500 birds (total crossbill population of 5,000, less 1,500 for scotica). This is probably high for years when there has been no irruption. At these latter times there could be less than 1,000 Common Crossbills in Britain and Ireland. After an irruption there is an increase in numbers, often to several times that figure, followed by a decrease over subsequent seasons until the next invasion.

BULLFINCH Pyrrhula pyrrhula

The Breeding Atlas estimated 600,000 pairs but since then the Common Birds Census has shown that although the woodland index is more or less steady the farmland index has shown a steady decline. Assuming 2-3 broods per pair, an average 0.4-1.3 young produced per nest, and using information on the relative winter mortality of adults and first-years, the mid winter population is likely to be between 1 and 1.5 million birds for Britain and Ireland.

HAWFINCH Coccothraustes coccothraustes

As no census has yet been carried out, the winter numbers can only be estimated; using Breeding Atlas figures of 10,000 breeding pairs, 20,000 Hawfinches can be assumed to winter in Britain.

LAPLAND BUNTING Calcarius lapponicus

The low numbers of birds present in the three winters of the survey period follow a succession of poor autumns for the species. A calculation based on the distribution map suggests that the current wintering population in Britain and Ireland is between 200 and 500 birds, a figure increased several-fold in peak years. There is however a possibility of duplicated counts and the difficulty of locating groups of birds may signifcantly affect the accuracy of such an estimate.

SNOW BUNTING Plectrophenax nivalis

A tendency to be influenced by climatic factors results in large variations from winter to winter in the numbers of Snow Buntings reaching Britain and Ireland. Unusually high numbers may be present over a series of years followed by a marked decline for a similar period. It is, therefore, difficult to assess the numbers of birds present each winter. County reports for the relevant winters indicate that numbers are currently on the low side, and, in conjunction with the distribution map, an estimated figure of 10,000 to 15,000 birds seems likely.

YELLOWHAMMER Emberiza citrinella

Common Birds Census results indicate that on farmland, its preferred habitat, the Yellowhammer in Britain has maintained a remarkably constant breeding population during the past 20 years, though there has been a decline in N Ireland. Fluctuations in woodland breeding numbers have been somewhat greater, but there is little indication that severe winters markedly affect overall population levels. Given the Breeding Atlas estimate of about 1,000,000 breeding pairs of Yellowhammers and an annual adult mortality of 46%, and assuming that each pair produces two offspring surviving to mid winter, the January 1982 population level in Britain and Ireland must have been of the order of 3,500,000 individuals.

CIRL BUNTING Emberiza cirlus

The 1982 breeding survey located a maximum of 181 pairs. It is therefore reasonable to suppose that, with a brood size of three to four and two broods a year the mid winter population is likely to be about 500 birds taking into account nesting losses and mortality.

REED BUNTING Emberiza schoeniclus

Since the Breeding Atlas estimate of more than 600,000 pairs in 1972 was made, the farmland CBC index has roughly halved. Assuming each pair produces an average of two offspring surviving to mid winter, and that there is an overall annual adult mortality of 43% (Prys-Jones 1986) and a limited winter influx of birds from abroad, a January 1982 population estimate for Britain and Ireland of about 1,200,000 birds seems not unreasonable. They suffer badly in cold winters and this causes large variation in numbers.

CORN BUNTING Miliaria calandra

Estimating winter numbers is not really possible. The Breeding Atlas suggested a breeding population of about 30,000 pairs and the CBC index has declined by about 10% since. But this index may be unreliable as it is usually based on rather small samples of Corn Buntings and fluctuates stongly. Distribution has also always been disjointed. In the absence of more accurate figures it is only possible to suggest that the mid winter population in Britain and Ireland is unlikely to exceed 150,000 birds and is perhaps below 100,000.

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