

International census of Whooper Swans *Cygnus cygnus* in Britain, Ireland and Iceland: January 1991

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A coordinated census of Whooper Swans wintering in Britain, Ireland and Iceland was made in January 1991. A total of 18,035 birds was counted, and these are thought to represent most of the Icelandic-breeding population. Of the total number recorded, 5225 (29.0%) were counted in Britain, 3484 (19.3%) in Northern Ireland, 8490 (47.1%) in the Irish Republic and 831 (4.6%) in Iceland. The distribution of the flocks is described in further detail and the results compared with the census made in January 1986. There was considerable variation in the proportion of juveniles recorded in different parts of the wintering range. Possible reasons for this variation are discussed.

The results of ringing programmes in Britain, Iceland and Denmark indicate that Whooper Swans *Cygnus cygnus* which winter in Britain and Ireland are predominantly from the Icelandic breeding population, although a small number of Icelandic Whooper Swans winter east of the North Sea, in Norway, Denmark and the Netherlands (Black & Rees 1984, Gardarsson 1991). Several hundreds, and up to 1300, Whooper Swans also remain in Iceland to winter on spring-fed freshwaters in the northeast and south, and on shallow coastal waters in the southwest (Gardarsson & Skarphedinsson 1985).

Small groups of Whooper Swans reach Britain and Ireland as early as September, but the main arrival period is from early October to mid-November, and most of the birds depart on spring migration in March and April (Black & Rees 1984, Gardarsson & Skarphedinsson 1984). They roost and feed on a variety of wetland habitats, with shallow lakes and lochs being preferred, where they consume a variety of emergent and submergent aquatic plants. On land they feed on grass and winter cereals, split grain in stubble fields, and root crops (notably sugar beet and potatoes) left after the harvest. In intertidal areas, the eel

grass *Zostera* is often selected (Lack 1986, Owen *et al.* 1986, Hutchinson 1989).

There have been several autumn and winter censuses of the Icelandic Whooper Swan population, with varying results. Boyd & Eltringham (1962) suggested that the British total in November did not exceed 4000, and Hutchinson (1979) estimated the Irish wintering population at 4000-6000. Brazil & Kirk (1979) obtained a total of 6765 for Britain and Ireland in November 1979, but their census was thought to have been incomplete. Counts made during the 1980s produced much greater numbers, with estimates of around 14,000 in Iceland in 1984 and 1985 (Gardarsson 1991), and over 16,700 swans were recorded during the first international census of the population in January 1986 (Salmon & Black 1986).

In this paper, we present the results of the second census of the Icelandic Whooper Swan population in winter, based on coordinated counts made in Britain, Ireland and Iceland. We focus particularly on regional variations in swan numbers and the proportions of young swans in flocks. The results are compared with the numbers recorded during the 1986 census to determine whether there has been a signif-

icant change in the size of the population.

Methods

The census was organised by The Wildfowl & Wetlands Trust (WWT) in collaboration with the Irish National Parks and Wildlife Service (NPWS) and the University of Iceland. The fieldwork in Britain and Northern Ireland was undertaken by volunteers contributing to the WWT's National Waterfowl Counts (NWC) scheme (see Kirby *et al.* 1991), and was coordinated by a network of Regional Organisers who recruited additional counters to obtain data for areas not usually covered by the NWC programme. In Ireland, comprehensive coverage was achieved with the help of NPWS staff and numerous others, including staff and volunteers from the Royal Society for the Protection of Birds and the Irish Wildbird Conservancy. Additionally, OJM and A. Walsh made aerial surveys of Loughs Ree (Roscommon/Westmeath/Longford) and Derg (Galway/Clare/Tipperary), and parts of the River Shannon (Galway/Offaly/Tipperary/Roscommon/Westmeath). Ground counts in Iceland were undertaken by five observers, with most of the west, south and north areas being surveyed from the air by AG.

The weekend chosen for the census was 12-13 January 1991. In Britain and Ireland, counts made within 5-20 January were accepted for analysis, where no other data were available. Approximately 44% of the counts from Britain and Ireland were made on the 12th or 13th, and 75% between the 11th and 15th. Logistical problems, notably the short day-length and adverse weather conditions, meant that Iceland could not be covered in such a short period. Here the census took place between 22 February and 11 March 1991, with c.85% of the counts being made during 22 to 28 February.

For each flock of Whooper Swans located, the following information was recorded: county, site name and grid reference; date and time; number of adult swans and cygnets; brood sizes; the identities of any ringed birds present; details of habitat and the numbers of birds on each habitat type; and whether the swans were using the site for feeding, roosting or both. Similar data were also collected for Bewick's *C. columbianus* and Mute Swans *C. olor*.

Observations were requested from all months from October to April, but the main emphasis of the mid-January survey was on counting Whooper Swans for the international census. The data from the other months, and those concerning habitat use will be the subject of further analyses and will be presented separately.

Results and discussion

Numbers

Table 1 presents the number of flocks and number of birds recorded in each country and region. Of the 18,035 birds recorded, 8490 were found in the Republic of Ireland (47.1%), 5225 in Britain (29.9%), 3484 in Northern Ireland (19.3%) and 831 in Iceland (4.6%). The country totals for Britain and the Irish Republic were very similar to those recorded during the January 1986 census, but the number of birds in Northern Ireland was c.47% higher, and in Iceland 36% lower, than the 1986 figure. The 1986 total for the whole of Ireland, estimated at 10,320 swans, was thought at the time to be exceptionally high due to a cold weather influx of birds that would normally have wintered in Scotland (Merne & Murphy 1986, Salmon & Black 1986). The 1991 census results for Ireland (11,974) were even higher, however, suggesting that the numbers recorded in 1986 were not unusual.

There were a few known gaps in coverage in the 1991 census. In Iceland, 60 or 70 birds are believed to have been missed, which represent only a small proportion of the population. In Britain, comparison of the regional totals with those from 1986 suggest that perhaps 200 birds were missed, since counts were not made of some flocks in Shetland, Tyne & Wear and North Wales during the 1991 census. In Ireland, the 1991 totals are thought to have been underestimated in the counties of Louth, Westmeath, Meath, Kildare and Tipperary, perhaps by 500 birds in all. It seems likely, therefore, that the population numbered some 19,000 swans in January 1991.

There are several possible sources of error in estimating the size of the population, including the lack of absolute synchrony in the timing of surveys in differ-

ent areas which could result in birds dispersing and being counted twice, miscounting, and species mis-identification. These potential errors are thought to have had minimal effect upon the final figure, however, since 75% of the counts in Britain and Ireland were made within a five-day period, most of the flocks were

small and easy to count, and the counters were experienced ornithologists practised at identifying swan species. Even the later count of the swans in Iceland is unlikely to have had a major affect on the results since Whooper Swans do not normally start their spring migration until March (Black & Rees 1984) and this sea-

Table 1. Numbers of Whooper Swans counted in Britain, Ireland and Iceland in January to March 1991. For definitions of the regions used for Britain see the Appendix. All British regions with ten or more birds are presented individually.

	Flocks	Birds		Flocks	Birds
BRITAIN			NORTHERN IRELAND		
NORTHERN ISLES			Down	10	116
Orkney	11	380	Antrim	7	575
NORTH WEST SCOTLAND			Armagh	9	462
Skye	2	22	Derry	13	1292
Western Isles	6	382	Tyrone	5	126
Rest	2	7	Fermanagh	2	913
NORTH EAST SCOTLAND			TOTAL	46	3484
Grampian	6	347	REPUBLIC OF IRELAND		
SE Highland	6	608	NORTH WEST		
North Highland	4	75	Donegal	29	1435
SOUTH WEST SCOTLAND			Leitrim	16	293
Dumfries & Galloway	8	346	Sligo	8	113
Ayrshire/Arran	3	39	Roscommon ¹	31	908
Lanarkshire/Strathkelvin	2	74	Mayo	35	882
Renfrewshire	1	30	Galway	18	793
Dunbarton/SE Argyll	2	122	NORTH EAST		
Argyll	6	70	Monaghan	17	527
Rest	1	2	Cavan	34	1148
SOUTH EAST SCOTLAND			Louth	2	164
Berwickshire	2	164	Longford	1	5
Roxburgh	4	131	Westmeath	0	0
Lothian	4	77	Meath	3	241
Fife	5	36	Dublin	1	11
Perth & Kinross	5	169	SOUTH WEST		
Angus	2	63	Clare	14	558
Rest	4	14	Limerick	0	0
NORTH WEST ENGLAND			Cork	10	138
Greater Manchester	6	36	Kerry	7	108
Isle of Man	1	20	SOUTH EAST		
Lancashire	3	472	Offaly ²	12	472
Cumbria	10	342	Laois	2	49
Rest	1	1	Kildare	2	12
NORTH EAST ENGLAND			Wicklow	2	65
Northumberland	3	164	Carlow	1	8
Rest	1	2	Tipperary ³	4	85
EAST/CENTRAL ENGLAND			Kilkenny	0	0
Cambridgeshire	3	616	Waterford	11	378
Norfolk	3	67	Wexford	2	97
South Yorkshire	1	14	TOTAL	262	8490
North Yorkshire	3	198	ICELAND		
Rest	6	26	West	5	17
WALES			South West	16	239
Anglesey	2	40	South	29	359
Rest	3	5	South East	2	62
SOUTHERN ENGLAND			North	16	154
Hampshire	1	54	TOTAL	68	831
Rest	5	10	GRAND TOTAL	514	18035
TOTAL	138	5225			

N.B. ¹includes aerial census of L. Ree; ²includes aerial census of R. Shannon; ³includes aerial census of L.

son was no exception (Bowler *et al.* 1992).

Distribution

The overall distribution of the flocks in Britain and Ireland is shown in Figure 1. One or more Whooper Swans were recorded at 514 sites, many of which had fewer than ten swans (42%) and 84% less than 60 birds. The distribution of flocks in Ireland in 1991 was generally similar to that presented by Merne & Murphy (1986) for the

1986 census, and the overall distribution of swans in Britain and Ireland corresponds well with the map compiled for the species in the 'Winter Atlas' project (in Lack 1986). The British distribution is also similar to that presented by Owen *et al.* (1986) who, like Lack (1986), used data from the entire winter period and for a number of winters to compile the maps.

The distribution of British and Irish flocks of 60 or more birds is highlighted in Figure 1; in Britain, sites which **regularly**

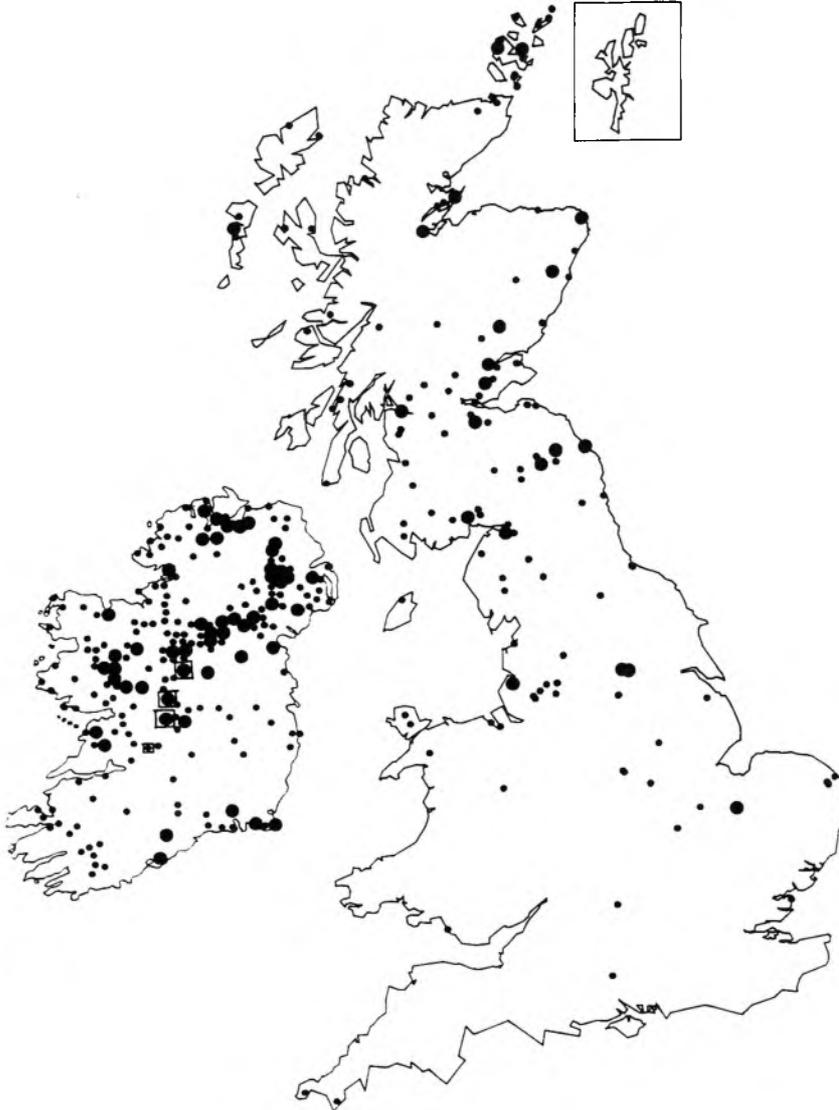


Figure 1. Distribution of sites used by Whooper Swans in Britain and Ireland. Sites with 60 or more birds are emphasised.

hold 60 or more Whooper Swans are considered to be nationally important for the species (see Kirby *et al.* 1991 for details of criteria and qualifying levels). Flocks of this size in Britain were found in the Western Isles and Orkney, along the coastal plain of eastern Scotland, on the Clyde and Solway Firth, and at a small number of scattered sites in England. In Northern Ireland, the largest flocks were concentrated around Loughs Foyle, Neagh, Beg and Upper Lough Erne. The interior of Co. Mayo, the Shannon Valley and sites around Cork and Wexford held the largest flocks in the Republic.

Throughout the Whooper Swans' range, sites that hold at least 1% of the total population over a five year period are considered to be of international importance for the species. The critical level for the Ice-

landic-breeding Whooper Swan population is currently 170 birds. Based on count data from the 1986/87 to 1990/91 period, internationally important sites in Britain and Northern Ireland include Lough Foyle (averaging 1157 birds), Loughs Neagh and Beg (1152), Upper Lough Erne (739), Loch of Harray (669), the Ouse Washes (594), Loch Eye/Cromarty Firth (588), Martin Mere/Ribble Estuary (438), Solway Firth (246), Loch of Strathbeg (245) and Loch Leven (209) (Kirby *et al.* 1991). The sites of international importance for Whooper Swans in the Irish Republic include Lough Swilly (750), Wilkinstown (367), Blackwater Callows (245), Glen Lough (236), Middle River Shannon (211), Lough Oughter (207), Little Brosna River (201), Blindwell Turlough (186), Stabannon (185) and Rahsane Turlough (179) (Sheppard in press).

Table 2. Age structure and brood sizes of Whooper Swans in Britain, Ireland and Iceland in January to March 1991.

	<i>n</i>	% Young	6	5	Brood size			1	Total
					4	3	2		
BRITAIN									
Northern Isles	228	12.3	0	0	0	0	0	4	4
North West Scotland	29	* 3.4	-	-	-	-	-	-	0
North East Scotland	62	* 12.9	0	0	0	0	0	1	1
South West Scotland	440	16.6	0	1	2	3	6	7	19
South East Scotland	430	14.0	0	0	1	2	1	4	8
North West England	138	7.2	0	0	1	1	1	0	3
North East England	82	* 7.3	-	-	-	-	-	-	0
East/Central England	318	21.7	0	0	7	5	5	9	26
Wales	27	* 0.0	-	-	-	-	-	-	0
Southern England	56	* 14.3	-	-	-	-	-	-	0
TOTAL	1810	14.5	0	1	11	11	13	25	61
FREQUENCY	-	-	0.0	1.6	18.0	18.0	21.3	41.1	-
NORTHERN IRELAND									
TOTAL	2097	13.5	0	0	12	20	39	32	103
FREQUENCY	-	-	0.0	0.0	11.7	19.4	37.9	31.0	-
REPUBLIC OF IRELAND									
North West	3736	6.2	0	2	21	41	73	46	183
North East	1077	3.2	0	0	5	14	19	12	50
South West	640	4.1	0	2	3	6	15	7	33
South East	639	10.3	0	0	6	8	19	9	42
TOTAL	6092	5.9	0	4	35	69	126	74	308
FREQUENCY	-	-	0.0	1.3	11.4	22.4	40.9	24.0	-
ICELAND									
West	14	* 21.4	0	0	0	1	0	0	1
South West	237	23.6	0	0	1	2	4	3	10
South	339	16.8	0	0	4	11	3	6	24
South East	62	* 6.5	0	0	1	0	0	0	1
North	154	19.5	0	0	1	4	4	5	14
TOTAL	806	18.6	0	0	7	18	11	14	50
FREQUENCY	-	-	0.0	0.0	14.0	36.0	22.0	28.0	-
GRAND TOTAL	10805	9.8	0	5	65	118	189	145	522
OVERALL FREQUENCY	-	-	0.0	1.0	12.5	22.6	36.2	27.7	-

N.B. A * identifies values based on small samples.

Productivity

Table 2 gives the percentage of juveniles recorded for 10,805 birds aged throughout Britain, Ireland and Iceland. Overall, the proportion of young was only 9.8%, indicating that 1990 was a poor breeding season for the species. There was little difference in the overall productivity of the swans wintering in Britain and Northern Ireland, at around 14% young, but the value for the Republic of Ireland was remarkably low at 5.9%. These compare with 22.9% young recorded in Britain and 23.1% in Ireland during the 1986 census (Merne & Murphy 1986, Salmon & Black 1986) after a good breeding season for the population in the summer 1985. The low proportion of young in the Republic in 1991 may perhaps be due to differences in habitat quality selected by family parties, which are usually dominant in the wintering flocks (Scott 1980, Black 1988), or to exploratory dispersal to sites further from the breeding range undertaken by yearlings and single birds. However, the percentage of young recorded in the same area in 1986 was higher than elsewhere in the British Isles. The proportion of young in Iceland was relatively high at 18.6%,

which supports the view of Gardarsson & Skarphedinsson (1985) that birds overwintering in Iceland include a higher proportion of family parties than the migrants.

There was considerable regional variation in the proportion of young in flocks within Britain, Ireland and Iceland (Table 2). The largest proportions were recorded from flocks in east/central England and southwest Scotland, in the southeast of the Irish Republic and in southwest Iceland. Further analyses will determine whether this pattern is consistent throughout the winter season and whether the distribution of family parties is associated with habitat quality or location on the migratory route.

Of the 522 families recorded, 36.2% contained two young, and 86.5% had one to three young (Table 2). The majority of adult Whooper Swans in Britain were accompanied by just one cygnet (41.1% of those recorded), those in Ireland by two cygnets (37.9-40.9%), and those in Iceland by three cygnets (36.0%). In addition to those in the Table, a family containing seven cygnets was reported from Co. Clare.

Many hundreds of volunteer ornithologists helped to achieve comprehensive coverage for this census, and these people should receive much of the credit for its success. We are indebted also to the NWC scheme's Regional Organisers for coordinating coverage in their regions, to Alan Walsh who assisted with the aerial surveys in Ireland, and to Arnor Thorir Sigfusson, Bjorn G. Arnarson, Olafur Karl Nielsen and Trausti Tryggvason who helped with the fieldwork in Iceland.

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Appendix. Regional definitions.

NORTHERN ISLES	Shetland, Orkney.
NORTH WEST SCOTLAND	SW Highland, Skye, Western Isles.
NORTH EAST SCOTLAND	Grampian, SE Highland, North Highland.
SOUTH WEST SCOTLAND	Dumfries & Galloway, Ayrshire/Arran, Lanarkshire/Strathkelvin, Renfrewshire, Dunbarton/SE Argyll, Argyll, Islay/Jura/Colonsay, Mull/Lismore/Coll/Tiree.
SOUTH EAST SCOTLAND	Berwickshire, Roxburgh, Tweeddale/Ettrick/Lauderdale, Lothian, Central, Fife, Perth & Kinross, Angus.
NORTH WEST ENGLAND	Cheshire, Merseyside, Greater Manchester, Isle of Man, Lancashire, Cumbria.
NORTH EAST ENGLAND	Cleveland, Durham, Tyne & Wear, Northumberland.
EAST/CENTRAL ENGLAND	Northamptonshire, Bedfordshire, Cambridgeshire, Suffolk, Norfolk, Lincoln, Leicestershire, Nottinghamshire, Humberside, Warwickshire, West Midlands, Staffordshire, Derbyshire, South, West and North Yorkshire, Shropshire.
WALES	All counties.
SOUTHERN ENGLAND	Cornwall, Devon, Somerset, Avon, Gloucestershire, Hereford & Worcestershire, Dorset, Wiltshire, Hampshire, Isle of Wight, Sussex, Kent, Surrey, Greater London, Essex, Hertfordshire, Buckinghamshire, Berkshire, Oxfordshire.