

Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans in Ireland: results of the International Swan Census, January 2005

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A thorough census of Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans took place over the weekend of 15/16 January 2005 in Ireland as part of the fifth international census, coordinated throughout Europe. A total of 1,142 sites were covered, including 365 in Northern Ireland and 777 in the Republic. Some 14,079 Whooper Swans were counted in 391 flocks, representing an increase in the number of birds, though a decline in flocks when compared with the census in 2000. Productivity, estimated at 18.6% cygnets, was consistent between Northern Ireland and the Republic, and was relatively high compared with previous censuses. Their habitat usage was comparable with that reported in 2000, with most on freshwater habitats, grassland and potato fields. Lough Neagh and Beg, Lough Foyle, Upper Lough Erne, Blackwater Callows/Lower Blackwater River and Lough Swilly supported the greatest numbers of Whooper Swans, and a total of 18 internationally important sites and a further four of all-Ireland importance were identified. A total of just 224 Bewick's Swans were counted in eight flocks, which represents an ongoing decline in numbers wintering in Ireland. Bewick's Swan productivity, at 16.9%, was deemed relatively high for Irish-wintering birds. As in previous censuses, sites in County Wexford supported by far the greatest numbers of birds.

Introduction

Whooper Swans *Cygnus cygnus* have a widespread breeding distribution across Northern Europe (including Iceland), Russia and Siberia. Their wintering distribution is patchy, although relatively well defined. Five flyway populations have been described (Wetlands International 2002), and birds over-wintering in Ireland are thought to come almost exclusively from the Icelandic breeding

population. The Bewick's Swan *C. ccolumbianus bewickii* is one of five populations of Tundra Swan, whose distribution range spans the northern coastline of North America, Russia and Siberia (Rees et al 1997). Their wintering range is also quite dispersed. Bewick's Swan

Plate 113. Whooper Swans (Graham McElwaine).

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breeds in northern Russia, and winters in northwest Europe (Wetlands International 2002).

These migratory swan populations have been monitored, at least in Britain and Ireland, since the 1950's. The first coordinated international census for both species was carried out in 1986, and they have since been conducted every four or five winters, usually in January. These censuses aim to monitor numbers of these species, and also to assess breeding success and changes in habitat preferences.

It has so far been shown that during the mid-winter period, the Icelandic-breeding Whooper Swan population has increased from 16,742 in 1986 to 20,645 in January 2000 (Robinson et al. 2004a). Numbers in Ireland over the same period have increased from 10,306 (Merne and Murphy 1986) to 12,730 (Colhoun et al. 2000).

During a slightly earlier census of Bewick's Swan in the winter of 1983/84, the population was estimated at between 16,000 and 16,500 birds (Beekman et al. 1985). It was shown to remain relatively stable during the 1980s (Dirksen and Beekman 1991), and to have increased during the 1990s to 29,000 in January 1995 (Robinson et al. 2004b). Results of the 2000 census have not yet been published, though it has been implied that Bewick's Swan numbers have been in decline since the late 1990s (Wetlands International 2002). Prior to the 1980s, a peak of 2,700 was recorded in Ireland during a census in 1956/57 (Merne 1977). During the 1980s, numbers increased from around 1,000 in January 1984 to 2,000 in 1990 (Beekman 1997). Thereafter, numbers in Ireland declined to just 382 in 2000 (Colhoun et al. 2000, Robinson et al. 2004b), despite an increase in Britain over the same period. Ireland is situated at the most southwest extremity of this flyway, and the recent decline in numbers has been attributed to improved habitat suitability closer to the breeding grounds.

This paper presents the results of the fifth international census which took place over the weekend of 15/16 January 2005.

Methods

The overall census in Ireland, Britain and Iceland was co-ordinated by the Wildfowl & Wetlands Trust.

Counts in Ireland were organised by the Irish Wetland Bird Survey (I-WeBS) Office and the Irish Whooper Swan Study Group (IWSSG). The census was scheduled for the weekend of the 15th/16th January. Most coverage was by volunteer birdwatchers and professional staff involved in I-WeBS or UK-WeBS (the Wetlands Bird Survey in the UK), including conservation staff from the National Parks and Wildlife Service (in the Republic), Environment & Heritage Service, Royal Society for the

Protection of Birds and Craigavon Borough Council (in Northern Ireland). IWSSG members also undertook coverage, especially in areas not regularly covered by waterbird counters.

Every attempt was made to ensure that all areas which held birds during previous swan surveys, and during regular I-WeBS and WeBS (Wetland Bird Survey in Northern Ireland) core counts in recent winters were covered. Full details of the methods used have been published in Colhoun et al. (2000).

Due to the complex patterns of movement of swan flocks between different feeding and roosting areas, for the purpose of this report, a site has been defined as a collection of discrete count units known to be used by a particular flock. Most of the totals in this paper are presented at county level. Where count units straddle county boundaries, the flock total was allocated to the county in which birds are mostly present.

Results

Coverage

A total of 1,232 count units were listed for coverage. Some 133 participants covered 1,142 count units, including 365 in Northern Ireland and 777 in the Republic. Of these, 95% were covered in the six-day period centred around the scheduled weekend (i.e. between 13 and 18 January). Outside this period, eight count units were covered between 3 and 12 January, while a further 45 were covered between 19 and 31 January. Data from a further two count units counted on 2 February were also included.

January 2005 was a particularly wet and windy month (Met Éireann), and over the weekend of the survey, many sites were flooded, and birds were notably dispersed. Swans were present in 417 (37%) total count units that were surveyed. An aerial census was conducted on 21 January of the Rivers Suck, Brosna and Shannon Callows (south of Athlone), as well as Lough Derg and the Shannon and Fergus Estuary. This served to identify flocks which may have been inadvertently missed due to the limited accessibility at these sites, particularly given the flooded conditions.

Whooper Swan

Whooper Swans were found in 28 counties, but were absent from Carlow and Kilkenny, Dublin and Louth; the latter two counties supported one flock each in 2000 (Colhoun et al. 2000). In total, 14,079 Whooper Swans were counted in 391 flocks (Table 1). This represents an increase (11%) in the number of birds, though a decline

Table 1. Numbers, age structure and brood sizes of Whooper Swans in Ireland in January 2005. Figures in parentheses represent percentage change when compared with the 2000 census.

County	Flocks	Count	Aged	% Juv	Total counted	Broods						Mean
						6	5	4	3	2	1	
Antrim	13 (-7.1)	601 (-16.9)	601	13.1	29	0	0	9	9	6	5	2.8
Armagh	22 (37.5)	668 (48.1)	575	21.7	63	0	2	2	9	27	23	1.9
Derry	18 (80.0)	1538 (79.9)	1289	23.9	102	0	4	5	15	38	40	2.0
Down	10 (-16.7)	411 (65.1)	360	16.9	27	1	0	1	4	14	7	2.1
Fermanagh	28 (-24.3)	913 (-28.0)	805	14.4	56	0	2	4	8	26	16	2.1
Tyrone	11 (37.5)	200 (70.9)	200	11.0	13	0	0	0	2	5	6	1.7
Northern Ireland total	102 (5.2)	4331 (18.2)	3830	18.6	290	1	8	21	47	116	97	2.1
Cavan	34 (30.8)	836 (-4.3)	681	18.1	36	0	3	3	8	10	12	2.3
Clare	24 (166.7)	561 (1.6)	543	17.3	13	0	0	1	4	6	2	2.3
Cork	4 (-33.3)	320 (68.4)	315	13.3	9	0	0	0	1	4	4	1.7
Donegal	21 (-19.2)	1068 (13.3)	1064	18.0	89	0	1	8	15	35	30	2.0
Galway	24 (-29.4)	803 (-30.0)	393	16.3	23	0	2	1	5	13	2	2.5
Kerry	5 (-44.4)	390 (50.0)	390	14.6	6	0	0	0	2	4	0	2.3
Kildare	3 (-25.0)	49 (-57.0)	49	24.5	0	0	0	0	0	0	0	0.0
Laois	1 (-50.0)	73 (55.3)	73	12.3	0	0	0	0	0	0	0	0.0
Leitrim	35 (-2.8)	496 (32.6)	258	29.1	3	0	0	1	2	0	0	3.3
Limerick	6 (-14.3)	240 (8.6)	240	22.1	19	0	1	3	6	6	3	2.6
Longford	10 (11.1)	235 (24.3)	42	38.1	2	0	0	0	1	1	0	2.5
Mayo	35 (-14.6)	949 (27.2)	873	18.4	47	0	1	6	10	18	12	2.3
Meath	7 (75.0)	252 (159.8)	109	18.3	1	0	0	0	1	0	0	3.0
Monaghan	12 (-36.8)	357 (-7.3)	270	18.5	0	0	0	0	0	0	0	0.0
Offaly	9 (12.5)	734 (5.0)	309	22.7	15	0	0	4	4	3	4	2.5
Roscommon	23 (-23.3)	665 (2.6)	549	19.7	42	0	2	4	14	11	11	2.4
Sligo	12 (-40.0)	209 (-42.3)	91	20.9	7	0	0	3	1	1	2	2.7
Tipperary	7 (-12.5)	309 (22.6)	166	13.9	8	0	0	2	1	2	3	2.3
Waterford	6 (0.0)	339 (36.7)	339	17.7	17	0	0	4	6	3	4	2.6
Westmeath	5 (0.0)	356 (-1.1)	74	25.7	4	0	0	0	1	1	2	1.8
Wexford	5 (25.0)	465 (97.9)	164	23.8	14	0	2	0	3	6	3	2.4
Wicklow	1 (-50.0)	42 (-22.2)	0	0.0	0	0	0	0	0	0	0	0.0
Republic total	289 (-8.3)	9748 (8.3)	6992	18.7	355	0	12	40	85	124	94	2.3
All-Ireland total	391 (-5.1)	14079 (11.2)	10822	18.6	645	1	20	61	132	240	191	2.2

in the number of flocks (6%), when compared with the 2000 census. Of the 119 sites that were not visited during the 2005 census, 23 were covered in 2000, when in total they supported 245 Whooper and 10 Bewick's Swans.

The distribution of Whooper Swans during this census (Fig. 1) was similar to those reported in previous censuses, though there was considerable variation at county level (Table 1). Compared with the 2000 census, there were increases in 19 counties and declines in 9. There was at least a 50% increase in Counties Londonderry, Tyrone and Down in Northern Ireland, and in Counties Cork, Kerry, Laois, Meath and Wexford. The greatest declines (>20%) were in Counties Kildare, Sligo, Galway, Fermanagh and Wicklow.

Loughs Neagh and Beg, Lough Foyle, Upper Lough

Erne, Blackwater Callows/Lower Blackwater River and Lough Swilly supported the largest numbers of birds (Table 2), and together contained almost 30% of the all-Ireland population. A total of 18 sites supported internationally important numbers (at least 210 birds, the 1% threshold set by Wetlands International (2002)). A further four sites supported numbers of all-Ireland importance (i.e. at least 130 birds, the 1% threshold used in Crowe (2005)).

Some 10,882 birds (77% of total counted) were aged (Table 1). The proportion of first-winter birds was consistent between Northern Ireland and the Republic, and at 18.6% overall, was considerably improved when compared with that in 2000. This indicates that Whooper Swans had a relatively successful breeding season in

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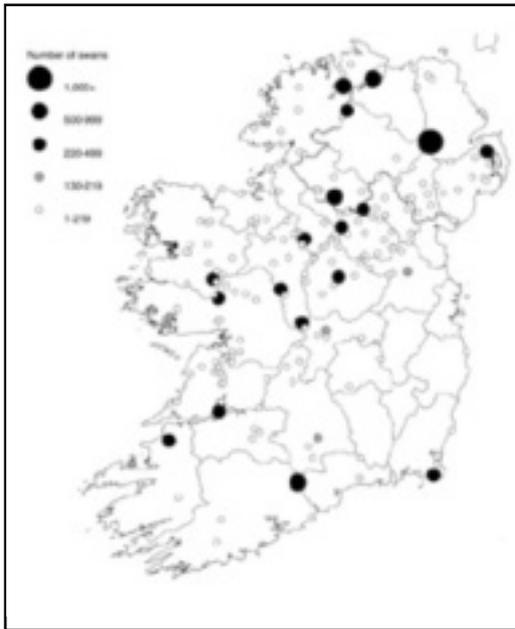


Figure 1. Distribution of Whooper Swan flocks in Ireland in January 2005. Black and grey symbols represent internationally and nationally important flocks respectively.

2004. There was considerable regional variation; when comparing productivity between counties where 200 or more were aged, productivity ranged between 11.0% (County Tyrone) and 29.1% (Leitrim).

The mean brood size overall was 2.2 cygnets, and again the figures for Northern Ireland and the Republic were relatively consistent (2.1 and 2.3 respectively). For counties where greater than 10 families were checked, mean brood sizes ranged between 1.7 (Tyrone) and 2.8 (Antrim). Greater than 80% of broods contained 1, 2 or 3 cygnets, while just one brood of 6 was recorded, in County Down (Table 1).

Bewick's Swan

A total of 224 Bewick's Swans were recorded in eight flocks in Counties Londonderry, Armagh, Roscommon, Galway, Sligo and Wexford. The Cull and Killag and North Slob (Wexford Harbour), both in County Wexford, supported 86% of total birds recorded. Less than 10 birds were recorded at each of the other sites. The proportion of juveniles was calculated at 16.9 (total of 201 aged). The mean brood size was 2.4, and broods ranged between 1 and 4 cygnets.

Table 2. Internationally and nationally important sites for Whooper Swans recorded in January 2005.

Site	County	Count
Loughs Neagh & Beg	Antrim, Londonderry, Tyrone, Armagh, Down	1517
Lough Foyle	Londonderry, Donegal	950
Upper Lough Erne	Fermanagh	621
Blackwater Callows/Lower Blackwater River	Waterford, Cork	525
Lough Swilly	Donegal	501
Wetlands east of Ballinrobe	Mayo, Galway	456
River Foyle	Donegal, Tyrone, Londonderry	444
Shannon Callows	Offaly, Galway, Roscommon, Tipperary, Westmeath	432
Finn-Lacky Catchment	Monaghan, Fermanagh	260
River Suck	Roscommon, Galway	324
North Central Galway Lakes	Galway	294
Lough Oughter Complex	Cavan	272
Rinn Lough Lakes	Leitrim	241
Glen Lough	Westmeath	237
Strangford Lough	Down	233
Cashen River & Estuary	Kerry	229
Tacumshin Lake	Wexford	221
Shannon & Fergus Estuary	Clare, Limerick, Kerry	220
Lyonstown Stud Farm	Tipperary	142
Tara Mines Tailings Ponds	Meath	142
Turraun Nature Reserve	Offaly	141
Tralee Bay, Lough Gill & Akeragh Lough	Kerry	130

Habitat

Habitat was recorded for 308 (81%) swan flocks. Whooper Swans were recorded in 24 habitat types overall, with the large majority in improved pasture, on lakes or in potato fields (Table 3). Greater proportions were recorded using grassland habitats in Northern Ireland while more were on freshwater body in the Republic. Bewick's Swans were recorded in seven habitats, and using beet at the two main sites in Wexford.

Discussion

Distribution and abundance

Despite the inclement weather, participation in the 2005 international migratory swan survey was high, and coverage was similar to that in 2000. Coordination of coverage ensured that efforts were spread and that the majority of sites which have held birds during the last census, and during recent winters were covered. The aerial census identified many flocks, particularly along the Rivers Shannon and Suck, and these counts were used in preference to the ground counts for those sites due to the difficulties encountered there because of access problems due to flooding.

Most of the known sites used by swans were covered, and the count of 14,079 Whooper Swans presented is deemed a reasonable estimate of population size, though it is likely that a relatively small proportion of birds were missed. This shows that there has been an 11% increase when compared with the total reported in 2000, which is consistent with the increasing trend shown by this species at least since the mid-1980s. The decline in number of flocks when compared with the previous census was unexpected, particularly given the flooded conditions at the time of the census. The continuing presence of a very large flock (749 birds recorded during census) in one field at Lough Foyle was also noteworthy, as such numbers are normally only recorded at staging sites on migration.

In contrast, numbers of the more easterly-breeding Bewick's Swan have continued to decline in Ireland. The total recorded is 41% lower again than the very low figure reported in 2000 (Colhoun et al. 2000), and this species has clearly greatly reduced in numbers and range in Ireland to the extent that its appearance is now becoming a rarity over much of the country. As reported by Colhoun et al. (2000), it is likely that fewer Bewick's Swans are migrating as far as Ireland due to milder winters and more suitable conditions further north and east, in addition to the increased attraction (by supplementary feeding) at sites in Britain.

Table 3. Habitat usage by Whooper Swans in Ireland in January 2005.

	All-Ireland		Republic of Ireland		Northern Ireland	
Number of records	12,629		8,298		4,331	
Natural permanent Lake	2,012	(15.9)	1,810	(21.8)	202	(4.7)
Non-tidal River	338	(2.7)	229	(2.8)	109	(2.5)
Freshmarsh	325	(2.6)	307	(3.7)	18	(0.4)
Improved pasture (dry)	2,669	(21.1)	1,305	(15.7)	1,364	(31.5)
Rough/unimproved pasture (dry)	179	(1.4)	79	(1.0)	100	(2.3)
Reseeded pasture (dry)	583	(4.6)	282	(3.4)	301	(6.9)
Arable: stubble	188	(1.5)	37	(0.4)	151	(3.5)
Arable: winter cereal	228	(1.8)	228	(2.7)	0	(0.0)
Arable: potatoes	1,919	(15.2)	1,003	(12.1)	916	(21.1)
Arable: sugar beet	411	(3.3)	411	(5.0)	0	(0.0)
Improved pasture (flooded)	869	(6.9)	256	(3.1)	613	(14.2)
Rough/unimproved pasture (flooded)	958	(7.6)	641	(7.7)	317	(7.3)
Reseeded pasture (flooded)	122	(1.0)	68	(0.8)	54	(1.2)
Turlough: improved pasture	466	(3.7)	466	(5.6)	0	(0.0)
Turlough: rough/unimproved	449	(3.6)	449	(5.4)	0	(0.0)
Callow: improved pasture	428	(3.4)	404	(4.9)	24	(0.6)

Other habitats recorded (total number of birds): Artificial lake/reservoir (26), Gravel Pit (4), Tidal river/estuary (58), Saltmarsh (2), Brackish Lake (41), Callow: rough/unimproved (32), Blanket bog/moorland (6), Flooded stubble (83), Flooded potatoes (79), Cutover bog (154),

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Productivity

Whooper Swans had a very good breeding season in 2004. The proportion of juveniles and mean brood size represent the highest recorded since the census in 1986 when productivity for the Republic and Northern Ireland combined was approximately 23% (Salmon and Black 1986). The productivity estimate was remarkably consistent between Northern Ireland and the Republic. Until this census, productivity had been consistently lower in Northern Ireland (Salmon and Black 1986, Cranswick et al. 1996, Colhoun et al. 2000, Robinson et al. 2004a).

Little has been documented about the breeding success of Bewick's Swan flocks that winter in Ireland. It is possible that the proportion of juveniles present in flocks in 2005 (16.9% cygnets) was quite high, as the only other published values include 8.5% cygnets in January 1984 (Beekman et al. 1985) and 18.5% in 2000 (Colhoun et al. 2000). Considerable caution needs to be exercised in interpreting these figures, however, due to the greatly reduced number of birds present nowadays.

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References

- Beekman JH. 1997. International censuses of the North-West European Bewick's Swan population, January 1990 and 1995. *Swan Specialist Group Newsletter* 6: 7-9.
- Beekman JH, Dirksen S, Slagboom TH. 1985. Population size and breeding success of Bewick's Swans wintering in Europe in 1983-4. *Wildfowl* 36: 5-12.
- Colhoun K, McElwaine JG, Cranswick PA, Enlander I, Merne OJ. 2000. Numbers and distribution of Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans in Ireland: results of the International Swan Census, January 2000. *Irish Birds* 6: 485-494.
- Cranswick PA., Bowler JM, Delany SN, Einarsson O, Gardarsson A, McElwaine JG, Merne OJ, Rees EC, Wells JH. 1996. Numbers of Whooper Swans *Cygnus cygnus* in Iceland, Ireland and Britain in January 1995: results of the international Whooper Swan census. *Wildfowl* 47, 17-30.
- Crowe, O. 2005. *Ireland's Wetlands and their Waterbirds*. BirdWatch Ireland, Newcastle, Co. Wicklow.
- Dirksen S, Beekman JH. 1991. Population size, breeding success and distribution of Bewick's Swans *Cygnus columbianus bewickii* wintering in Europe in 1986-87. In J. Sears & P. J. Bacon (eds.) *Proceedings of the 3rd IWRB International Swan Symposium, Oxford 1989*. *Wildfowl Suppl.* No. 1: 120-124.
- Merne OJ. 1977. The changing status and distribution of the Bewick's Swan in Ireland. *Irish Birds* 1: 3-15.
- Merne OJ, Murphy CW. 1986. Whooper Swans in Ireland, January 1986. *Irish Birds* 3: 199-206
- Met Éireann. 2005. *Monthly Weather Bulletin No. 225*, Glasnevin Hill, Dublin.
- Rees EC, Bowler JM, Beekman JH. 1997. *Cygnus columbianus* Bewick's Swan and Whistling Swan. *BWP Update* Vol. 1 2: 63-74.
- Robinson JA, Colhoun K, McElwaine JG, Rees EC, Cranswick PA. 2004a. *Whooper Swan Cygnus cygnus in Scotland, England, Wales, Northern Ireland and the Republic of Ireland 1960/61-1999/2000*. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Robinson JA, Colhoun K, McElwaine JG, Rees EC. 2004b. *Bewick's Swan Cygnus columbianus bewickii (Northwest European population) in Britain and Ireland 1960/61-1999/2000*. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Salmon, DG, Black JM. 1986. The January 1986 Whooper Swan census in Britain, Ireland and Iceland. *Wildfowl* 37: 172-174.
- Wetlands International. 2002. *Waterfowl population estimates - Third Edition*. Wetlands International Global Series No. 12, Wageningen, The Netherlands.