

Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans in Ireland: results of the International Swan Census, January 2015

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A census of Whooper Swan *Cygnus cygnus* and Bewick's Swan *C. columbianus bewickii* populations took place in Ireland over the weekend of 17/18 January 2015. This census was the seventh in a series of international co-ordinated censuses of the European flyways of these species and takes place every four to five years. A total of 1,327 count units were covered and a total of 15,104 Whooper Swans were counted in 495 flocks, representing a decline of 0.2% in the total number of birds recorded when compared with the 2010 census results. The total number of flocks recorded was substantially higher than in 2010. The weather in the weeks leading up to the 2015 census was generally mild and wet, resulting in an abundance of available wetlands throughout the country, and in a widely scattered distribution. The proportions of juveniles recorded in flocks and the mean brood sizes, at 22.3% and 2.39 respectively, were especially high when compared with previous censuses, indicating a successful breeding season in 2014. A total of ten internationally important and 15 nationally important sites were identified, with Lough Neagh, Upper Lough Erne, Lough Beg and the Shannon Callows being the most important sites. The total number of Bewick's Swans recorded was just 21 in four flocks, and this represents a significant further decline (of 74%) in numbers wintering here.

Introduction

Each winter, Ireland plays host to more than 10,000 migratory swans distributed across low-lying wetland and grassland habitats. These are predominantly Whooper Swan *Cygnus cygnus*, with small numbers of Bewick's (or Tundra) Swan *C.*

columbianus bewickii. Whooper Swans have a widespread breeding distribution across Northern Europe (including Iceland), Russia and Siberia. Their wintering distribution is

Plate 70. Whooper Swans (Michael O'Clery).

patchy, although relatively well defined. Five populations are recognised (Brazil 2003, Wetlands International 2006), and birds over-wintering in Ireland come almost exclusively from the Icelandic-breeding population. The Tundra Swan *Cygnus columbianus columbianus* has a more coastal breeding range in the northern parts of North America, Russia and Siberia. Their wintering range is also quite dispersed. There are five populations of Tundra Swan, two of which are of the race known as Bewick's Swan. The majority of these swans breed in northern Russia and winter in northwest Europe (Wetlands International 2006). These migratory swan populations have been monitored in Britain and Ireland since the 1950s. The first co-ordinated international census for both species was carried out in 1986, and they have since been conducted every four to 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.

The Icelandic-breeding Whooper Swan population has sustained an ongoing increase in numbers, from 16,742 in 1986 to 29,232 in January 2010 (Hall *et al.* 2012). Numbers in Ireland over the same period increased from 10,306 (Merne & Murphy 1986) to 14,981 (Boland *et al.* 2010). In contrast, the numbers of Bewick's Swan wintering in Britain and Ireland continues to decline, and 7,079 were recorded in Britain and Ireland in 2010, including just 80 in Ireland (Boland *et al.* 2010). This represents a considerable decline from the 2,700 recorded in Ireland during the census in 1956/57 (Merne 1977).

The seventh international census took place over the weekend of 17/18 January 2015. This paper presents the results of that census, including an update on total numbers wintering in Ireland, and how these have changed over time at a regional scale (county level). It also provides details on productivity, reflecting the 2014 breeding season.

Methods

The overall census in Ireland, Britain and Iceland was co-ordinated by the Wildfowl and Wetlands Trust. Counts in Ireland were organised through the Irish Wetland Bird Survey (I-WeBS) and the Irish Whooper Swan Study Group (IWSSG). The census was scheduled for the weekend of 17/18 January 2015. Most coverage was by volunteer birdwatchers and professional staff involved in I-WeBS or WeBS (the Wetland Bird Survey in the UK), including conservation staff from the National Parks and Wildlife Service (in the Republic of Ireland), Northern Ireland Environment Agency, Royal Society for the Protection of Birds and Craigavon Borough Council (in Northern Ireland). Surveying was also undertaken by IWSSG members, especially in areas not regularly covered by waterbird counters.

Every attempt was made to ensure that all areas which

held birds during previous international swan censuses and during regular I-WeBS and WeBS core counts in recent winters were covered. Full details of the methods have been published in Colhoun *et al.* (2000). Most of the totals in this paper are presented at county level. Site totals are expressed as an amalgamation of totals from those count units which are part of the same wetland complex, and include the collection of roosting and feeding areas used by the same flock(s) of swans. Once data were compiled, an assessment of the extent of coverage was made for each site complex, and aerial census results were used where ground-based coverage was considered incomplete.

Results

Coverage

A total of 1,327 count units (904 in the Republic of Ireland and 423 in Northern Ireland) were covered by 197 observers. Overall, coverage was completed between 10 January and 2 February, with the large majority (95%) covered on the scheduled weekend or within three days either side of it, while the remaining 68 count units were covered outside this period. During the lead-up to the census weekend the weather had been very mild and wet with air temperatures dropping to below zero degrees Celsius between 17 and 19 January, i.e. the census weekend. Thereafter, for the remainder of the month, temperatures were sustained at freezing point, or above (Met Éireann 2015).

Whooper Swan

Whooper Swans were recorded in all counties other than Carlow and Dublin. In total, 15,104 were counted in 495 flocks (Table 1). This represents an increase of less than 1% in the total number of birds recorded when compared with the published total from the 2010 census (Boland *et al.* 2010). However, additional counts totalling 155 birds in six flocks in Donegal and Clare have been submitted since publication of the 2010 census, resulting in an upward revision of the 2010 total to 15,136. Thus, the overall total for 2015, when compared with the actual census total in 2010, is slightly lower by 0.2%. There was an increase of 10% in the total number of swans recorded in the Republic of Ireland, and a decrease of 24% in Northern Ireland, with respective totals of 11,586 and 3,518 recorded (Table 1). Despite the apparent stability in numbers overall, there was a substantial increase in the number of flocks reported both in Northern Ireland and in the Republic of Ireland, to 495 overall, and representing a 27% increase when compared with 2010.

The distribution of Whooper Swans during this census is illustrated in Figure 1. At county level, highest numbers were recorded in Galway, Roscommon, Mayo and Cavan, but there

Table 1. Numbers, age structure and brood sizes of Whooper Swans in January 2015 at county* level, for Northern Ireland and the Republic of Ireland, and overall. Figures in parentheses represent percentage change when compared with the 2010 census.

County	Total	Flocks	Aged	% Juv	Total no. of broods	Brood size							Mean Brood size
						1	2	3	4	5	6	7	
Antrim	769 (48)	25 (92)	769	19.5	60	24	18	10	7	1	-	-	2.05
Armagh	465 (-8)	19 (46)	313	19.8	30	11	11	5	1	2	-	-	2.07
Down	515 (-6)	12 (20)	515	28.3	62	17	13	18	7	6	1	-	2.60
Fermanagh	784 (-23)	32 (19)	733	19.1	60	15	24	13	4	2	2	-	2.33
Londonderry	648 (-61)	26 (-10)	581	26.0	61	24	16	9	7	5	-	-	2.23
Tyrone	337 (-3)	10 (0)	247	14.6	16	5	7	3	1	-	-	-	2.00
NI total	3,518 (-24)	124 (22)	3,158	21.7	289	96	89	58	27	16	3		2.26
Cavan	1,053 (20)	48 (55)	815	27.4	29	8	10	8	2	1	-	-	2.24
Clare	632 (20)	22 (10)	578	20.1	24	8	6	5	3	2	-	-	2.38
Cork	244 (-5)	9 (-31)	232	26.7	13	4	6	1	2	-	-	-	2.08
Donegal	499 (-29)	29 (61)	441	17.7	23	8	10	3	2	-	-	-	1.96
Galway	1,793 (63)	43 (26)	1,407	19.5	38	9	13	12	3	1	-	-	2.32
Kerry	470 (-12)	8 (33)	390	10.3	0	-	-	-	-	-	-	-	-
Kildare	162 (45)	3 (-40)	28	35.7	2	-	-	2	-	-	-	-	3.00
Kilkenny	22 (>500)	2 (100)	22	4.5	1	1	-	-	-	-	-	-	1.00
Laois	120 (-21)	4 (100)	74	27.0	3	-	2	1	-	-	-	-	2.33
Leitrim	302 (124)	23 (77)	251	29.1	17	2	7	4	3	1	-	-	2.65
Limerick	133 (-65)	3 (-25)	133	13.5	8	2	4	-	2	-	-	-	2.25
Longford	213 (11)	11 (83)	167	17.4	1	-	1	-	-	-	-	-	2.00
Louth	93 (-50)	2 (0)	32	21.9	0	-	-	-	-	-	-	-	-
Mayo	1,248 (37)	49 (63)	1,069	25.7	50	15	13	9	9	4	-	-	2.48
Meath	209 (-18)	10 (67)	103	26.2	7	2	2	1	1	-	1	-	2.71
Monaghan	496 (23)	13 (-38)	373	17.2	11	-	4	5	2	-	-	-	2.82
Offaly	489 (20)	14 (180)	258	23.3	0	-	-	-	-	-	-	-	-
Roscommon	1,367 (34)	45 (50)	790	24.8	28	6	4	11	7	-	-	-	2.68
Sligo	179 (-4)	4 (-56)	156	22.4	11	3	4	-	-	1	2	1	3.18
Tipperary	246 (-11)	7 (-13)	128	24.2	11	-	6	1	4	-	-	-	2.82
Waterford	320 (-28)	4 (-56)	320	26.3	12	1	5	1	5	-	-	-	2.83
Westmeath	389 (-38)	7 (-22)	370	18.1	23	4	2	13	3	1	-	-	2.78
Wexford	791 (23)	9 (80)	602	27.7	63	14	22	16	5	5	1	-	2.49
Wicklow	116 (183)	2 (0)	107	31.8	10	1	4	4	1	-	-	-	2.50
ROI total	11,586 (10)	371 (29)	8,846	22.5	385	88	125	97	54	16	4	1	2.48
All-Ireland total	15,104 (0)	495 (27)	12,004	22.3	674	184	214	155	81	32	7	1	2.39

* County-level totals are based on the locations of the flocks, and differs slightly from treatment of county-level totals in previous years, such as 2010 (Boland *et al.* 2010), where the flocks were first compiled at site level and then at county level. The most notable differences, therefore, occur in counties with wetland complexes spanning multiple counties, e.g. Shannon and Fergus Estuary, Lough Ree and River Foyle.

was considerable variation in almost all counties when compared with 2010 (Table 1). Increases took place in 14 counties, and these were greatest in Galway (+692 birds), Roscommon (+350) and Mayo (+340). Decreases took place in 16 counties, and these were greatest in Londonderry (-1,025 birds), Limerick (-243) and Westmeath (-243). At a flock level,

increases were reported in 18 counties and decreases in nine counties.

The 1% flyway and all-Ireland thresholds are currently estimated at 270 and 150 birds respectively (Crowe & Holt 2013, Wetlands International 2015). Accordingly, when totals are examined at a wetland site or complex level, internationally

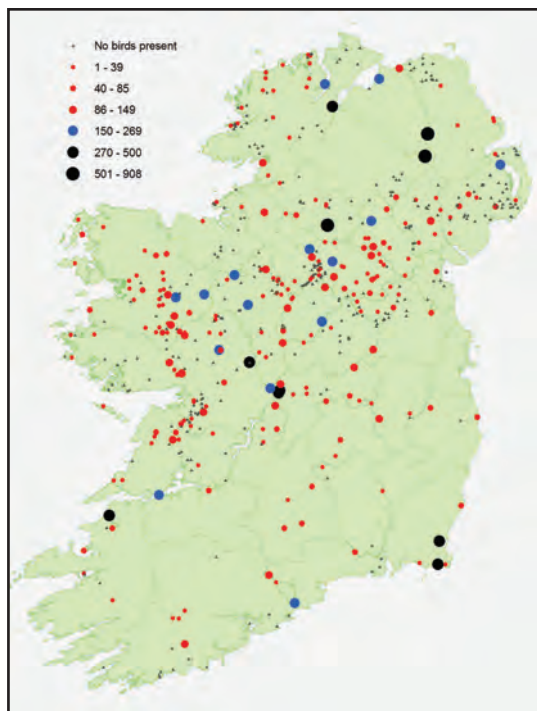


Figure 1. Distribution of Whooper Swans in Ireland in January 2015. Large black and blue symbols represent internationally and nationally important sites based on 1% thresholds of 270 and 150 respectively.

and nationally important concentrations were recorded at ten and 15 sites respectively (Table 2). However, it should be noted that assessments of site importance based on counts in January alone are limited as they do not reflect the importance of sites in other months, especially during arrival in October and November and prior to departure in spring. Lough Neagh, Upper Lough Erne and Lough Beg continue to support highest numbers, though the latter two show a decline when compared with the 2010 census. The total recorded at Lough Foyle, another site that was among the most important in 2010, was much lower during this census, and it has dropped from international to national importance. A significant drop in total numbers was also recorded at the adjacent Lough Swilly, which has been shown to be part of the same overall complex as Lough Foyle. Most of the other internationally important sites showed increases when compared with 2010, most notably Tacumshin Lake, while a single flock of 365 at a site at Kilmacshane (Galway) was the highest single flock total reported in the Republic of Ireland, and elevates this new site to one of international significance for Whooper Swan (Table 2).

Large-scale variation in numbers continues to occur at site level. During this census, there were changes in status at 15 of

the 25 internationally and nationally important sites listed when compared with 2010 (Table 2); i.e. there was a change in the category in which the site was listed. Specifically, 11 sites listed as internationally or nationally important were not listed in 2010, and a further four sites declined in status, from international to national importance. Numbers at a further ten sites listed in 2010 were below the thresholds and are not listed in Table 2. These include three sites that were internationally important in 2010, namely Little Brosna Callows, Lough Iron and the Blackwater Callows.

In total, 12,004 individuals (80% of all swans recorded) were aged, of which 22.3% were juvenile (Table 1). This includes 22.5% juveniles in the Republic of Ireland and 21.7% in Northern Ireland. A total of 674 broods were recorded, ranging between broods of one and a peak of seven in one flock in Sligo. The mean brood size overall was 2.39, and for counties where greater than ten families were checked, mean brood sizes ranged between a low of 1.96 (Donegal) and a peak of 3.18 (Sligo). The mean brood size was larger in the Republic of Ireland (2.48) when compared with Northern Ireland (2.26), and this result seems to be attributable to apparent differences in brood structure when analysed at such a broad scale (Figure 2). The proportion of juveniles and mean brood sizes seemed to be lowest in northern parts of Ireland and higher elsewhere, perhaps suggesting there may have been a latitudinal influence on the distribution of juveniles and family groups. However, there were no significant patterns shown during this census in brood size ($F = 1.807$, $P = 0.1955$) or in the proportion of juveniles ($F = 2.17$, $P = 0.1584$).



Plate 71. Whooper Swans (Oran O'Sullivan).

Table 2. Internationally and nationally important sites for Whooper Swans recorded in January 2015. Flyway thresholds after Crowe and Holt (2013) and Wetlands International (2015).

Site	County	Count	% change (2010)
Internationally important sites (1% flyway threshold = 270)			
Lough Neagh	Antrim/ Londonderry/ Tyrone/ Armagh/ Down	908	1
Upper Lough Erne	Fermanagh	689	-14
Lough Beg	Antrim/ Londonderry	679	-25
Shannon Callows	Offaly	465	28
Wexford Harbour & Slob	Wexford	382	-7
River Suck	Roscommon	381	15
Kilmacshane*	Galway	365	-
Cashen River & Estuary	Kerry	341	-33
River Foyle	Donegal/ Tyrone/Londonderry	332	10
Tacumshin Lake*	Wexford	316	829
Nationally important sites (1% all-Ireland threshold = 150)			
Shannon & Fergus Estuary**	Clare	246	-27
Brees Wetlands*	Mayo	231	425
Garryduff*	Galway	228	-
Lough Swilly**	Donegal	223	-34
Glen Lough*	Westmeath	215	139
East Ballinamore Lakes	Cavan	210	56
Ballyhaunis Lakes*	Mayo	208	86
Castleplunket Turloughs*	Roscommon	195	255
Strangford Lough	Down	178	29
Lough Oughter Complex**	Cavan	176	-51
Lower Blackwater River*	Waterford	175	130
Lough Gara*	Sligo	159	31
North East Galway Lakes*	Galway	157	>1,000
Lough Foyle**	Londonderry/ Donegal	157	-82
Finn-Lacky Catchment*	Monaghan	156	53

* Did not qualify in 2010

** Moved from international to national importance

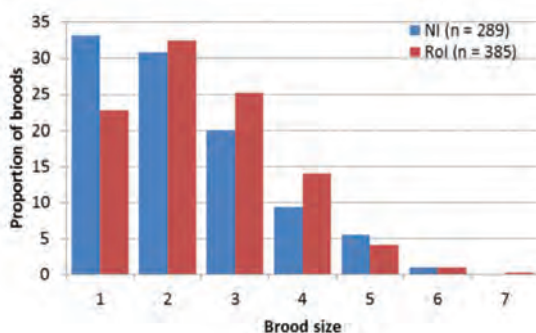


Figure 2. Proportions of total broods of different sizes in Northern Ireland and the Republic of Ireland in January 2015.

Bewick's Swan

A total of just 21 Bewick's Swans was recorded in four flocks (Table 3). The majority were recorded at the North Slob (Wexford). This is the first census when no birds were recorded in Northern Ireland.

Habitat

The habitat utilised was recorded for 84% of swans overall (Figure 3). Whooper Swans were recorded in 25 out of the 30 habitat types available for selection, with the highest proportion recorded on dry improved pasture (40%), on turloughs or callows (13%) or on waterbodies (9%).

Table 3. Totals of Bewick's Swans recorded in January 2015.

Site	County	Count	% juv
Brideswell	Roscommon	2	-
The Cull & Killag (Ballyteige)	Wexford	3	0
Wexford Harbour & Slobs	Wexford	13	15*
Tacumshin Lake	Wexford	3	-

* Two broods of one juvenile each.

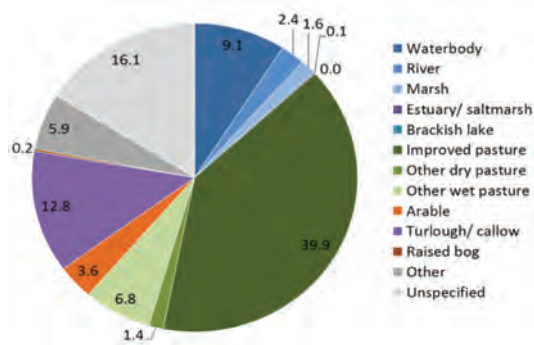


Figure 3. Habitats used by Whooper Swans during January 2015.

Discussion

Distribution and abundance

The overall total number of Whooper Swans recorded in Ireland in 2015 (at 15,104) is similar to that for 2010 (updated census total of 15,136). This result means that the 2015 census marks the first since 1995 where there was no further increase in numbers, implying that totals here are stable. Boland *et al.* (2010) indicated that the rate of increase in 2010 was beginning to decline. It is unfortunate that the Bewick's Swan has continued its downward trend in Ireland, with just 21 recorded in four flocks. With a decline at flyway scale and a substantial decline at their key Wexford haunts, the Wexford Slobs, Tacumshin and Killag in the south and east of the county, the continued future presence of this species in Ireland is in doubt.

The weather in the months leading up to the census was relatively mild and wet (Met Éireann 2014, 2015), which resulted in an abundance of available wetlands and in generally favourable habitat conditions for swans overall. These conditions were in stark contrast to those in 2010, when

especially cold conditions prevailed (Boland *et al.* 2010). During that census, with many of the smaller wetlands frozen over and habitat conditions in an extremely poor state, swan flocks were recorded in previously unknown and unusual locations. Therefore, it was expected that the results of the 2015 census would reveal the distribution of swans as markedly different when compared with 2010.

Despite the similarity in total numbers recorded in Ireland during both the 2010 and 2015 censuses, Whooper Swans were clearly more dispersed in 2015, with a 27% increase in the number of flocks recorded. Conversely, the total number of flocks exceeding 100 swans was greater in 2010 (35) when compared with 2015 (23). Furthermore, there was large-scale variation in totals at the county level, revealing differences in distributions between censuses. The majority of swans during this census were reported on grasslands, with a slightly higher proportion on waterbodies when compared with 2010.

Because of the recorded difference in distribution, sites that qualified as internationally and nationally important were also quite different when compared with previous censuses. There were many new sites of importance identified during this census when compared with 2010, presumably the result of a greater spread in the distributions of birds. The majority of internationally important sites have retained this status, while only a small proportion of the sites that were nationally important in 2010 have remained on the nationally important list in 2015. Among the internationally important sites in 2010, declines in numbers have resulted in a loss of some key sites to national importance, most notably Lough Foyle, Lough Oughter, Lough Swilly and the Shannon and Fergus Estuary.

Breeding success

The overall mean brood sizes and proportions of juveniles of Whooper Swans in 2015 were both higher when compared with censuses carried out since 1995 (Cranswick *et al.* 1996, Colhoun *et al.* 2000, Crowe *et al.* 2005, Boland *et al.* 2010). The variation in productivity at county and at regional levels possibly reflects a tendency for family groups to congregate at certain sites, and it seems that family groups were less prevalent in the northern part of Ireland in January 2015 (Donegal and Northern Ireland). Reasons for these patterns remain unclear.

Ongoing monitoring at a selection of sites across Ireland in the intervening years (IWSSG unpublished) has shown that mean brood sizes and proportions of juveniles have been widely variable since the last census. Most notable was the substantial decline in the proportion of juveniles to a low of just 14% and 15% in Northern Ireland and the Republic of Ireland, respectively, in 2011/12. The WeBS and I-WeBS trends indicate that total counts have also varied during the intervening period; the I-WeBS trend (I-WeBS unpublished)



Plate 72. Whooper Swans (Michael O'Clery).

showed that there had been a decline in numbers to levels reported during the mid to late 1990s. Therefore, the improvement in breeding success shown here is a welcome result.

Conclusion

The results from the current census (January 2015), especially when compared with 2010, clearly illustrate that swan distributions are strongly influenced by the availability of suitable habitats, which in turn are substantially affected by weather conditions. The winter of 2014/15 was mild in the weeks and months leading up to the census, meaning that there was a diversity and abundance of wetlands available throughout Ireland, and this is possibly why swans were so widely dispersed. Thus, it is important to reiterate that the primary purpose of thorough international censuses is to generate the most robust possible total number of birds, which then facilitates assessment of trends and of site importance at national and international scales. These assessments cannot

rely solely on national monitoring schemes, such as WeBS and I-WeBS, because of the widely dispersed nature of swans, especially as flocks are often reported considerable distances from wetlands. It is widely known that waterbirds are highly mobile outside the breeding season, and that they can move significant distances during a given winter. Thus, information on the importance of sites is better examined over the course of a season, based on information gathered in conjunction with WeBS and I-WeBS, rather than on a snapshot such as the census reported here.

Results of this census indicate that numbers in Ireland have stabilised, despite a notable increase in breeding success (2014) when compared with previous censuses. It is important that the Whooper Swan trend is closely monitored through WeBS and I-WeBS over the coming years to track ongoing year to year changes. Furthermore, the Irish Whooper Swan Study Group continues to undertake monitoring of breeding success at a number of sites throughout Ireland, and this information is important to help explain the trends shown. Hopefully, a combination of trend and productivity information will indicate that there is no significant reversal of the positive trend that has been evident for so long.

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References

- Boland, H., McElwaine, J.G., Henderson, G., Hall, C., Walsh, A. & Crowe, O. 2010. Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans in Ireland: results of the International Swan Census, January 2010. *Irish Birds* 9: 1-10.
- Brazil, M. 2003. *The Whooper Swan*. Poyser, London.
- Colhoun, K., McElwaine, J.G., Cranswick, P.A., Enlander, I. & Merne, O.J. 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, P.A., Bowler, J.M., Delany, S.N., Einarsson, Ó., Gardarsson, A., McElwaine, J.G., Merne, O.J., Rees, E.C. & Wells, J.H. 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. & Holt, C. 2013. Estimates of waterbird numbers wintering in Ireland, 2006/07-2010/11. *Irish Birds* 9: 545-552.
- Crowe, O., McElwaine, J.G., Worden, J.G., Watson, G.A., Walsh, A. & Boland, H. 2005. Whooper *Cygnus cygnus* and Bewick's *C. columbianus bewickii* Swans in Ireland: results of the International Swan Census, January 2005. *Irish Birds* 7: 483-488.
- Hall, C., Glanville, J.R., Boland, H., Einarsson, Ó., McElwaine, G., Holt, C.A., Spray, C.J. & Rees, E.C. 2012. Population size and breeding success of Icelandic Whooper Swans *Cygnus cygnus*: results of the 2010 International Census. *Wildfowl* 62: 73-96.
- Merne, O.J. 1977. The changing status and distribution of the Bewick's Swan in Ireland. *Irish Birds* 1: 3-15.
- Merne, O.J. & Murphy, C.W. 1986. Whooper Swans in Ireland, January 1986. *Irish Birds* 3: 199-206.
- Met Éireann. 2014. *Monthly Weather Bulletin No. 343*. Glasnevin Hill, Dublin.
- Met Éireann. 2015. *Monthly Weather Bulletin No. 344*. Glasnevin Hill, Dublin.
- Wetlands International. 2006. *Waterbird Population Estimates*. Fourth edition. Wetlands International, Wageningen.
- Wetlands International. 2015. *Waterbird Population Estimates*. Accessed 17 October 2015: wpe.wetlands.org.