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Barnacle Geese *Branta leucopsis* in Ireland: results of the 2018 census

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A complete aerial and ground census of Barnacle Geese *Branta leucopsis* was conducted in Ireland in spring 2018 as part of the international Greenland Barnacle Goose census. This population winters exclusively in north-western Ireland and Scotland, where regular censusing is ongoing since 1959. A total of 16,237 Barnacle Geese was recorded in Ireland in March 2018, primarily on the north-west coast and offshore islands. The abundance of Barnacle Geese in Ireland has been on a general upward trend since the 1950s. However, the 2018 census represents a decrease of 7% compared to the 2013 estimate, in accordance with a flyway population decline in recent years. Internationally significant flocks were recorded at Ballintemple, Dunfanaghy New Lake, Trawbreaga Bay, the Inishkea Islands, Cross Lough and Termoncarragh. A further 11 sites held nationally important numbers and a high proportion of the population was associated with the European Union Birds Directive Special Protection Area network. There was no notable reduction in the range of this species in Ireland, nor a reduction in the proportion of the flyway population wintering here when compared with the last census in 2013. The five-yearly census continues to provide useful data for long-term monitoring.

Introduction

The Greenland Barnacle Goose *Branta leucopsis* winters exclusively in north-western Ireland and Scotland. The entire population migrates to north-east Greenland for the breeding season, staging in north-west Iceland on the spring journey and in south-east Iceland in autumn. In the 1950s, this population was considered threatened due to its declining trend. Protective legislation was introduced, and several winter censuses were conducted to monitor the recovery (Boyd 1968). A regular international census of Greenland Barnacle

Geese in Ireland and Scotland began in 1959 and continues to the present day (Boyd 1961, Mitchell & Hall 2013).

Barnacle Geese in Ireland principally occur on offshore islands and along the coasts of counties Donegal, Sligo, Mayo and Galway (Crowe *et al.* 2014). Smaller numbers can be found in counties Clare (e.g. Mutton Island), Kerry (e.g. the Magharee Islands) and Wexford (e.g. the Slobs) (Merne &

Plate 9. Barnacle Goose at Ballyconnell in County Sligo (Ulrike Schwier).

Walsh 2003, Crowe *et al.* 2014). The international censuses have shown that the Irish portion of the flyway population has increased several-fold since the 1950s: from 2,800 individuals in 1959 to 17,500 in 2013 (Boyd 1961, Crowe *et al.* 2014).

A complete aerial and ground census of Barnacle Geese was conducted in Ireland in spring 2018 as part of the international Greenland Barnacle Goose census. Here we present results of the 2018 census and discuss historical trends and current status of the species in Ireland.

Methods

Previous censuses

Full censuses of Barnacle Geese in Ireland were conducted 13 times between 1959 and 2013. Following an initial intense survey effort, censuses were conducted at approximately five-year intervals. The dates of the initial censuses were March and December 1959 and spring 1961, 1962, 1965, 1966 and 1973 (Boyd 1968, Ogilvie & Boyd 1975). Periodic spring censuses were conducted from 1975 on (Ogilvie & Boyd 1975, Ogilvie 1983, Walsh & Merne 1988, Merne & Walsh 1994, 2002, Walsh & Crowe 2008, Crowe *et al.* 2014).

2018 census

A full aerial and ground census of known Barnacle Goose sites in Ireland was undertaken from 19 to 21 March 2018. Ground counts took place on 19, 20 and 21 March. Sites covered during the ground-based census were: Dooey, Inishowen, Dunfanaghy (Donegal), Ballintemple (Sligo), Achill, Bellmullet, Clew Bay (Mayo) and the west Clare coast.

The aerial census took place on 19 and 20 March using a Cessna 172. On the first day, the aircraft departed from Weston Airfield at 11.00 hours GMT and the survey transect commenced at the Blasket Islands (Kerry), moving northwards to Blacksod Bay (Mayo). The survey transect was completed at Strandhill (Sligo) at 18.15 hours. On the second day, the aircraft departed Strandhill at 08.30 hours and the survey transect continued northwards to Inishtrahull Island (Donegal), finishing at 10.35 hours. Survey methodology followed that outlined in Walsh and Merne (1988). Observers at either side of the aircraft made counts of flocks flushed from islands and coastal sites during the transect. Any large flocks were photographed. Following the survey, flocks in photographs were counted by two independent counters to ensure accuracy, and these were collated with ground and aerial counts to provide a final total number. Where multiple estimates existed for the same flock, the photograph was taken as the best estimate, followed by the aerial count and lastly the ground count.

Results

2018 census

In 2018, a total of 16,237 Barnacle Geese was recorded in Ireland. A total of 58 sites was visited (Appendix 1). Of these, 33 sites supported Barnacle Geese (Figure 1). The largest flocks were recorded at Ballintemple (Sligo), the Inishkea Islands (Mayo), Trawbreaga Bay and Dunfanaghy New Lake (Donegal). Ballintemple supported the highest number of geese, at 4,410, followed by the Inishkea Islands, at 2,330.

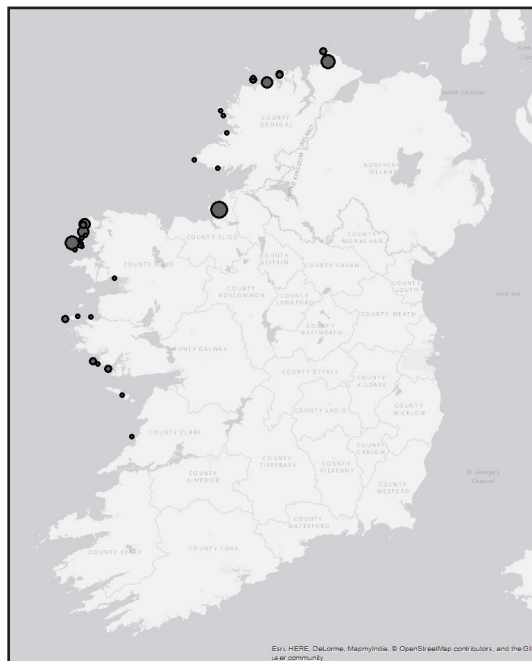


Figure 1. Sites supporting Barnacle Geese during the March 2018 census. Increasing abundance is represented by increasing circle size, from the smallest flocks (5–250 individuals), to small (251–800 individuals), mid-range (801–1,500 individuals), large (1,501–2,500 individuals), through to the largest flocks (2,501–4,500 individuals).

There were nationally (≥ 160 individuals) and internationally (≥ 720 individuals) important numbers of Barnacle Geese at several sites (Table 1). Six sites supported internationally important numbers (1% of flyway population). These were Ballintemple (Sligo), Dunfanaghy New Lake and Trawbreaga Bay (Donegal), as well as the Inishkea Islands and nearby mainland sites Cross Lough and Termoncarragh on the Mullet Peninsula (Mayo). A further 11 sites held nationally important numbers (1% of national population). These were

Table 1. Sites where numbers of Barnacle Geese exceeded internationally and nationally important thresholds during the March 2018 census.

County	Site	Total Count
Sites exceeding international threshold		
Mayo	Inishkea Islands* (F555214)	2,330
Mayo	Cross Lough* (F639294)	804
Mayo	Termoncarragh* (F650349)	940
Sligo	Ballintemple* (G644436)	4,410
Donegal	Dunfanaghy New Lake* (C000363)	1,300
Donegal	Trawbreaga Bay* (C436514)	1,775
Sites exceeding national threshold		
Galway	Birmore Island* (L801262)	587
Galway	St. MacDara's Island* (L721299)	221
Galway	CroaghnaKeela Island* (L687323)	252
Galway	Inishshark Island* (L484648)	638
Mayo	Moynish More Island (L862943)	169
Mayo	Tiraun (F617237)	184
Mayo	Annagh Head (F639341)	243
Donegal	Dooley (C088421)	450
Donegal	Inishdooley Island* (B896383)	280
Donegal	Doagh* (C086417)	300
Donegal	Malin Head (C402592)	380

Flocks associated with Special Protection Areas are marked with an asterisk. International threshold is 720 and national threshold is 160, based on the 2018 census.

Birmore Island, St. MacDara's Island, CroaghnaKeela Island, Inishshark Island (Galway), Moynish More Island, Tiraun, Annagh Head (Mayo), Dooley, Inishdooley Island, Doagh and Malin Head (Donegal). Of all birds recorded, 89% were associated with Special Protection Areas (SPAs) designated under the European Union Birds Directive (Directive 2009/147/EC) (Table 2). Barnacle Geese are a listed Special

Table 2. County totals for the number of Barnacle Geese recorded during the March 2018 census. The proportion of birds recorded on offshore islands and associated with Special Protection Areas (SPAs) is also indicated, along with the number of sites Barnacle Geese were recorded at.

County	Number of birds	% on islands	% in SPAs	Number of sites
Clare	30	100%	100%	1
Galway	1,948	100%	59%	7
Mayo	4,984	51%	15%	12
Sligo	4,410	0%	100%	1
Donegal	4,865	12%	18%	12
Overall	16,237	32%	89%	33

Conservation Interest within all SPAs in which they were recorded, with the exception of Inishmore, Mullet Peninsula, Blacksod Bay/Broad Haven and West Donegal Coast SPAs.

Population trends in Ireland

The 2018 census estimate of 16,237 birds represents a decrease of 7% compared to 2013 (Figure 2). The proportion of the flyway population wintering in Ireland in 2018 was 23% (Figure 2). This is very similar to the 2013 figure of 22%. In accordance with the overall population decline, the number of birds in most counties also decreased between 2013 and 2018, with the exception of Galway (Table 2). No Barnacle Geese were recorded in Wexford or Kerry during this census.

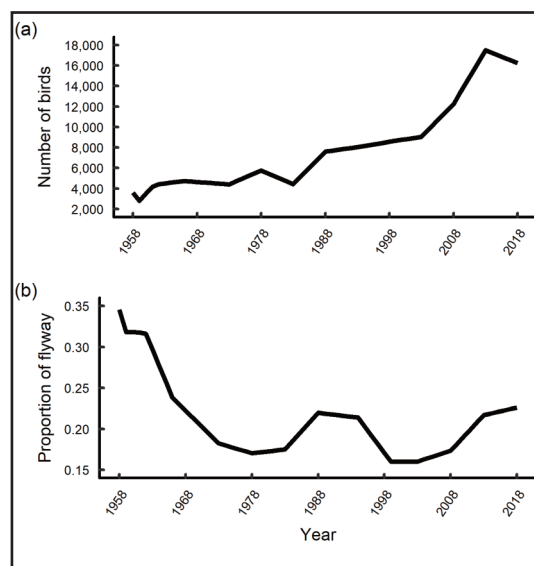


Figure 2. Population trend of Barnacle Geese in Ireland between 1958 and 2018 (a) and trends in the proportion of the flyway population in Ireland between 1958 and 2018 (b) (source of 1958 to 2013 data: Crowe *et al.* (2014)).

Discussion

The 2018 census of Greenland Barnacle Geese in Ireland was part of the most recent international survey of the flyway population. Successful coverage of known Barnacle Goose sites in Ireland was achieved, with good survey conditions for both ground counts and the aerial transects. A total of 16,237 Barnacle Geese was recorded in Ireland in March 2018, primarily on the north-west coast and offshore islands.

Long-term trends

The abundance of Barnacle Geese in Ireland has been on a general upward trend since the 1950s, in line with many northern migrant goose species (Fox & Leafloor 2018). The considerably depleted population of 2,800 birds in 1959 increased and remained relatively stable around a figure of 5,000 individuals for two decades, aside from a brief decline in the late 1970s (Ogilvie & Boyd 1975, Ogilvie 1983). From the early 1980s, the population grew rapidly, increasing four-fold to a high of 17,500 in 2013 (Crowe *et al.* 2014). The global increase in the Barnacle Goose and other goose species has been attributed to improved food resources as geese transition from traditional to agricultural habitat (Fox & Abraham 2017, Clausen *et al.* 2018). It has also been demonstrated that warmer and wetter winter conditions as a result of climate change, have improved survival and productivity prospects in waterfowl (Kéry *et al.* 2006, Dickey *et al.* 2008, Cleasby *et al.* 2017, Guéry *et al.* 2017).

The 7% decrease in Ireland's Barnacle Goose numbers observed over the most recent five-year census interval is the first since the late 1970s, although it is relatively small. The cause of the 23% decrease observed during the 1978 to 1983 census interval was unclear. Ogilvie (1983) suggested the prolonged drought in summer 1976 resulted in little food for geese the following season and this, along with a very cold winter in 1978-79, may have had a negative impact on the population through food shortage. Geese are highly susceptible to unanticipated changes in otherwise predictable food resources (Clausen *et al.* 2012).

The remarkable rate of increase in Ireland's Barnacle Geese observed since 2001 has clearly reduced. The population size increased by 43% in the 2008 to 2013 census interval and by 35% in the preceding 2003 to 2008 interval. It is unclear whether the recent decrease represents a period of population decline or a plateau in the period of rapid increase. We suspect there has been a decrease in Barnacle Goose immigration into Ireland due to high levels of shooting mortality on the Isle of Islay in Scotland (summary of bag data available from Scottish Natural Heritage: <https://www.nature.scot/goose-management-scheme-islay-documents>). Future surveys should provide greater insights. Nevertheless, the population in 2018 is still several times higher than the critically low numbers reported during the 1950s, and it currently appears to be secure. There has been no notable reduction in the range of this species in Ireland, nor a reduction in the proportion of the flyway population wintering here when compared with 2013.

The population decrease in Ireland mirrors the trend in Scotland. In Scotland, the population decreased by 12% in the 2013 to 2018 census interval (C. Mitchell, unpublished data). That both national trends are falling indicates there is a decline



Plate 10. Barnacle Geese
(www.carlmorrowphotography.com)

in the flyway population rather than geese simply shifting their wintering distribution from Ireland to Scotland. Barnacle Goose flocks in Ireland exceeded the international threshold in similar geographical areas to those recorded in the 2013 census (Crowe *et al.* 2014). At a meta-scale, there is consistency in the location of internationally significant flocks over time: internationally significant numbers are repeatedly recorded around the Mullet Peninsula, Ballintemple, Dunfanaghy New Lake and the Inishowen Peninsula.

Distribution

Barnacle Geese in Ireland in 2018 were highly concentrated in the north-west. A small proportion of the population was recorded in Clare, but the majority was found from coastal counties between Galway and Donegal. Mayo supported the greatest abundance, closely followed by Donegal and Sligo (where the total comprised just a single flock of over 4,000 birds in Ballintemple). Roughly a third of the population was recorded from offshore islands (Table 2), the most noteworthy in terms of numbers being the Inishkea Islands, supporting an internationally important population. The remaining two thirds of the population was recorded from coastal mainland areas, with the largest flocks at Ballintemple, Dunfanaghy New Lake and Trawbreaga Bay. Donegal had the greatest distribution of geese, as flocks were recorded at 22 locations, perhaps reflecting smaller areas of suitable habitat available.

Given the high mobility of these geese, it is important to consider seasonal movements of the population – for example, a move northward prior to spring migration (Philips *et al.* 2003) – when analysing patterns of occurrence. This census has traditionally been carried out during early spring and may not accurately reflect the distribution of birds during the mid-winter period. The survey timing may explain the

absence of geese in Kerry (the southernmost part of the range) and the small numbers in Clare. Wintering range retraction or short-stopping is an unlikely cause as annual Irish Wetland Bird Survey (IWeBS) data shows no decreasing trend in the numbers of Barnacle Geese in the south-west (Tralee Bay and the Clare coast) during mid-winter (IWeBS Office, unpublished data). Small flocks (up to 32 individuals) were recorded at the Slobs in Wexford up to March 2016 (IWeBS Office, unpublished data), while a flock of 14 was recorded in the Wexford Wildfowl Reserve in February 2018 (A. Walsh, pers. obs.).

The 2018 population is almost twice its 2003 size (Merne & Walsh 2003). The period from 2003 to the present saw a great increase in the abundance of geese at mainland sites when compared with islands, particularly in Donegal and Mayo (Merne & Walsh 2003). If this is a general pattern of change which continues, it has implications for the agricultural community as Barnacle Geese tend to feed on agricultural grassland, sometimes with considerable negative impacts (Bainbridge 2017, Mason *et al.* 2017). A high proportion (>80%) of birds on the mainland were associated with the SPA network. Agri-environment schemes, both within and outside of the SPA network, have the potential to be instrumental in the conservation management of this species into the future. Numbers outside the SPA network were highest on the Mullet Peninsula, Dooey and Malin Head, thus could represent a future management challenge. Units of management of Greenland Barnacle Geese outside the breeding grounds at the Irish and Scottish scale also needs to be further explored, as conservation management strategies for one country is likely to influence the other. For example, ongoing derogation shooting on Islay (McKenzie 2014) is likely to impact Irish totals as there is high connectivity between sites. Even localised disturbance of geese can result in impacts at the flyway level (Klaassen *et al.* 2006, Jensen *et al.* 2017).

Future monitoring

The five-yearly international census of Greenland Barnacle Geese continues to be a necessary tool in long-term monitoring of the population. Robust estimates of the population can only be captured in these thorough surveys, along with national scale changes in distribution. Such data provides the evidence base to inform the conservation management of the 23% of the flyway population of Greenland Barnacle Geese that overwinter in Ireland. Full national surveys during the census intervals would also be useful in determining annual variation and site use, particularly during the autumn and mid-winter periods. This would be valuable in targeting management actions appropriately to mitigate potential future challenges.

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Appendix 1.

Sites visited during the March 2018 Barnacle Goose census.

Kerry

Beginish Island (V410787)
Magharee Islands (Q621213)
Clare
Mutton Island (Q971744) 30*

Galway

Aran Islands (L901062) 20
Birmore Island (L801262) 587*
St. MacDara's Island (L721299) 221*
Croaghnaakeela Island (L687323) 252*
Inishturk Island (L595746)
Cruagh Island (L530550)
High Island (L503574)
Aughrus Point (L544572)
Friar Island (L523578)
Inishshark Island (L484648) 638*
Crump Island (L676656) 115
Davillaun Island (L582663) 115*

Mayo

Emlagh Point (L741797)
Caher Island (L660760)
Roonagh Lough (L747766)
Clare Island (L680850)
Achill Beg Island (L710923)
Moynish More Island (L862943) 169
Inishgallon Island (F622030)
Duvillaun Island (F572159) 60*
Falmore (Mullet) (F627185) 81
Surgeview (Mullet) (F609188) 17
Eachléim (Mullet) (F620208) 142
Inishkea Islands (F555214) 2330*
Tiraun (Mullet) (F617237) 184

Elly (Mullet) (F629244) 8
Barnagh (Mullet) (F653268) 6
Cross Lough (Mullet) (F639294) 804
Inishglora Island (F611311)
Annagh Head (F639341) 243
Termoncarragh (F650349) 940*

Sligo

Ballintemple (G644436) 4410*
Innismurray Island (G571540)

Donegal

St. John's Point (G704695)
Shalwy (G639739) 60
Inishduff Island (G647723)
Muckros Head (G622737)
Fintragh Bay (G678761)
Rathlin O'Birne Island (G466801) 110*
Inishkeel Island (B704000) 6*
Dooley (C088421) 450
Roaninish Island (B656026)
Inishkeeragh Island (B683122) 133*
Aranmore Island (B663157) 11
Owey Island (B711231)
Inishfree Lower Island (B756240)
Falcarragh (B934339)
Dunfanaghy New Lake (C000363) 1300
Inishdooley Island (B896383) 280
Inishbeg Island (B895396) 60
Doagh (C086417) 300*
Fanad Head (C227477)
Trawbreaga Bay (C436514) 1775*
Malin Head (C402592) 380*
Inishtrahull Island (C480654)

An asterisk indicates Special Protection Area. A count is given where Barnacle Geese were recorded.
