Whimbrel *Numenius phaeopus* migrations at North Bull Island, Dublin Bay: 2012 to 2015

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Whimbrel *Numenius phaeopus* migrations were monitored at North Bull Island in Dublin Bay from 2012 to 2015. A small but regular passage was recorded annually with more birds in spring than in autumn in each year. Earliest migrants arrived from mid-March but the main spring passage began abruptly in week 17 (22-28 April) with values remaining high in week 18 (29 April-5 May). Small numbers recorded frequently in mid-summer were considered likely to be late prenuptial migrants. Autumn passage was more protracted and lacked an obvious 'peak' week. There were two winter records. Based on other recent investigations into Whimbrel migration routes, it appears that the vast majority of spring migrants at North Bull Island belong to the large *islandicus* breeding populations in Iceland. A direct overseas route to West Africa in autumn by the majority of Icelandic birds possibly explains why smaller numbers are recorded at that time of year. However, exactly what proportion of autumn passage migrants are *islandicus* or *phaeopus* from Northern Europe is unknown at present and requires further investigation. The results also show that North Bull Island is a regular staging area in both spring and autumn for nationally important populations.

Introduction

There are seven subspecies of Whimbrel *Numenius phaeopus* of which two occur in Europe. The breeding range of the *islandicus* subspecies is from Iceland south to Scotland and *phaeopus* from Fennoscandia to the River Yenisey in Russia; both subspecies winter in the southern hemisphere (Van Gils *et al.* 2016). Small numbers also overwinter on the Atlantic coast of Europe (Velasco & Alberto 1993, Balmer *et al.* 2013). Ringing recoveries and biometrics indicate that the majority of Whimbrels recorded during migration in Ireland and west Britain are *islandicus,* whilst those in eastern Britain and mainland Europe are *phaeopus* (Ferns *et al.* 1979, Grant 2002, Carneiro *et al.* 2015, Robinson *et al.* 2016). During migration Whimbrels can be found in wetlands, saltmarshes and tidal flats.

In Ireland, their biannual migration patterns have been documented since the nineteenth century, with the heaviest passage thought to occur along the south and west coasts (Thompson 1850, Ussher & Warren 1900, Kennedy *et al.* 1954). They also occur inland during migration (Hutchinson 1989), while flocks are regularly observed at seabird migration watchpoints, especially along the west coast such as Annagh Head (Mayo) (personal observation) and Bridges of Ross (Clare) (Niall T. Keogh, personal communication). In spring, the earliest migrants usually arrive in March and the main passage is from mid-April into May but autumn passage is less intense and extends from June/July to September (Ruttledge 1966, Hutchinson 1989). Small numbers can occur in winter

Plate 175. Whimbrel (Shay Connolly).

and nesting has been suspected on one occasion, but not proven (Perry 2006). Despite being a familiar migrant, only one detailed study has been carried out to date. This reported 'unprecedented' numbers in spring at Cork Harbour in the 20 day period between 15 April (DOY 105) and 4 May (DOY 124) in the three years 1977 to 1979 (Pierce & Wilson 1980) (DOY = Day of Year; see Methods).

North Bull Island, Dublin Bay, is a stopover site for passage migrant waders, including Whimbrel, and this species has been known to occur regularly since the nineteenth century (Patten 1898). However, it would appear that numbers on passage were quite small with a maximum of only five or six reported by Kennedy (1953) up to the early 1950s, but this may, in part, be due to observer effort. Hutchinson (1975) stated that the highest count up to the early 1970s was 60 birds. There were also three November records and one over-wintering record from 11 November 1957 to 19 January 1958. Although the number of Whimbrels that migrate through Ireland annually is not known, it is not considered to be a species of conservation concern (Colhoun & Cummins 2013). Sites of national importance for Whimbrels in Ireland are those where a five-year mean exceeds 20 birds (Olivia Crowe, personal communication).

This study sought to establish the timing and scale of Whimbrel migrations at North Bull Island from 2012 to 2015 and to compare the results to other data for Ireland and Britain. The results provide additional insights into the migration patterns of this species in Ireland.

Study area

North Bull Island (53.3705° N, 6.1440° W) on the northern shore of Dublin Bay is a relatively new island having evolved through the accelerated accumulation of sediments following engineering works in Dublin Port in the nineteenth century (Jeffery 1977). It has since developed into a coastal ecosystem of sand dunes, saltmarshes and inter-tidal sediments. Due to the scientific importance of its habitats and species, the area is a National Nature Reserve (NNR), Special Protection Area (SPA) for birds and Special Area of Conservation (SAC) for habitats (NPWS 2016). The rich feeding grounds within the reserve attract large numbers of passage migrants and wintering waterfowl annually, including several species with populations of national and international importance (Crowe 2005).

Methods

The primary objective of field monitoring was to obtain one count per week during two ten-week periods, one in spring and one in autumn. Spring counts were conducted from mid-March to May (weeks 12 to 22) and autumn counts from early July to September (weeks 29 to 39). Data were obtained for a maximum of 80 weeks, with the occasional assistance of other observers (see Acknowledgements). The mudflats and saltmarshes were scanned up to one hour before high tide from the Wooden Bridge to Sutton (about 5.5 km) using a telescope (x30) and binoculars (x10). Outside of these main survey times in spring and autumn data on Whimbrel numbers were recorded during regular but less formal visits to the island.

Long term data on the earliest spring arrivals at North Bull Island from 1999 to 2016 were recorded by the author. These data were used to determine potential advancement in arrival times in spring. To assess potential trends in arrival times in relation to local air temperatures and the winter North Atlantic Oscillation (NAO), data were analysed using a linear regression model with Whimbrels as the dependant variable (Data Desk 6.0). January, February and March air temperature data for Phoenix Park (1999-2016) were obtained from the European Climate Assessment and Dataset (2016) website (http://www.ecad.eu/). The winter NAO index (DJFM) 1998-2015 were obtained from Hurrell *et al.* (2016). Models were checked for any breaches of the assumptions of the linear model. Calendar dates were converted to Julian days (DOY = Day of Year) and the data were assessed in weekly terms with the first week of the year starting with Julian day = 1. Data were adjusted for the 2012 leap year.

Winter records at North Bull Island were put into an Irish context using data extracted from the *Irish Birding* (2016) website (www.irishbirding.com). These data were used to assess potential changes in over-wintering populations in Ireland from 2011/12 to 2015/16 compared to data reported in the *Bird Atlas 2007-2011* (Balmer *et al.* 2013). Winter records were defined as those that occurred from 1 November to 28 February.

As the rates of turnover during pre- and postnuptial migrations at the site are unknown, it was not considered reasonable to calculate the ratio of birds between spring and autumn based on total or average numbers. Instead, the single highest weekly count in spring is compared to the highest weekly count in autumn for each of the four years.

Results

Intra-annual patterns

Apart from isolated early and late migrants, Whimbrels were recorded almost continuously between weeks 12 and 37 (Figure 1). All birds recorded were either feeding or roosting on the mudflats and saltmarshes of the island.

Although a few individuals arrived from week 11 onwards (mid-March), numbers remained in single digits until weeks 15 ($\tilde{x}$ = 7, peak of 14) and 16 ($\tilde{x}$ = 16.3, peak of 37). An abrupt

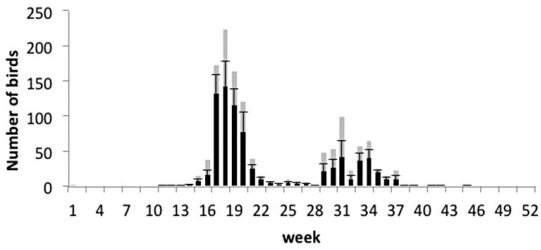

Figure 1. Weekly counts of Whimbrels at North Bull Island, 2012 to 2015. Black bars are mean number of birds (+S.E.); grey bars represent a maximum weekly count.

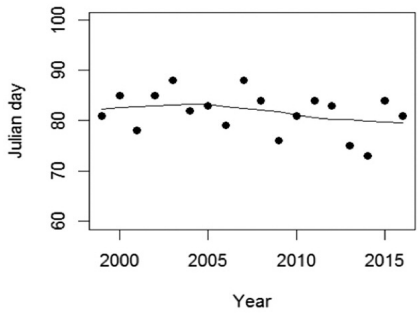

Figure 2. Earliest arrival dates of Whimbrels at North Bull Island, 1999 to 2016. Black line = lowess line.

increase occurred in week 17 ($\tilde{x}$ = 132) with peaks of 130 in 2013, 172 in 2014 and 142 in 2015. This event occurred in week 18 ($\tilde{x}$ = 141, peak of 223) in 2012. A steady decrease took place subsequently with numbers tapering off by week 22 ($\tilde{x}$ = 10, peak of 15). Up to nine birds were present in all four years in weeks 23 to 28 inclusive (June to early July). Autumn passage was lower and lacked a clearly defined 'peak'. Small numbers began to filter through from weeks 29 to 37 with maximum values in weeks 31 ($\tilde{x}$ = 41, peak of 98) and 34 ($\tilde{x}$ = 40, peak of 64). Migration usually ceased by week 38 (mid-September) but a few birds occurred sporadically into October. Within the suvey years 2012 to 2015, the earliest arrival date was DOY 73 (14 March 2014) and latest in autumn was DOY 289 (15 October 2012). Single birds were recorded on DOY 3 (3 January 2013) and DOY 313 (9 November 2015).

In excess of 20 birds (the threshold for national importance) were recorded regularly during spring and autumn in each year from 2012 to 2015. The mean peak count over this period in spring was 141 and that in autumn was 41. The ratio of the peak weekly counts from spring migration to autumn were 2.3x (2012), 2.3x (2013), 6.4x (2014) and 3.6x (2015).

Responses to changing climatic factors

The earliest arrival date over the years 1999-2016 was DOY 73 (14 March) and the mean earliest arrival date was DOY 82 (23 March). There was no significant trend in first arrival dates at North Bull Island (Figure 2) and no signifcant relationship between earliest arrival times and either local air teperatures or the winter North Atlantic Oscillation (NAO).

Although it is likely that some wintering birds in Ireland go unrecorded and there may be some duplication in those that are reported, it would appear that an average of 15 birds were present annually in winter at coastal sites in Ireland, including North Bull Island (Table 1). The majority of records refer to single birds, but ten were recorded on two occasions. Connaught was the only province without a winter record during 2011/12 to 2015/16.

Discussion

Whimbrels are common passage migrants in Ireland, occurring widely at coastal and inland sites on an annual basis (Kennedy *et al*. 1954, Hutchinson 1989). Although the numbers recorded at North Bull Island were small, a very clear biannual migration pattern was apparent, with higher numbers in spring compared to autumn in all four years. In

Table 1. Winter records of Whimbrels in Ireland, 2011/12 to 2015/16 (Irish Birding 2016).

	2011/12	2012/13	2013/14	2014/15	2015/16	Mean	S.E.
No. of reports	9	8	11	7	13	10	1.2
No. of birds	22	9	21	7	14	15	3.4
No. of sites	8	7	10	7	10	8	0.8
No. of 10km^2 recorded	8	6	9	6	7	7	0.6

Plate 176. Whimbrels (Colum Clarke).

each of the four years 2012 to 2015, spring migration occurred in a relatively short window with peak numbers usually in the last week of April and the first few days of May. In contrast, smaller numbers passed through over a longer period in autumn, and there was no clear 'peak' week. In addition, the regular presence of small numbers of birds during summer months in all years, and the two winter records, were unexpected, but not unprecedented.

To qualify as nationally important for Whimbrels the mean of five years peak counts at a site must exceed 20 birds. Although this threshold was exceeded regularly during spring and autumn annually, this survey was only carried out over a four year period. Although 2016 was not part of this survey, results from occasional counts between 14 April and 27 September also exceeded the threshold for national importance on five occasions in spring (peak of 103 on 1 May) and once in autumn (peak of 34 birds on 26 July) (Cooney 2017). Therefore, the five-year mean for 2012 to 2016 was 154 in spring and 54 in autumn. These results qualify North Bull Island as a site of national importance for Whimbrels.

Although much is known about Whimbrel breeding and wintering ranges, there are gaps in knowledge of the scale, temporal patterns and migration routes of the species in Western Europe, and particularly in Ireland. While data are sparse, Ireland is an important stopover location for the Icelandic populations in spring due to its location on the western fringe of Europe. This survey is the first time that pre- and postnuptial migrations have been systematically recorded at one location in Ireland. Apart from occasional records in bird publications, the only other survey of Whimbrel passage was carried out in Cork Harbour nearly four decades ago in the late 1970s (Pierce & Wilson 1980). Although that study reported large numbers over a three year period, it was confined to spring migration and the numbers recorded were at the time considered 'unprecedented'. Peak passage was recorded at Cork Harbour during week 17. The only annual data available on Whimbrel passage in Ireland since then is available on the Irish Birding website (www.irishbirding.com). In recent years, large numbers were reported in spring and autumn from many locations but highest counts were always in spring. For example, eight separate daily counts of over 200 birds were reported from 2009 to 2016. The five highest counts were in week 17 (22-28 April), two in week 18 (29 April–5 May) with one in week 35 (26 August–1 September). The highest daily total during this period was 600 at Rosscarberry (Cork) on 27 April 2011 (DOY 117). Peak migration occurred in week 17 at Cork Harbour (1977-1979), in Ireland as a whole (2009–2016) and at North Bull Island (2012–2015).

The seasonal bias towards higher numbers at North Bull Island in spring, compared to autumn, is consistent with the published status of the species in Ireland (Hutchinson 1989). The seasonal pattern at North Bull Island is also consistent with that reported from the Severn Estuary in the United Kingdom (Ferns *et al.* 1979). During spring migration the Severn Estuary was estimated to hold 74% of British migrant Whimbrels, but only 8% in autumn. This was in contrast to data from eastern England, where a higher proportion of birds occurred in autumn than in spring (Ferns *et al.* 1979, Prater 1981). A comparison of biometric data using wing lengths in that study confirmed that the majority of birds in the Severn Estuary were likely to be Icelandic, while those in eastern England were likely to be from Fennoscandian breeding populations.

Evidence on the migration routes of Whimbrels is available from ringing recoveries and, more recently, from the use of satellite transmitters and geolocators. Previous ringing recoveries in Ireland and west Britain included only one autumn bird and eight birds in spring (Gunnarsson & Guðmundsson 2016). These relative spring and autumn recovery rates did not fit the pattern that might be anticipated if post-breeding Icelandic Whimbrels, with their young, undertook the same migration route. More recently, a satellite transmitter fitted to a Whimbrel in northwest England showed that this bird flew directly from its Icelandic breeding ground to Guinea-Bissau (Whimbrel info 2016). This was the first evidence of a direct, non-stop Atlantic route for a Whimbrel to its wintering grounds in West Africa, a distance of 6,000 km. Estimates of energy expenditure required for such a long-distance migration were previously considered doubtful (Trolliet 2006). A more recent investigation using geolocators showed that this was not a one-off occurrence. All birds recovered in a study by Carneiro *et al.* (2015) (five of ten which were originally fitted with geolocators) followed the direct Atlantic route in autumn which took four or five days. The fact that all birds had undertaken the same direct route southwards is strong evidence that this is a major route for the Icelandic population and could explain the low autumn numbers recorded at North Bull Island and in Ireland in general. This study also showed that the birds fitted with geolocators undertook a completely different route in spring, with a non-stop flight from West Africa that was mainly over sea but included a stopover of approximately twelve days in Ireland and western Britain (Carneiro *et al.* 2015). At least two of these birds entered into the general area of the Irish Sea in April 2015 (Camilo Carneiro, personal communication) at the same time that a significant rise in numbers occurred at North Bull Island. This suggests that Whimbrels at North Bull Island in spring are of the *islandicus* race which breeds in Iceland. However, exactly what the proportion of the *islandicus* population stopover in Western Europe during prenuptial migration is unclear as there is new evidence that some, but possibly a significant proportion of the population, also undertake a continuous sea crossing directly from West Africa to Iceland (Alves *et al.* 2016).

There is mounting evidence that changing climatic conditions are impacting on wildfowl, wading bird and passerine distributions and migration patterns (Pearce-Higgins & Holt 2013, Pavón-Jordán *et al.* 2015, Miles *et al.* 2016) and that these impacts are likely to continue (Huntley *et al.* 2007). However, unlike some Icelandic breeding species, Whimbrels have not shown any advancement in earliest arrival dates or any relationship in arrival times with climatic drivers (Boyd & Petersen 2006, Gunnarsson & Tómasson 2011). This is consistent with the results from data collected for North Bull Island. A possible explanation for their lack of response compared to other Icelandic breeding wader species may be due to the fact that they are long-distance migrants with a short breeding season and therefore a more pressurised annual cycle (Gunnarsson 2010).

A possible response to milder conditions in winter might be an increase in the number of birds overwintering in Ireland. Although the *Bird Atlas 2007-2011* (Balmer *et al*. 2013) reported a 111% increase in 10 km squares with winter records this might not necessarily equate to an increase in the number of overwintering birds. From 2011/12 to 2015/16 about seven to 22 birds were reported annually during the winter months in Ireland (Irish Birding 2016), a figure that is remarkably close to the estimated 20 birds in the mid-1980s (Hutchinson 1989). Careful monitoring of wintering populations might indicate whether any significant change in winter numbers is occurring and whether this is related to climatic drivers.

In conclusion, although local in nature, the results from North Bull Island probably reflect a more general pattern for Ireland and west Britain. North Bull Island is a regular staging post for nationally important populations of Whimbrels in spring and autumn. Whilst it appears that the strong passage in spring belongs to the *islandicus* sub-species, the situation in autumn seems to be more complex. A direct route for all the Icelandic population in autumn, avoiding the west coast of Europe, would not explain the presence of birds at North Bull Island or at other sites in Ireland at that time of the year. At present, a single autumn ringing recovery from the Outer Hebrides provides the only evidence, albeit tenuous, that Icelandic birds do migrate southwards in autumn via Ireland and the United Kingdom. How many Icelandic birds take this route along the coast of Western Europe is at present unknown. However, given that *phaeopus* are more common during autumn migration than in spring in eastern Britain and mainland Europe (Fern *et al.* 1979, Prater 1981), it is not unreasonable to conclude that autumn flocks in Ireland possibly contain some *islandicus* from Iceland and *phaeopus* from the Faroese and Fennoscandian populations.

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