Decline of the Bewick's Swan *Cygnus columbianus bewickii* population wintering in Northeast/Northwest Europe

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Abstract

The 39.4% decline in numbers in the Northeast/Northwest European population of Bewick's Swan *Cygnus columbianus bewickii* between 1995 (29,780 birds) and 2010 (18,057 birds) was of major conservation concern, alleviated by a partial recovery to 20,149 recorded in the January 2015 census. The most recent census, in January 2020, however found that the recovery was not sustained. The results described in this paper found a further 29.7% decline between 2015 and 2020, with 12,702 individuals counted in 2020 and the population estimated at 12,930 birds. This represents a 56.7% decrease over the 25-year period from 1995–2020; an annual average decrease of 3.3% per year, with a higher rate of decline (8.5%/year) over the most recent 5-year period. Changes in the Bewick's Swans distribution were evident, with a significant increase in the proportion of the population recorded in countries in the northeastern part of the wintering range compared with those further south and west. More sites of international importance for Bewick's Swans in mid-winter (*i.e.* with ≥ 1% of the total population) consequently were found in Germany during the 2020 census than in previous censuses. Moreover, the swans were found to be more widely dispersed, rather than being concentrated at key sites, in 2015 and 2020. Annual productivity data, based on the percentage of cygnets (first-winter birds) recorded in wintering flocks, indicate that the recruitment to the population was consistently lower than estimated survival rates between 2010 and 2020, and moreover this has continued up to and including winter 2024/25. A population model predicts that a further reduction in population size to an estimated 11,068 Bewick's Swans will be found during the next census scheduled for January 2026, unless the swans have a good breeding season in summer 2025, which would represent a decrease of 14.4% since 2020.

Key words: abundance, *Cygnus c. bewickii*, distribution, habitat use, population change, sites of international importance.

The International Waterbird Census (IWC), initiated by the International Waterfowl Research Bureau (IWRB) with counts made of wildfowl in 19 countries in January 1967 (Rüger *et al.* 1986), has recently been described as "*one of the largest, internationally harmonised, biodiversity monitoring schemes in the world*" (Stroud *et al.* 2022). It is now a global monitoring programme coordinated by Wetlands International, which collects and analyses information on trends in numbers of waterbirds at wetland sites from 143 countries across the world. Species-specific censuses have additionally been undertaken for a range of waterbird populations from the late 20th century onwards – including for migratory geese and swans (which often disperse to feed over farmland areas away from their wetland roosts) – to provide more comprehensive information on variation in the total population size and distribution, and the reasons for population change (*e.g.* Fox *et al.* 2010; Fox & Leafloor 2018). With the development of international action plans for the conservation of species and populations, data from species-specific censuses also enable an assessment of the effectiveness of management and conservation programmes undertaken on implementing the action plans.

The Northeast/Northwest European population of Bewick's Swans (as it is now described under the African-Eurasian Migratory Waterbird Agreement (AEWA), formerly known as the Northwest European population), which breeds in the European Russian Arctic and migrates to wintering sites in northwest Europe, has declined markedly in numbers since the mid-1990s (Beekman *et al.* 2019). Concerns regarding the decline led to an International Single Species Action Plan (ISSAP) being adopted by the 5th Meeting of the Parties to AEWA in 2012, with the overall goal of maintaining the population minimally at its 2000 level of 23,000 birds (Nagy *et al.* 2012). Research and conservation projects initiated under the auspices of this ISSAP threw light on some of the demographic drivers leading to the population increase (up to 1995) and subsequent decrease (Wood *et al.* 2018; Nuijten *et al.* 2020a; reviewed in Rees & Clausen 2024), and also described a marked northeasterly shift in the winter distribution of the population attributable to climate change (Nuijten *et al.* 2020b; Linssen *et al.* 2023), in line with the results of the international counts (Beekman *et al.* 2019). Whilst an increase in the number of swans in the more easterly breeding and wintering Northwestern Siberia/Caspian population of Bewick's Swans has occurred during the 21st century (Rees *et al.* 2024) (see population distribution maps and trends on the Waterbird Populations Portal; Wetlands International 2025), a shift towards eastern wintering grounds was not found to explain variation in the abundance of individuals in the NE/NW European population (Wood *et al.* 2018).

One of the actions within the ISSAP was to continue monitoring population size changes through the 5-yearly International Swan Censuses – including the International Bewick's Swan Censuses (IBSC) – which were first held during the mid-1980s at a time when the population numbered *c.* 16,000 birds (Dirksen & Beekman 1991). Results of the January 2010 and 2015 censuses suggested that the rate of the population decline may have stabilised or even reversed (Beekman *et al.* 2019). Since then, however, the annual proportion of cygnets recorded in wintering flocks (which ranged from 3.9%–8.7% each year from 2016–2020 inclusive; Supporting Materials Table S1), has consistently been below estimated mortality rates ranging from 15%–23% during the 1970s–2010s (derived from Wood *et al.* 2018). Moreover, the redistribution of the population in winter suggests that sites not previously identified as being of international importance may now have reached qualifying levels (*i.e.* regularly holding ≥ 1% of the total population, in accordance with Ramsar Convention criteria; Scott 1980; Ramsar Convention 2017), or – conversely – sites which previously qualified may no longer support internationally important numbers of the species.

Here we therefore present the results of the most recent IBSC undertaken for the

NE/NW European Bewick's Swans, to determine the current status of the population and its distribution in winter. Moreover, we draw attention to sites now important for the birds in mid-winter, given the observed changes in their winter distribution. Particular attention is paid to sites in Germany, which historically was primarily important as a staging area for Bewick's Swans wintering in the Netherlands, Britain and Ireland, but where increasing numbers now remain over winter (Beekman *et al.* 2019). Additionally, annual productivity data (recorded for the population in December each year; *e.g.* Koffijberg 2024) are analysed to determine whether they explain any change in population size between 2015 and 2020. A population model is then used to predict trends in population size up to 2026, ahead of the next census in January 2026. The results will contribute to the review of the ISSAP for the NE/NW European Bewick's Swan population, which will include an assessment of whether a revision of the ISSAP is required.

Methods

Surveys

Internationally coordinated counts of Bewick's Swans in northwest Europe have been made in mid-January in 1984, 1987, 1990, 1995, 2000, 2005, 2010 and 2015, following the methods described by Beekman *et al.* (2019). The censuses were timed to coincide with the dates of national waterbird monitoring schemes contributing to the IWC, to achieve the highest coverage and also to avoid asking the counters to make two mid-winter surveys in census years. This continued in 2020 when the IBSC was conducted over the IWC weekend of 11–12 January 2020. Censuses of the Iceland/UK & Ireland and the NW Mainland European Whooper Swan *Cygnus cygnus* populations were also made at the same time, and the first of these has been reported separately (Brides *et al.* 2021), with the other still due for publication (totals mentioned briefly in Rees & Clausen 2024).

As in previous years, the 2020 IBSC was undertaken by a network of volunteer and professional ornithologists involved in national waterbird count programmes across the Bewick's Swans' main wintering areas. For the NE/NW European Bewick's Swan population, these were primarily in Belgium, Denmark, France, Germany, Ireland, the Netherlands, Poland and Britain but with countries further northeast along the migration route (Estonia, Latvia, Lithuania and Sweden) and those where small numbers regularly occur (Switzerland and Norway) also participating. In 2020, the IBSC was extended to incorporate Bewick's Swans wintering in countries ranging from the East Mediterranean to Central Asia for the first time, to obtain better information on the size and distribution of the Northwestern Siberia/Caspian population and provide a baseline for further monitoring of Bewick's Swans in this region. These counts, which include numbers recorded in Greece and Turkey, have been published (Rees *et al.* 2024) but are also considered here to provide context to changes observed in the NE/NW European population during the mid-winter period.

Counts were primarily made during daylight hours at the swans' feeding sites. Many observers recorded not only the number of birds present at a site, but also the age of the birds (*i.e.* the number of adults and cygnets aged), brood sizes, habitat, whether the swans were seen at a feeding or roost site (or both), and the name and coordinates for the site. Extra care was taken to avoid double-counting swans potentially seen both at their wetland roosts and their field feeding areas; for instance, if birds were first counted flying from the roost and the swans were then observed in the fields (for recording age and habitat data), only the peak count was included in the census total. As for previous censuses, sites were taken as being a single count area (*e.g.* a large lake), or as a complex of sub-sites (*e.g.* fields or smaller waterbodies used sequentially by a flock) within the area used by the swans around a larger roost site. Coverage was extended to areas known or suspected to be used by swans, to make the census as complete as possible, with opportunistic data provided by citizen-science portals (*e.g.* ornitho.de in Germany) also occasionally included if considered valid and useful by the national count coordinator. Aerial surveys are generally not used for the IBSC in Europe, because of extensive ground coverage and financial constraints, although they are used for censusing Whooper Swans in Iceland (Brides *et al.* 2021). Counts made up to two weeks either side of the census dates were included for sites not surveyed on the census weekend if the national coordinator considered that the risk of duplicate counts was low. For sites counted twice within the census period, the numbers recorded on the date closest to those made at other sites in the vicinity were used for determining the total population size, again to reduce the possibility of duplicate counts. All counts were sent to the national count coordinator (often the person also responsible for collating national IWC data) for verification, before being forwarded to the international IBSC coordinator for collation and analysis.

Treatment of census data

National counts recorded during the IBSC for Bewick's Swans in all countries of the swans' northwest European wintering range were summed for each census year, to describe population size and trends in numbers. Pearson correlations were used to test the association between national totals and population size for countries receiving a high proportion of the population in mid-winter (*i.e.* with > 5% of the population in at least one year), to determine whether trends in the national counts followed population trends in some countries but not in others. Numbers recorded in Greece and Turkey are also illustrated because, although the marked increase in the number of Bewick's Swans wintering on the Evros/Meriç Delta (on the border between Greece and Turkey) during the 21st century are considered to be mainly from the Northwestern Siberia/Caspian population, some population switching does occur and the level of population interchange remains uncertain (Rees *et al.* 2024).

Distribution data

Changes in geographic distribution over time were initially assessed as the proportion of the population recorded in the northeast (Germany, Denmark, Norway, Sweden, Baltic countries and Switzerland), central (Netherlands and Belgium), or southwest (Britain, Ireland and France) parts of their wintering range in each census year. Linear regressions (in Minitab version 14.1) were then used to analyse variation in the proportion of the total population (arcsine transformed for normality of residuals) recorded in these regions across census years. Additionally, maps of the swans' distribution were generated using QGIS 3.34 software (QGIS Development Team 2024) for years in which counts were recorded to site level (*i.e.* the IBSC from 1990 onwards), with data grouped onto 1° grids (geographic coordinates), to illustrate changes in the location of sites used by the swans over time. Mid points of the Bewick's Swans' wintering distribution in each census year were then determined by using the European Terrestrial Reference System (ETRS89, UTM zone 32) to convert the geographic coordinates for each census to a projected metric coordinate system. The mean location points and standard deviation ellipses (following the Yuill method; Yuill 1971) were calculated using the coordinates' data and also the number of swans counted at each site by the QGIS Standard Deviational Ellipse Plugin (Tveite 2016). By mapping the 2020 distribution data together in conjunction with those from the previous censuses, we aim to illustrate whether the northeasterly shift in the swans' mid-wintering distribution reported previously (see Beekman *et al.* 2019; Nuijten *et al.* 2020b; Linssen *et al.* 2023) has continued. Regression analyses of both the mean latitude and mean longitude in relation to the mean December–January temperatures recorded at the De Bilt weather station (in the centre of the Netherlands) in the census year (obtained from the Royal Netherlands Meteorological Institute website; KNMI 2025) – tested whether variation in these central locations was linked to differences between years in the prevailing temperatures at the time of the censuses. Linear regression was also used to analyse the mean location points in relation to year, to determine whether there was a significant northerly or easterly shift in the swans' distribution over time.

With the variation in total population size and distribution reported for Bewick's Swans since the IBSCs were initiated in the late 20th century, sites of international importance for the NE/NW European population in mid-winter may likewise have changed. We therefore mapped the sites with ≥ 1% of the total population size recorded for each of the censuses, with a view to identifying any sites with internationally important numbers of Bewick's Swans which may not yet be protected under national or international conservation legislation. For the 1% threshold, we used population size estimates derived from each IBSC, rather than from the periodical flyway assessments typically published by Wetlands International or by the AEWA Conservation Status Review.

Productivity data

Age counts made on the swans' wintering grounds in December have been used to assess the Bewick's Swans' breeding success on an annual basis over several decades, but particularly in the 21st century (Tijsen &

Koffijberg 2019, 2022; Prior *et al.* 2023; Koffijberg 2024). Analysis of variance was used to test whether the proportion of cygnets recorded within each country during the IBSC were consistent over time or varied between censuses. The proportion of cygnets were arcsine-transformed so that residuals met the test assumptions.

Population model

In order to predict what the total population size might be at the time of the next census (due to be held in January 2026), we developed a population model in R version 4.4.0 (R Core Team 2024). The model ran from 2010 to 2026, projecting the total number of swans each January (to match the timing of the censuses), based on breeding success and survival rates, together with the initial numbers of swans recorded in the 2010 census. The model consisted of three life stages: adults, yearlings, and cygnets (Supporting Materials Fig. S1). The initial number of cygnets in the model in January 2010 was 1,210, calculated as 6.7% (as per the December 2009 age assessment) of the 18,057 swans that were counted in the January 2010 census. The initial number of yearlings was 1,023, based on the 6.0% of cygnets recorded in the December 2008 age assessment, assuming that the total number of swans in 2009 was 18,786 (based on a linear interpolation of the 2005 and 2010 census totals) and the individual probability of survival from the cygnet to yearling life stages was put at 0.908 (from winter to winter, derived from resightings of colour-marked individuals included in an integrated population model; Nuijten *et al.* 2020a). Finally, the initial number of adults (including third-winter birds) in the model in January 2010 was 15,824, estimated as 18,057 (*i.e.* the total census count) minus the numbers of yearlings and cygnets. Following these initial swan numbers specified for 2010, the model projected the annual numbers of swans for each January from 2011 to 2026, the latter being the expected date of the next census. The model calculated the number of adults each year as the sum of (i) the product of the previous year's number of adults and the adult survival rate, and (ii) the product of the previous year's number of yearlings and the yearling survival rate. In the absence of survival estimates for recent years, we used the values reported by Nuijten *et al.* (2020a) to account for the uncertainty regarding the exact annual survival rates, with the model using Monte Carlo simulations to draw a survival value (based on a random uniform distribution) for each year from the 95% credible intervals reported by Nuijten *et al.* (2020a) for adults (0.869–0.877) and yearlings (0.917–0.954). Similarly, the model calculated the number of yearlings each year as the product of the previous year's number of cygnets and the cygnet survival rate, using a Monte Carlo simulation to draw annual survival values from the 95% credible intervals reported by Nuijten *et al.* (2020a) for cygnets (0.891–0.926).

Typically, population models use an estimate of the numbers of young produced per breeding adult in their calculations, but as such data are not available at the population level for the NE/NW European population of Bewick's Swans, we had to use an alternative approach. Our model estimated the number of cygnets produced each year by first calculating the percentage of the population that were "non-cygnets" (*i.e.* adults and yearlings), as the inverse of the percentage cygnet values determined in the age assessments (Supporting Materials Table S1). Once the model had already calculated the numbers of adults and yearlings (in the previous steps), we could estimate the total population size by first dividing the combined number of adults and yearlings by the percentage of adults and yearlings in the population (*i.e.* 100% minus the % cygnets observed in the age assessment). The difference between the total population size and the total numbers of non-cygnets therefore represented the number of cygnets produced each year. As the December 2025 age assessment has not yet taken place, the model used a Monte Carlo simulation for this final year of the simulation to draw a value for the percentage of cygnets (based on a random uniform distribution) from the observed range between 2008 and 2024 (*i.e.* 3.3%–13.9%; Table S1). Each model was run starting in 2010, so that we could compare the model projections with the totals recorded in 2015 and 2020 censuses. Whilst no formal statistical comparison could be achieved with only two data points, this nonetheless provided a visual assessment of whether the model projections appeared reasonable. We ran the model 10,000 times and extracted the mean projected population size for each year. Furthermore, to estimate the 95% confidence intervals associated with our projections, we ordered the 10,000 model projections numerically, and the lower and upper 95% CIs were taken as the 250th and the 9,750th simulations, respectively. The R code used to run the population model is available from the following figshare repository: https://doi.org/10.6084/m9.figshare.30005983.

Habitat data

The habitats used by the swans during the IBSC were noted where these could be ascertained, and were grouped into three main categories (pasture, arable and waterbodies) with the condition of the pasture (wet/dry; rough/improved), crop type (*e.g.* sugar beet, potatoes, maize, winter cereals) and whether the swans were on freshwater or coastal sites also recorded (see Supporting Materials Table S2 for the habitat codes). Mid-winter habitat use by the swans was then analysed by calculating the percentage of birds on pasture, arable crops and waterbodies, with linear regression analysis of the proportion of birds (arcsine transformed) on each habitat used to test for any trends in their use of feeding sites over time. The swans' use of different arable crops was also described in further detail.

Results

Population size and trends

In January 2020, a total of 12,702 Bewick's Swans were counted across northwest Europe. The total population size is however put at *c.* 12,930 birds, on the basis that numbers in Germany were closer to 5,900 individuals, rather than the 5,672 counted (Table 1). The marked decline in the NE/NW European Bewick's Swan population from its peak of 29,780 in 1995 therefore is continuing, and some stabilisation or reversal of the downward trend suggested by the 2015 IBSC (Beekman *et al.* 2019) has

Table 1. Total number of Bewick's Swans recorded by country during coordinated international censuses of the NE/NW European population from 1984 onwards.

Country	1984	1987	1990	1995	2000	2005	2010	2015	2020
Belgium	43	120	25	266	325	175	496	806	184
Britain	4,995	8,018	8,754	6,983	7,215	6,992	6,999	4,371	1,278
Denmark	427	91	606	928	363	402	7	747	786
Estonia	n/a	n/a	4	5	29	12	1	6	2
France	88	77	19	52	41	206	274	569	364
Germany	678	321	1,183	1,118	1,450	3,390	637	5,444	5,900**
Ireland (Northern)	130	107	504	145	35	13	1	0	0
Ireland (Republic of)	1,114	1,041	1,500*	435	347	211	100	21	12
Latvia	0	1	0	0	2	0	0	0	0
Lithuania	1	n/a	32	12	0	2	2	0	13
Netherlands	8,801	6,650	14,003	19,822	14,003	10,218	9,527	8,113	3,896
Poland	5	4	116	12	1	74	2	70	369
Sweden	0	1	0	0	1	0	1	0	123
Switzerland	1	5	2	2	2	3	8	1	0
Norway	1	0	0	0	2	4	2	1	3
TOTAL	**16,284**	**16,436**	**26,748**	**29,780**	**23,816**	**21,702**	**18,057**	**20,149**	**12,930**

Notes: 1984 and 1987 data are from Beekman *et al.* (1985) and Dirksen & Beekman (1991), with numbers in Denmark in 1987 updated (from a previously published total of 22 birds) following Nielsen *et al.* (2019). * = number estimated for the Republic of Ireland because the main census was for the Icelandic Whooper Swan population the following year (in 1991; Kirby *et al.* 1992; Rees *et al.* 1997). ** = number estimated for Germany, rather than the number counted (5,672 birds) in 2020. n/a = no data available. A single Bewick's Swan was recorded in Austria in 2000, but none were found among Whooper Swans during the international swan censuses in other years.

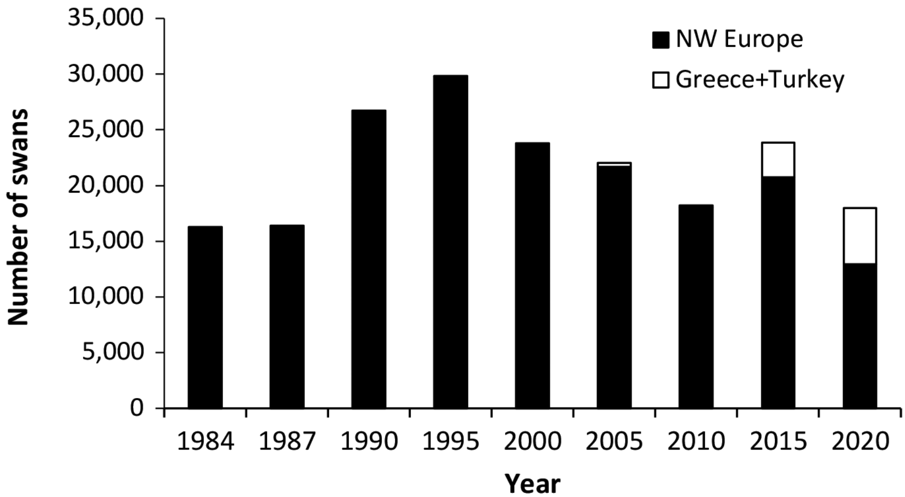

Figure 1. Numbers of Bewick's Swans in the NE/NW European population, counted during the international swan censuses made across northwest Europe in 1984–2020 inclusive. Counts from Greece and Turkey, recorded in the mid-January international waterbird censuses (IWC) during swan census winters from 1995 onwards, are also included but the low numbers in some years (9 in 1995, 0 in 2000, 350 in 2005 and 161 in 2010) are not evident. Bewick's Swans were considered to be vagrants (small numbers only) in these two countries during the 20th century.

not been sustained (Fig. 1). The population size of 12,930 in 2020 indicates a 56.6% decrease over the 25-year period from 1995–2020, giving an annual average exponential decline of 3.3% per year. Moreover, there were 36.0% fewer than the 20,149 birds counted in the previous census in 2015, a decline of 8.5% per year over the most recent 5-year period (Table 1). Even if all Bewick's Swans counted in Greece (3,679) and Turkey (1,374) during the IBSC could be attributed to the NE/NW European population, which is clearly not the case (Vangeluwe *et al.* 2018), the population would still be in decline (Fig. 1).

Changes in distribution

The variation in total population size over time coincided with changes in the numbers counted in the Netherlands in mid-winter, with an initial increase up to 1995 followed by a decrease (Fig. 2). The correlation between the national count and total population size was statistically significant for the Netherlands (Pearson correlation: $r_8 = 0.946$, $P = 0.001$; Fig. 2), but not for the other countries (Britain, Ireland and Germany) where at least 5% of the population has been recorded (Britain: $r_8 = 0.605$, $P = 0.08$; Ireland: $r_8 = 0.264$, $P = 0.49$; Germany: $r_8 = -0.275$, $P = 0.48$; n.s. in each case).

There was a significant decrease since the 1980s in the proportion of birds in the southwest (linear regression: $F_{1,8} = 6.54$, $P = 0.038$; Fig. 3a) and a significant increase in the proportion in northeastern countries in mid-winter ($F_{1,8} = 9.85$, $P = 0.016$; Fig. 3b), whilst the trend for the central

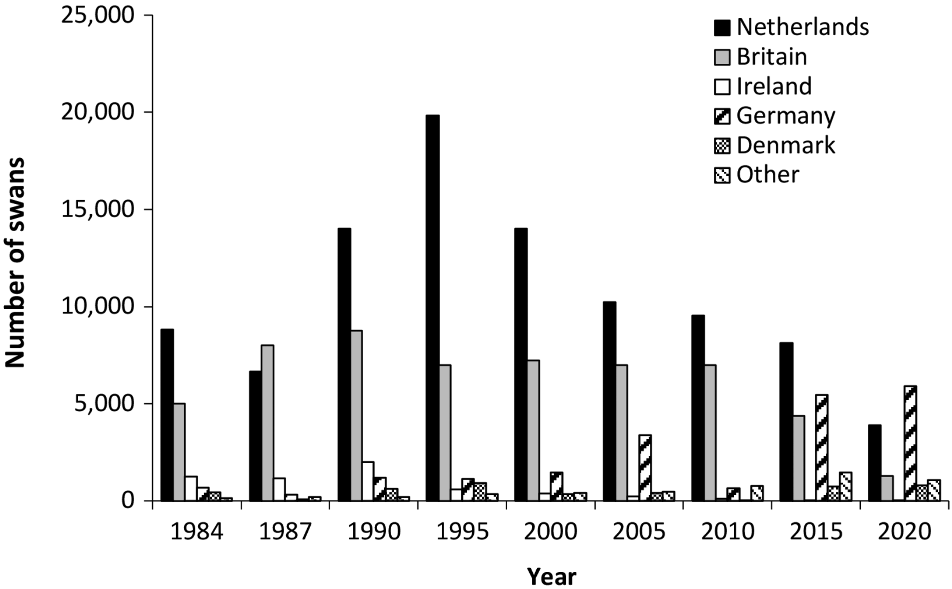

Figure 2. Total number of swans recorded in each range country during the International Bewick's Swan Censuses (IBSC) for the NE/NW Bewick's Swan population.

region (Netherlands and Belgium) was not significant ($F_{1,8}$ = 1.60, P = 0.25, n.s.; Fig. 3c). Counts for Britain remained stable at *c.* 7,000 individuals from 1995–2010 inclusive before decreasing by 37% to *c.* 4,300 in 2015 and a further 71% to *c.* 1,300 in 2020; a drop of 82% over the 10 years from 2010–2020 (Fig. 2; Table 1). Further west, the major decline in numbers in Ireland reported in Beekman *et al.* (2019) continued, with only 12 recorded in Northern Ireland and the Republic of Ireland combined in 2020, although interestingly the count of 364 wintering in France was the second highest for the country during the 2020 IBSC (Table 1). In contrast, most of the increase in the proportion of Bewick's Swans wintering further northeast is reflected in the increasing numbers remaining in Germany in mid-winter, with a count of 5,672 counted and 5,900 estimated for the country in January 2020; 45.7% of the total population of 12,902 birds. Numbers in Poland and Sweden also increased, to 369 and 123, respectively, but these contributed much lesser to regional totals.

Maps of the Bewick's Swans' distribution (Fig. 4) also illustrate a northeasterly shift in their mid-winter core areas since the 1990s, but this was not statistically significant on analysing variation in their central location over time ($F_{1,6}$ = 1.02, P = 0.36 and $F_{1,6}$ = 5.63, P = 0.06 for latitude and longitude, respectively, n.s. in each case; Fig. 5). Analysis of the mean latitudes recorded for the population in relation to the mean December–January temperatures for the centre of the Netherlands in census years suggested that the centre of the population was further north in milder

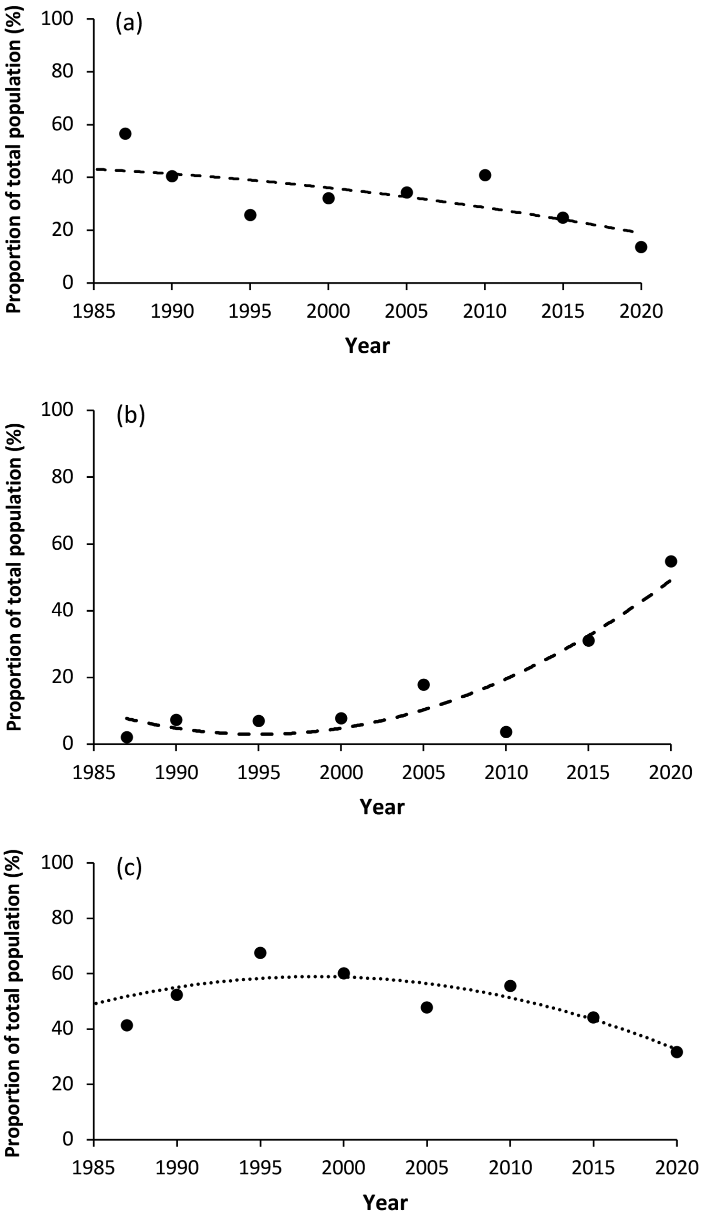

Figure 3. Variation over time in the proportion of Bewick's Swans of the NE/NW population, recorded in different regions during mid-winter. (a) = southwest region (Britain, Ireland and France), (b) = northeast region (Germany, Denmark, Norway, Sweden, Baltic countries and Switzerland), and (c) = central region (Netherlands and Belgium). Dashed line = statistically significant trend; dotted line = not significant.

winters, but this was not statistically significant ($F_{1,6}$ = 6.40, P = 0.53, n.s.; Fig. 6a), and analysis of the longitude data likewise found that the swans were not significantly further east in warmer years ($F_{1,6}$ = 0.49, P = 2.48, n.s.; Fig. 6b).

Sites of international importance

Overall, 78 sites reported internationally important numbers of Bewick's Swans in at least one of the IBSC during 1990–2020. Most (50) were in the Netherlands, but there were also 17 in Germany, 7 in Britain and 1 each in Belgium, Denmark, France and the Republic of Ireland (Fig. 7). Of these, only the Ouse Washes (Britain) and Alblasserwaard (Netherlands) had ≥ 1% of the census total in each of the censuses, whilst the Nene Washes (Britain) and Eempolders (Netherlands) had internationally important numbers in 6 of the 7 censuses.

Whilst the Ouse Washes and Nene Washes remained important sites for the species in the most recent census, a striking feature of the 2020 counts was the number of sites with > 1% of the population in Germany for the first time. Nine in all, in contrast to only four sites during the censuses prior to 2010 (Fig. 7), reflecting the eastward shift in the swans' mid-winter distribution. One site in Denmark (Tipperne) and one in France (Lac du Der-Chantecoq) also, notably, had internationally important numbers in January 2020 but not in the earlier censuses.

A total of 17 sites had internationally important numbers of Bewick's Swans during the IBSC 2020, which is in line the number of key sites in previous censuses (17–22 in 1990–2015 inclusive). These sites held a total of 6,836 swans (52.9% of the population), in comparison with 57.0%–76.6% in the 1990–2015 censuses (Beekman *et al.* 2019), indicating that the swans were dispersed into smaller groups in 2020 than previously. Indeed, both 2015 and 2010 saw the lowest concentration of swans at key sites of all the censuses since 1990, suggesting a more dispersed distribution. The highest congregations at key sites were recorded in January 2010 (76.6%), following a spell of very cold weather throughout northwestern Europe. In January 2020, the maximum count of 1,129 birds (8.8% of the total population) was made at Lake Veluwemeer in the Netherlands.

Productivity

The January 2020 census found a much lower percentage of cygnets in the population than the previous IBSC, indicating that 2019 was a poor breeding season for the NE/NW European population. Overall, there were just 6.9% cygnets (n = 7,198 birds aged) in January 2020, with a mean brood size of 1.9 (227 cygnets in 122 families where brood size was recorded), compared to 9.6–13.2% cygnets in previous IBSC (Fig. 8; Supporting Materials Table S3). The January 2020 proportion of cygnets was however in line with the 6.6% cygnets recorded during the December 2019 age counts; *i.e.* for the same breeding season (Table S1). Although the proportion of cygnets recorded varied between countries, no country had a consistently higher or lower proportion of cygnets in the flocks over the years (ANOVA: $F_{5,25}$ = 1.79, P = 0.15, n.s.; Fig. 8).

A visual assessment of the population trend projected by our population suggested

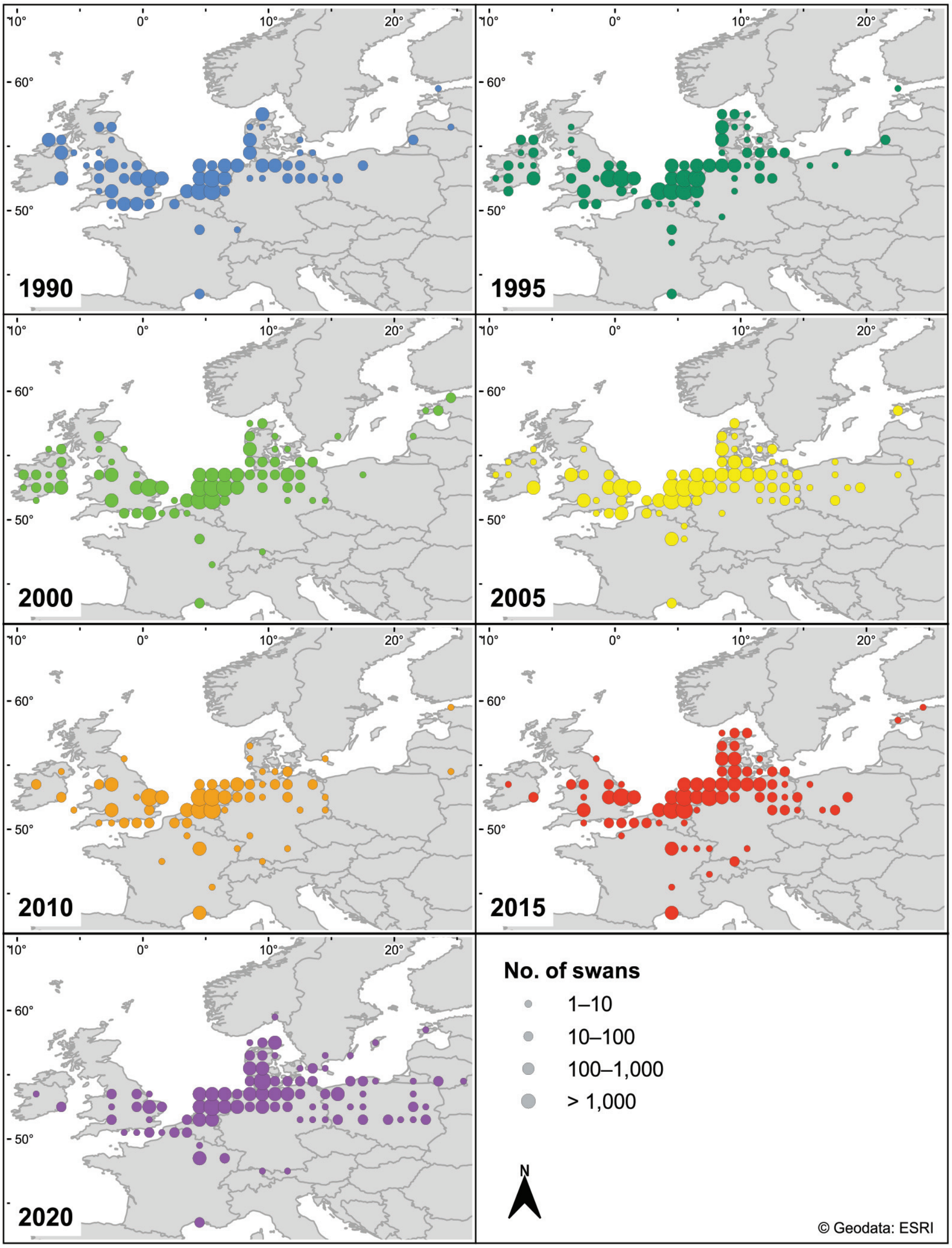

Figure 4. Distribution of Bewick's Swans of the NE/NW population during the international censuses in January 1990, 1995, 2000, 2005, 2010, 2015 and 2020, aggregated into 1° × 1° grid squares (geographic coordinates).

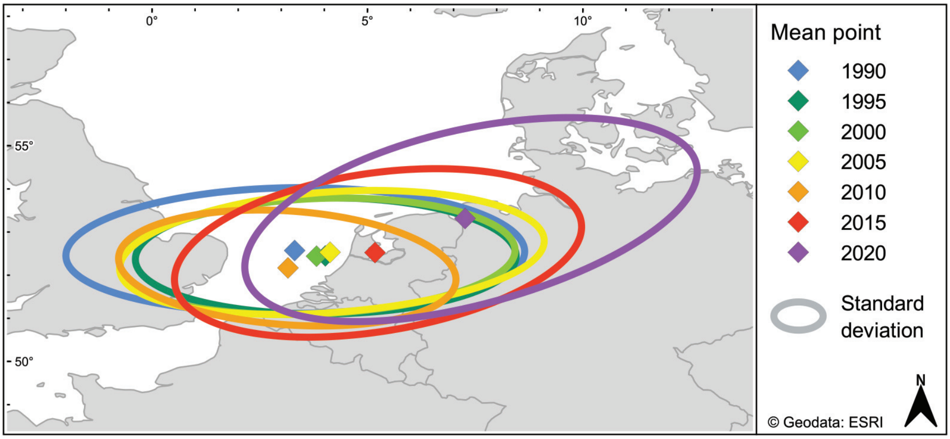

Figure 5. Central midpoint (mean location) of the NE/NW European Bewick's Swan population during the mid-January international censuses.

that the model output was a reasonable match to the observed counts made during the 2015 and 2020 censuses (Fig. 9). For 2015, the model projected a mean (± 95% CI) population size of 17,206 (17,005–17,409) individuals compared with the 20,149 counted in the census, whilst for 2020 the model projected 13,358 (13,139–13,577) relative to the 12,930 estimated from the census results. Our population model projected a mean count of 11,068 individuals (95% confidence interval = 10,414–11,761) in January 2026 (Fig. 7), which would represent a mean decrease of 14.4% since the count of 12,930 birds in 2020. The lower and upper bounds of the 95% CIs for our model projections would represent decreases of 19.5% and 9.0%, respectively. The trend in the model projections suggested that the relatively high breeding success values in 2021 and 2022 (11.0 and 13.4%, respectively; Table S1) had resulted in a small increase in the mean population size, from 12,681 in January 2022 to 12,911 in January 2023 (Fig. 9); however, lower values in subsequent years (in particular the 3.3% recorded in December 2024) resulted in a projected decline in numbers.

Habitat use

The proportion of Bewick's Swans recorded feeding on grasslands has declined since the mid-1990s and this trend continued in 2020, with 75.8% on pasture in 1995 dropping to 30.8% in 2020 (linear regression: $F_{1,6} = 21.23$, $P = 0.006$; Fig. 10a). There was a corresponding increase in the proportion using arable land over the same period, from 17.4% in 1995 to 46.7% in 2015 though the proportion on arable sites did drop to 38.4% in 2020 ($F_{1,6} = 11.05$, $P = 0.02$; Fig. 10a). More swans were reported on waterbodies during the 2020 IBSC than in previous censuses, with 27.9% (3,019 of 10,811 swans where habitat was recorded), but there was no indication of a trend over time ($F_{1,6} = 0.83$, $P = 0.41$, n.s.). Other habitats, continued to be used relatively

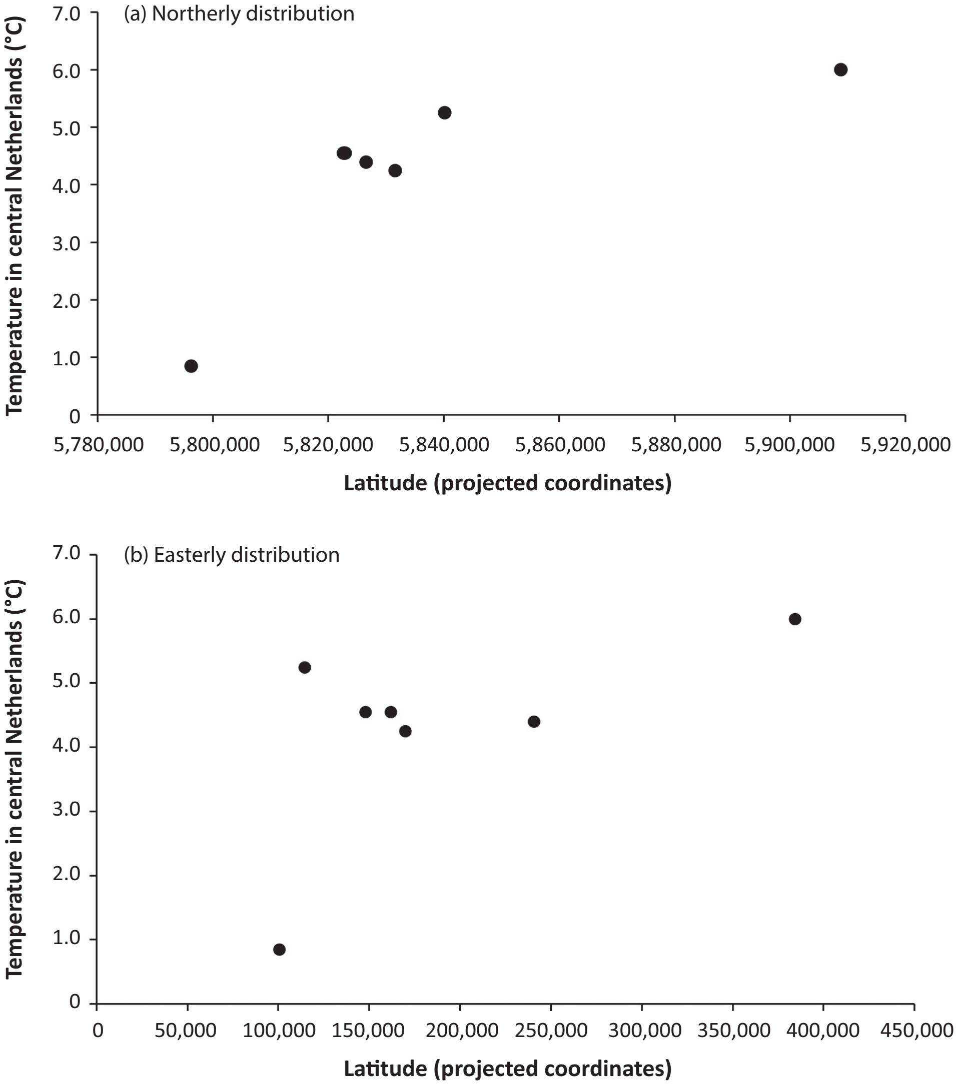

Figure 6. Mean coordinates (ETRS89, UTM zone 32) recorded for the NE/NW European Bewick's Swan population, in relation to the mean January temperatures for the centre of the Netherlands, during census years. The association between temperature and swans' (a) northerly and (b) easterly distribution were not statistically significant.

infrequently, accounting for 0.0–4.2% of birds where the habitat was recorded during the census, with 2.9% on "other" habitats in 2020.

The crops used by Bewick's Swans at arable sites varied quite markedly between years, although cereals were consistently important (used by 13.4%–56.8% of the

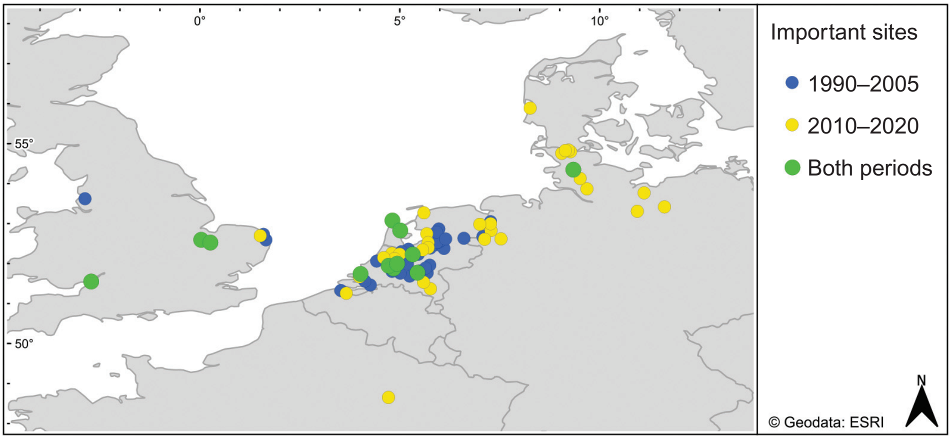

Figure 7. Location of sites of international importance (supporting ≥ 1% of the NE/NW European Bewick's Swan population) recorded during the international censuses in January 1990–2005 (in blue) and 2010–2020 (in yellow), or during both periods (in green). Note: this is a snapshot of the location of key sites, based on mid-January census data recorded every five years.

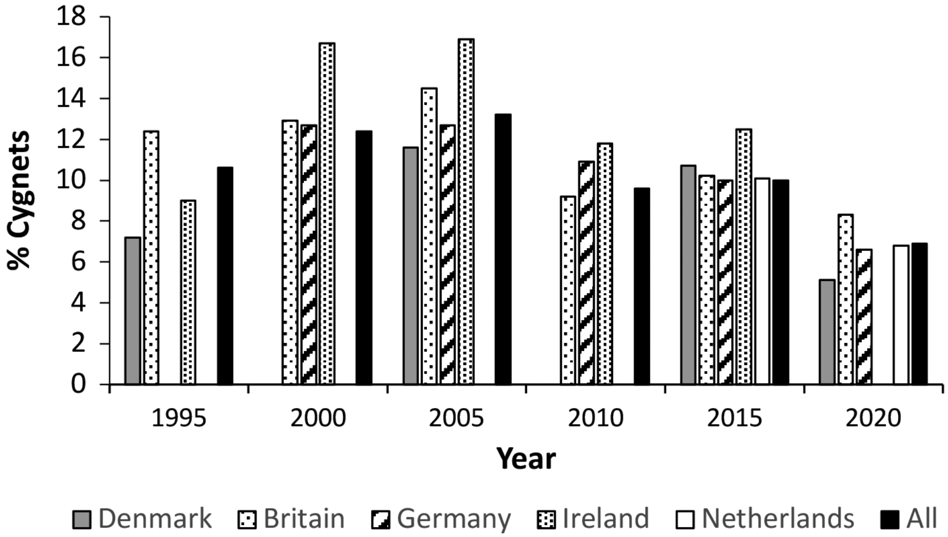

Figure 8. Percentage of cygnets recorded in flocks counted during the International Bewick's Swan Censuses. Note: age counts were recorded during the censuses (in mid-January), so data for the Netherlands are given only for 2015 and 2020, because Dutch age-counts generally are made in November–December each year. Sample sizes are given in the Supporting Materials (in Table S3), and years when < 15 Bewick's Swan were aged (*i.e.* Denmark in 2010; Ireland in 2020) are also not illustrated.

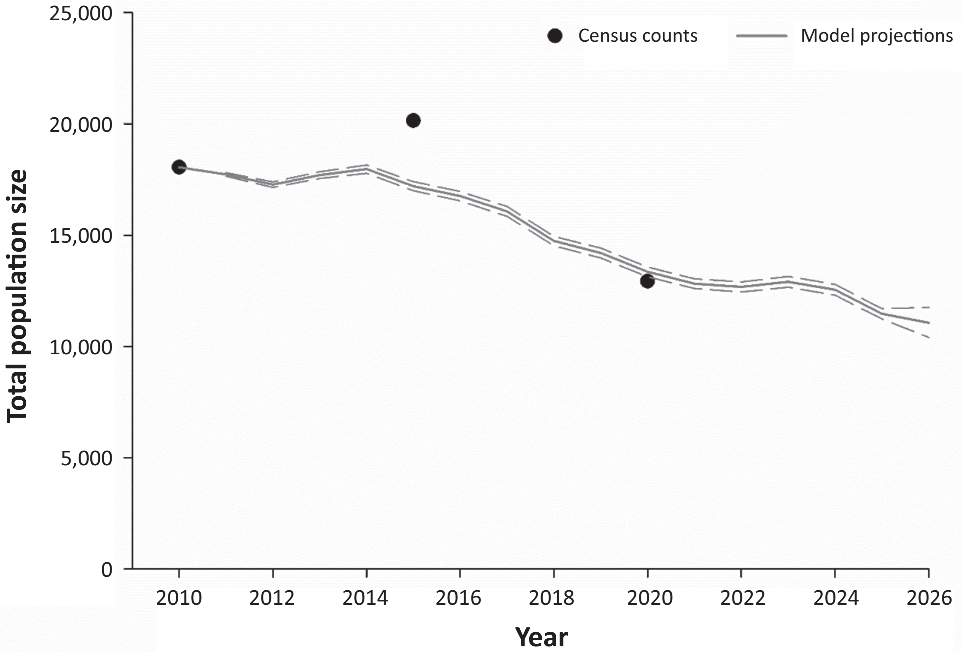

Figure 9. The mean (± 95% CI) numbers projected by our population model (see Methods for details) for the NE/NW European Bewick's Swan population, compared with the census totals recorded in 2015 and 2020.

swans where habitat data were recorded during the IBSC), and with more swans (31.7%) reported on maize fields in 2020 than in previous censuses (Fig. 10b). Overall, of the swans seen on arable land where crop type was recorded (*n* = 28,531 for all censuses), 41.7% were on winter cereals, 22.7% on sugar beet, 12.8% on stubble fields (crop type not recorded), 9.3% on oilseed rape, 3.5% on potatoes, 6.8% on maize and 3.2% on "other" crops (Fig. 10b).

Discussion

Population size and trends

The results of the January 2020 IBSC indicate that the marked 56.7% decline in numbers in the NE/NW European Bewick's Swan population, from the peak count of 29,780 birds recorded in 1995 is continuing, with an annual average decrease of 3.3% per year over the 25-year (1995–2020) period. The 10-year decline, from 2010 to 2020, is of 45.8%. Moreover, the population estimate of 12,930 birds in 2020 is a 36% drop on the previous estimate of 20,149 birds counted in January 2015, a decline of 8.5% per year between the two censuses, indicating that the tentative evidence for stabilisation in the population decline at *c.* 20,000 birds between 2010 and 2015 (Beekman *et al.* 2019) was not sustained. The population model presented here found that the productivity data recorded across northwest Europe each

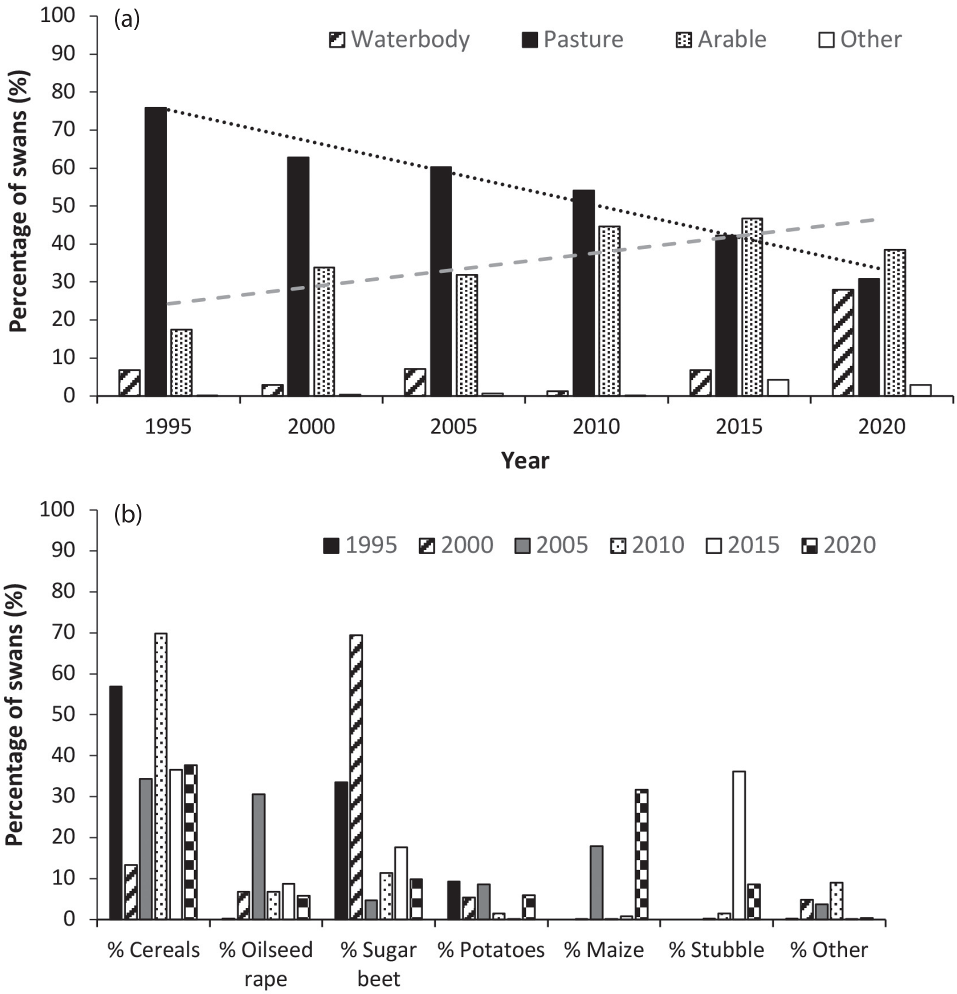

Figure 10. Percentage of Bewick's Swans recorded on different habitat categories during the International Bewick's Swan Censuses: (a) the relative use of different habitats, and (b) the relative use of different types of arable crops in each census year. Note: habitat data were available only for the Netherlands, Baltic countries and one site in Poland in 1990, so data are presented for 1995 onwards.

winter could explain the decreasing numbers from 2010 to 2020 inclusive, on assuming that survival rates were within the 95% credible intervals reported by Nuijten *et al.* (2020a), which suggests that the decline is attributable to recent poorer productivity rather than to population interchange/switching (which is discussed further below). Separate reassessment of survival rates is however required, to determine which assumptions regarding adult, yearling and cygnet survival probabilities still hold.

Although the major decrease in Bewick's Swan numbers reported here is at the population level, rather than for Bewick's Swans globally, it is of major conservation concern. A decline approaching 25% over ten years can result in a species being classified as Near Threatened in the IUCN Red List and a decline of 30% decline over ten years triggers a species being classified as Vulnerable. Given the decline for the NE/NW European Bewick's Swan population, the status of the other populations should be updated to assess medium and long-term trends for the species as a whole. There was a slow increase in the relatively small Northwestern Siberia/Caspian population (currently estimated at 6,000–13,000 birds) during 2000–2015, followed by a period of rapid increase during 2015–2017, but this was followed by a weak decline in 2017–2022 (Rees *et al.* 2024). Moreover, the more abundant East Asia population (estimated at *c.* 105,000 birds in 2020) is thought to be stable or decreasing (Fang *et al.* 2020; Rees & Clausen 2024). Trends, and factors affecting these trends, therefore need to be monitored very closely for the Bewick's Swan globally. The Bewick's Swan is classed as a subspecies of the Tundra Swan *Cygnus columbianus*, and the New World subspecies *Cygnus c. columbianus* remains abundant and is hunted in North America (Limpert *et al.* 2020), but the subspecies are easy to distinguish with Bewick's Swans having more extensive yellow markings on the bill, as well as being slightly smaller and with a more musical call (Cramp & Simmons 1977). As they were considered to be separate species historically, with the matter being debated up until the American Ornithologists' Union reclassified Whistling Swans as Tundra Swans in the 1980s (American Ornithologists' Union 1983; Limpert *et al.* 2020), it is possible that they may in future again be treated separately by the IUCN for Red List purposes.

Changes in distribution

The response of migratory waterbirds to climate change, including on their choice of wintering areas, is becoming increasingly apparent with the tendency for Arctic breeding species to winter closer to their breeding grounds – thus shortening their migration distances – increasingly being described (*e.g.* Fox *et al.* 2016; Podhrázský *et al.* 2017; Heldbjerg *et al.* 2024). Previous analysis of IBSC data found that, although there was a significant decline over time in the proportion of the population wintering in countries in the western part of the wintering range (notably Ireland), with an increase in the proportion wintering in more easterly countries (notably Germany), there was no statistically significant temporal trend in the mean latitudes and longitude data indicative of a northeasterly shift in the swans' distribution in the census years (Beekman *et al.* 2019). With the benefit of the 2020 data, the analyses were repeated and gave similar results, with the proportion of swans in the southwest (in Britain, Ireland and France combined) decreasing, whereas those in the northeast (in Germany, Denmark, Norway, Sweden, Baltic countries and Switzerland) increased. But there was no overall trend for Bewick's Swans wintering in the central region (the Netherlands and Belgium) and, although the maps indicated an increasing shift towards a more northeasterly distribution, temporal trends in the mean latitudes and longitude data were not statistically significant. The lack of a trend, perhaps because latitude and longitude were treated separately, but also because the relatively small number of censuses, means that there are few data points to include in such an analysis, resulting in low statistical power. That the decline in numbers in the central region commences in 1995 (Fig. 3c), and a trend from 1985 therefore would not be linear, may also explain the non-significant result. The lack of Bewick's Swans in Ireland, which received *c*. 5% of the population as recently as 1990, represents a local extinction, with recent counts finding just one Bewick's Swan in winter 2023/24, and no overwintering Bewick's Swans on the island of Ireland for the first time in winter 2024/25 (B. Burke, pers. comm.). There may be cold weather movements to the country in future, but currently it seems likely that the Bewick's Swan will no longer be a regular winter visitor to Ireland.

Beekman *et al*. (2019) did find that Bewick's Swans occurred significantly further north, but not further east, in years with milder winters in the Netherlands, suggesting that the swans may be able to make increased use of more northerly sites should warmer winters become more frequent as a result of climate change. Whilst this association did not reach statistical significance on including the 2020 data (P = 0.053), given the small sample size (n = 7 years) the results do indicate a continuing tendency, and conditions further east (*e.g.* in Poland and Germany) therefore need to be considered more carefully. Moreover, detailed analysis of winter site selection by individual Bewick's Swans, identified both by leg rings (Nuijten *et al.* 2020b) and by GPS tags fitted to the swans (Linssen *et al.* 2023), have described the importance of weather conditions on the migration distance flown ("short-stopping"), time spent in the wintering range ("short-staying") and the day-to-day decisions taken by the birds on whether to continue their autumn migration. It should be emphasised that the IBSCs have only been conducted every fifth year for most of the study period, and do not track what happens in the years in between. Thus in Denmark, where annual midwinter censuses are available since January 1983 (except 1986), the wintering population is fluctuating, with low numbers in colder years (*i.e.* 1987, 1995, 1996, 2003, 2010, 2011, 2013) and higher numbers in milder years, but this was not captured by the IBSC censuses. Numbers recorded in Denmark in recent years were in fact higher in seven of the eight years between 2014 and 2023 (ranging from 992–1,902 birds; Nielsen *et al.* 2024) than those recorded in the two IBSC years 2015 (747 birds) and 2020 (786 birds). Hence, the Danish wintering proportion of the population is steadily growing, which adds weight to the northeasterly shift in distribution described here and by other studies.

The changes in winter distribution illustrated by the international counts, which are also shown by the movements of individually marked swans (Nuitjen *et al.* 2020b; Linssen *et al.* 2023), have consequences for the location and management of key sites for Bewick's Swans. This is especially obvious on considering Germany, which prior to 2010 had only four sites with ≥ 1% of the total population during the mid-winter IBSC, but in 2020 had nine out of 17 sites of international importance during the census. This implies that existing networks of key sites – *e.g.* Special Protection Areas (SPA) which are designated for the protection of listed species under the EU Bird Directive – should be critically reviewed in light of these changes in distribution, with potentially new sites also taken into account during national and international evaluation and assessment processes (see below). In this context, it should be noted that during the 2020 census (and also in January 2015) slightly more than 50% of the swans were concentrated at key sites, whereas this was on average 62% from 1990 to 2005 (on excluding January 2010, which was a cold winter with heavy snowfall in parts of the range), showing that they were more widely dispersed in recent winters.

Changes in habitat use

During the late 20th century, Bewick's Swans were found to be feeding primarily on pasture during the IBSC, but the proportion found on grassland habitats steadily declined whilst the proportion on arable crops increased over the same period. In 2015 more swans were found on arable sites than on pasture for the first time, and habitat data reported for swans during the 2020 census indicated that this pattern had continued. The proportion feeding in waterbodies showed little variation over time except for a marked increase in 2020, largely attributable to 1,129 Bewick's Swans (37% of the 3,019 on wetland habitats) on Lake Veluwemeer and a further 294 on the adjacent Lake Wolderwijd in the Netherlands, where improved water quality at both sites has resulted in increasing the growth of submersed macrophytes such as stoneworts *Chara* sp., which provide food for the swans (van den Berg *et al.* 1998; Tijsen & Koffijberg 2015) until well into the midwinter period.

The proportion of swans reported on different arable crops during the January 2020 census indicated that autumn-sown winter cereals continue to be an important food source in mid-winter, and that use of harvest remains of sugar beet continues to decline. This may reflect decreased availability of sugar beet in January, either by more efficient harvest techniques and/or ploughing earlier to maximise use of the land (there being no general decline in the area put to sugar beet; European Association of Sugar Manufacturers 2025). More swans were reported on maize fields in 2020 than in previous censuses, which may reflect increased availability of maize within the swans' wintering range as well as the swans selecting it as a high carbohydrate food source (Clausen *et al.* 2018) in mid-winter. Interestingly, although arable crops continue to be the main feeding habitat for the swans, the percentage of the birds recorded on arable land was lower in 2020 than in 2010 and 2015, perhaps as a result of them feeding in higher numbers on aquatic macrophytes at the permanent waterbodies. Changes in habitat use over the years may also be associated with the shift in distribution (and consequently changes in the habitat on offer in the various countries of the swans wintering range), changes within countries in the growing of particular crops as a result of warmer weather, or a combination of these factors. For instance, the swans fed primarily on grasslands when wintering in Ireland during the 1990s (although they did also use sugar beet fields; Robinson *et al.* 2002), and that very small numbers now winter in the country may have at least partly contributed to the decrease in the proportion feeding on pasture in comparison with arable sites.

Population interchange

During the second half of the 20th century the number of Bewick's Swans in the NE/NW European Bewick's Swan population was increasing, and only a handful of individuals wintered in southeastern Europe, thought to be vagrants from the Northwestern Siberia/Caspian population which wintered mainly around the Caspian Sea. The decline in numbers wintering at the swans' traditional sites in NW Europe however coincided with an increase in numbers wintering on the Evros/Meriç Delta on the Greek-Turkish border increasing from just a handful of birds present up to the mid-1990s to 8,400 counted in February 2016 (Litvin & Vangeluwe 2016; Vangeluwe *et al.* 2016, 2018). Although the increasing numbers in Greece did not offset the drop in numbers recorded for the NE/NW European population (Beekman *et al.* 2019; Fig. 1), determining the extent to which Bewick's Swans wintering in Greece represented a redistribution of swans from traditional NW European wintering sites, or a shift in distribution and concurrent increase in the Northwestern Siberia/Caspian population, was included as an action for investigation within the ISSAP (Nagy *et al.* 2012).

On planning the January 2020 IBSC, the census was extended to include areas considered to be the wintering grounds of the Northwestern Siberia/Caspian population, and population size was put at 6,000–13,000 birds, pending further comprehensive surveys of the whole region (Rees *et al.* 2024), and this provides baseline data for comparing population trends for the two populations into the future. Meanwhile, given that adding the 5,053 Bewick's Swans counted in Greece and Turkey in January 2020 (from Rees *et al.* 2024) to the 12,930 estimated for NW Europe amounted to only 17,983 birds in Europe, and noting that tracking data has shown that a proportion of the birds wintering in Greece migrate along the eastern side of the Ural Mountains, through northern Kazakhstan and the Caspian region (*i.e.* the flyway of the Northwestern Siberia/Caspian population) to winter on the Evros/Meriç Delta (Vangeluwe *et al.* 2018) it seems that, although it may play some role, the ongoing decline in the NE/NW European Bewick's Swan population is not solely or even primarily attributable to a redistribution of swans to the Caspian region (see also Wood *et al.* 2018). Instead there is increasing evidence that low productivity is a main reason for the decline (Nuijten *et al.* 2020a; this study).

Sites of international importance

The new population estimate of 12,930 Bewick's Swans has major implications for identifying sites of international importance which warrant protection for the species, with the threshold level for such sites (*i.e.* those which regularly receive ≥ 1% of the total population of a species or subspecies; Ramsar Convention 2017) being now much lower (at 129 birds) than during the 1990s (290 birds). The sites listed here, which were found to have internationally important numbers during the IBSC provide only a snapshot of key sites, because of the infrequency of the censuses and the IBSC also do not capture the main autumn and spring staging sites and breeding areas crucial for the species. They do however serve to flag the importance of Germany now, and potentially Poland in future, in providing feeding and roosting sites for the swans in mid-winter. During the 20th century Germany was important for Bewick's Swans mainly during their spring staging period rather than in mid-winter, but it held nearly half (45.7%) of the total population in January 2020. Whilst nine sites in Germany were recorded with internationally important numbers in the 2020 IBSC, interestingly only two were among the seven sites with internationally important numbers during previous censuses, suggesting that the swans are quite changeable in their use of wintering sites in Germany. Moreover, it is worth noting that, as in 2015, the nine sites identified almost certainly underestimates the number of sites in Germany receiving ≥ 1% of the total population in mid-winter, because much of the data were provided at the flock/subsite level. The key sites for Bewick's Swans in Germany therefore should be assessed more carefully at the national level, including determining links between sites and their importance at different times of the migration and wintering seasons, to determine whether they have protected status and to inform appropriate conservation strategies. This holds true more in general for other countries as well, and is also an important evaluation in the context of the upcoming revision of the ISSAP.

As for previous IBSCs, all sites in Britain and Belgium were identified as key sites for the species in the ISSAP for the Northwest European Bewick's Swans (Nagy *et al.* 2012; Beekman *et al.* 2019), and have also been designated as SPAs, but 10 (63%) of the 16 sites in the Netherlands with ≥ 1% of the Bewick's Swans counted in at least two of the censuses have not yet been protected as SPAs under the EU Birds Directive, including four listed within the ISSAP for the Netherlands. In contrast with other countries, SPA designations in the Netherlands focus mainly on wetlands and therefore do not cover feeding sites on farmland used by herbivorous waterbirds such as Bewick's Swans, with some of these areas listed only as Important Bird Areas (IBAs). The Lac du Der-Chantecoq in France is protected through being listed not only as an IBA but as a Key Biodiversity Area (KBA) and as a Ramsar Site, but it too is not listed as an SPA. Tipperne, on Ringkøbing Fjord in Denmark, is protected as part of the Ringkøbing Fjord Ramsar site and as SPA No. 43. Of the nine sites in Germany, the Eider-Treene-Sorge-Niederung in Schleswig-Holstein is protected as a Natura 2000 site and Fischteiche der Lewitz in Mecklenburg-Vorpommern is listed as an IBA, KBA and SPA, but multiple other sites are currently not protected through EU, IUCN or Ramsar designations. Sites that regularly receive internationally important numbers of Bewick's Swans, and the extent to which they are protected, should be studied in greater detail for a future publication, taking into account counts made annually (not just in census years) and seasonal variation in distribution so that important staging areas are included. This should form part of national assessments of whether a network of key feeding and roosting sites chain of key sites is being sustained (as required by the ISSAP; Nagy *et al.* 2012), at least in preparation of the revision of the ISSAP for the NE/NW European Bewick's Swan population.

Even for sites that have been protected, more detailed studies of the swans' use of local areas have illustrated that feeding and even roosting areas may fall outside the SPA or Ramsar site boundaries. Here we also visualise "sites" at the level provided by counts, without considering adjacent sites that might have to be merged in a more detailed (national) account. Increasing use of arable crops by Bewick's Swans over the decades means that, although their wetland roost might be protected, they would spend much of the day feeding in fields away from the protected areas. In some regions, the creation or restoration of waterbodies also may draw birds away from protected sites. GPS tags fitted to both Whooper Swans and Bewick's Swans wintering at the Ouse Washes SPA and on adjacent fields in southeast England not only illustrated the swans' use of farmland during the day and their return to designated reserves to roost at night, but also found that they would use alternative roosts (notably irrigation reservoirs) outside the SPA in warmer conditions and when river levels were high (Wilson *et al.* 2025). Restoration of large lakes in Denmark also resulted in a shift in the distribution of geese and swans, with new roosts established adjacent to farmland in inland areas being found and utilised by the birds (Clausen *et al.* 2019). Further investigation of the precise locations of feeding flocks and their interaction with waterbodies used for roosting is therefore required, to describe the main areas used by the birds and proportion of time spent outside SPA boundaries, for assessing whether additional conservation measures (*e.g.* agri-environment schemes) are warranted, not only for the swans but for other species using these sites. A number of sites which were once important for the swans but are no longer used by the species, particularly in the western parts of the range, should for now retain their protected status both for their continued importance for other species (*e.g.* the increasing numbers of Whooper Swans wintering on the Ouse Washes in southeast England; Brides *et al.* 2021) and to maintain a network of sites that would permit recovery of the NE/NW European Bewick's Swan population or serve as refuge sites during harsh winters, when the swans may fly further south and west, and find their former wintering sites.

Future prospects

Overall, the ongoing decline of the NE/NW European Bewick's Swan population described in this paper, which is projected to have decreased further since 2020, is not only of concern but corresponds with trends noted for some other Arctic-breeding waterbirds, such as the Lesser White-fronted

Goose *Anser erythropus* and the Greenland White-fronted Goose *A. albifrons flavirostris* (Jones *et al.* 2008; Stroud *et al.* 2012; Fox *et al.* 2025). That the decline seems to be associated with low productivity may be difficult to address, given the size and location of the swans' breeding grounds in the Russian Arctic. Moreover, the reasons underlying the low productivity are unclear and may be complex (as illustrated for Dark-bellied Brent Geese *Branta b. bernicla*; Ebbinge *et al.* 2025), with cold weather and higher numbers of predators (*e.g.* Arctic Foxes *Vulpes lagopus*) having an influence in some years (Wood *et al.* 2016). Still, the potential for conditions (particularly food resources) at staging sites to have carry-over effects into the breeding season should receive further attention. Improving conditions for the swans not only at staging sites but also on the wintering grounds (*e.g.* by maintaining the network of suitable habitats, and reducing the threat of lead poisoning, collision with infrastructure and illegal shooting, as listed in the ISSAP), to ensure that winter mortality is kept to a minimum, therefore is increasingly important, because, although these threats may not be the main cause of the decline tackling them, should help towards reducing the downward trend and some recovery of the population in good breeding years. In particular, all effort should be made to protect and maintain a network of key sites for the species at their staging and wintering areas, taking into account the short-stopping by Bewick's Swans in milder winters. Germany, and notably its federal states of Niedersachsen, Schleswig-Holstein and Mecklenburg-Vorpommern, which now receives 45.7% of the total population in mid-winter and has recorded increasing numbers over the study period, now has a major responsibility for the conservation of this population into the future. With the eastward shift in distribution, Poland may also be of greater importance for the swans in the coming years. Future coverage and census effort should also take into account the swans' apparent tendency to disperse more widely, rather than to concentrate at key sites in recent years.

A review of the ISSAP for the NE/NW European Bewick's Swan population is currently underway and should be completed following the recently released AEWA guidelines, in order to identify which conservation actions have been undertaken and proved successful. The development of a new ISSAP should then be considered in light of the ongoing trends and the outcome of the review but is likely to be crucial for the species to thrive in northwest Europe. A National Action Plan, being developed for the Bewick's Swan in Germany, will also be a great asset to the conservation of the species in the coming years, given the international importance of Germany. In the immediate future, the next international swan census – scheduled for January 2026 – should be undertaken and results reported promptly to determine the current size of the population. Whilst obtaining a comprehensive census of the Northwestern Siberia/Caspian population is challenging given ongoing conflict in the region, undertaking the second census in January 2026 would also help towards updating the trends for this population as well.

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Photograph: Bewick's Swans at Haaler Au, Schleswig Holstein, Germany, by Hans-Joachim Augst.