species	data	document	Last updated
Greylag Goose	Winter counts	Methodology	27042022

Each year in January, the Greylag geese are counted in all range states. The counts refer to counts in wetlands areas, as well as counts from schemes specifically for geese, which mainly focus on farmland areas. The counts are collected by national coordinators and reported to Wetlands International (which coordinates the International Waterbird Census (IWC) survey, van Roomen et al. 2018). This result in three different datasets from the January counts:

IWC count totals (observed numbers)
These represent the unadjusted number of birds counted in a given year for all IWC sites and reported to Wetlands International. It consists of counts at fixed sites (mainly wetlands) in each range state. Coverage may however vary between years because some data may not have been submitted to national coordinators by observers. Thus, the IWC count totals cannot be interpreted as representing the entire population in a range state.

IWC imputed totals
To account for variation in coverage and submission of data, IWC imputed totals are calculated from a subset of IWC sites that have more than five counts and at least one of these is after 2008, thus it excludes sites that are only counted occasionally to avoid overestimations of the population size. Based on these counts, population trends are calculated using a method that first calculates national trends for each country and then combines national trends into a flyway trend. rTRIM 2.0.6 (Boogart et al., 2018) are used for the calculations of imputed values as well as trends. TRIM (Van Strien et al., 2001) takes the observed values whenever they are available and imputes the missing values for sites without counts in the given year using a General Estimation Equation that takes year and site effects into account.

These principles are not applied in Denmark, where no imputing is done because since 2000 the country only reports counts to the IWC from a reduced site list of wetland areas (Pihl 2000, Holm et al. 2018). A large part of the population in Denmark is found in farmland areas not included in the IWC sites. Occurrence varies from year to year, depending on the availability of crops on which the geese forage. Hence, the numbers at the reduced site list sites would not be representative for the status of the species in the country. Instead, Denmark adds the sum of all counted Greylag Geese outside the IWC sites, by inclusion of unsystematic data from the portal www.dofbasen.dk, to the sum within the included sites, providing a good estimate of the total, of which a part is not available for the IWC imputation.
Furthermore, in The Netherlands, the imputed totals are taken from the national Dutch trend analysis, who uses a different method (Hornman et al. 2021). In the Netherlands, imputing is carried out for the network of monitoring sites, which should encompass all relevant areas (including major areas of farmland). The criterion is that sites should have >= 1% of the flyway population, which is reviewed periodically. Thus, opposite to the IWC imputed totals, the imputed values for The Netherlands are considered representative for the total national population.

In general, IWC imputed totals are mainly used to assess trends, but they are not a reliable estimate of population size for a highly congregatory species because imputing can significantly inflate the numbers.

EGMP National totals (collated by the EGMP)
The EGMP totals are usually based on the IWC count and some countries report the observed values without any adjustment for missing counts while others report the imputed values. However, IWC counts

in most countries only include a certain fraction of the total wintering population, but it is rarely known how incomplete these counts are.

Nevertheless, the mid-winter counts are an important source of data, as simultaneous counts are performed across the wintering range of the population and movements in this time of the year are limited. However, we should be aware (also when comparing to breeding bird numbers), that the January count is made towards the end of the hunting season and thus affected by the size of the offtake during the hunting season (from late summer to the midwinter period). Moreover, it is at a time of the year when breeding birds from MU1 have migrated to MU2, which makes it impossible to distinguish between the populations in the two MUs. Hence, the midwinter counts only provide information on the overall trend and size of the entire flyway population but not suitable to assess the size and trend in the different management units.

There are two populations in Norway, the Iceland population and the NW/SW European population, we only use numbers from the NW/SW European population.