

Waterbird Population Size and Trend estimates for the 8th edition of the Report on the Conservation Status of Migratory Waterbirds in the AEWA Agreement Area

Methodological notes

Introductions

The Report on the Conservation Status of Migratory Waterbirds in the Agreement Area is produced according to Paragraph 7.4 of the Action Plan to the Agreement on African-Eurasian Migratory Waterbirds (AEWA). This requires the Agreement Secretariat, in coordination with the Technical Committee and the Parties, to prepare a series of seven international reviews on the implementation of the Action Plan. One of these reviews is the *Report on the conservation status of migratory waterbirds in the Agreement area* (aka Conservation Status Report - CSR). The format and analytical content of the CSR is developed by the Technical Committee and approved by the Standing Committee in 2004 (AEWA Technical Committee 2004).

Population size and trend estimates of the waterbird populations included into the Agreement are documented in Annex 1 to the CSR in a table format. The content of this table is also accessible through the [WPE Portal](#)¹. The WPE Portal not only contains the CSR but also the global dataset for Waterbird Population Estimates (WPE). The general terms and standards applied in the WPE process are described under the Data Presentation menu on the WPE Portal. This document complements those explanations with the special regional interpretations of those terms and standards. This document updates the methodological notes prepared to the CSR7.

How to access the data?

Currently the portal shows data from the last global dataset, i.e. the 5th edition of the Waterbird Population Estimates published in 2012, as default. To show data for the **8th edition of the AEWA Conservation Status Report**, the user shall use the [Search menu](#) or [Start searching the database now!](#) link. Select CSR8 from the **Publication** dropdown box and tick AEWA in the **Conservation framework column**. Alternatively, use the following link:

¹ <http://wpe.wetlands.org/>

<http://wpe.wetlands.org/search?form%5Bspecies%5D=&form%5Bpopulation%5D=&form%5Bpublication%5D=11&form%5Bprotection%5D%5B1%5D=1>

Until the CSR8 is published, you need to [register](#) and [login](#) to the WPE portal before you can see the draft CSR8 assessments. At the time of writing, no updates were made for the CSR8 yet. Hence, the entries are identical to the CSR7 entries.

The data for the selected publication is presented in an overview table format. Explanation of the meaning and conventions related to each columns related to [Species & Populations](#), [Population Estimates](#), [Population Trends](#) and [1% threshold](#) are presented in the relevant sections of the **Data Presentation** menu.

On screen, the references as well as the size (start with S) and trend (start with T) notes can be read by moving the mouse pointer over the blue links.

Clicking on the blue population name opens the population details view with all the WPE and the CSR (from the 4th to the 7th editions) assessments for the population. On this screen references and notes appear at the bottom of the page but moving the mouse pointer over the link also works.

It is also possible to print or save as a PDF file the whole document by clicking on the **Print** link at the bottom of the page. In this case references and notes appear at the end of the document.

Treatment of sources

The population size and trend estimates are produced based on the collective effort of organisations participating in the [African-Eurasian Waterbird Monitoring Partnership](#) and other researchers who collect and analyse water- and seabird data. A wide range of sources were collected to estimate the size and trends of the 554 populations of water- and seabirds listed on Table 1 of the AEWA Action Plan. This includes trend analyses reports, global or regional Red List assessments, specialised taxonomic or regional status assessments, action plans, information available from AEWA International Working Groups or IUCN Species Specialist Groups, articles or, occasionally, personal communications with specialists.

Published population size and trend estimates were reviewed critically. If there were multiple references, the recency and the quality of the data were assessed, and the more recent and better assessments were used.

If only a single source of reference was used for the population size or trend estimate and the data is presented as in the reference, details are not repeated in the Notes fields. The user is expected to consult the reference for further details. In such cases, the standards of the WPE Portal or described in this document were followed only as far as possible. This means for example that trend periods may differ from our standard 10-year period.

Taxonomy & Nomenclature

In case of the species listed in Annex 2 and populations listed in Table 1 of Annex 3 of the AEWA, the nomenclature is fully harmonised with AEWA².

Population Estimates

In the majority of cases, the population size is estimated based on estimates of breeding populations (e.g. European Red List of Birds) or on January waterbird counts (IWC). Occasionally, results of migration counts at bottleneck or staging sites are also used (e.g. in case of Common Crane).

Whether data from the breeding or from the non-breeding season is used depends on:

- (1) When the population does not overlap with other populations,
- (2) Quality and scope of the surveys in the given season,
- (3) Whether the population size can be reliably deduced from auxiliary information during the overlap period.

If the population does not overlap with other populations in any part of its annual cycle and all other factors are equal, the following seasons are considered to be more appropriate to estimate population size:

- (1) Mid-winter or migration counts: for populations that are highly concentrated at wintering or stop-over sites and that breed at remote areas (e.g. Arctic) or are rather obscure during the breeding season;
- (2) Breeding season surveys: colonial breeding and dispersed breeding birds at lower latitudes, especially if only a small proportion of the population can be counted during other seasons.

If the population size can be estimated in both seasons and estimates are available, we compared the quality and scope of the available estimates and choose the data from the most comprehensive source with the least bias.

In case of mid-winter or bottleneck counts, data from synchronised counts are preferred to totals of national estimates of seasonal maximums because the latter includes some double counting.

² Harmonisation of the nomenclature with the *HBW and BirdLife International Checklist of the Birds of the World*, the official taxonomic reference to the IUCN Red List, the Convention on Migratory Species and AEWA, is expected to be implemented globally in the 6th edition of the Waterbird Population Estimates.

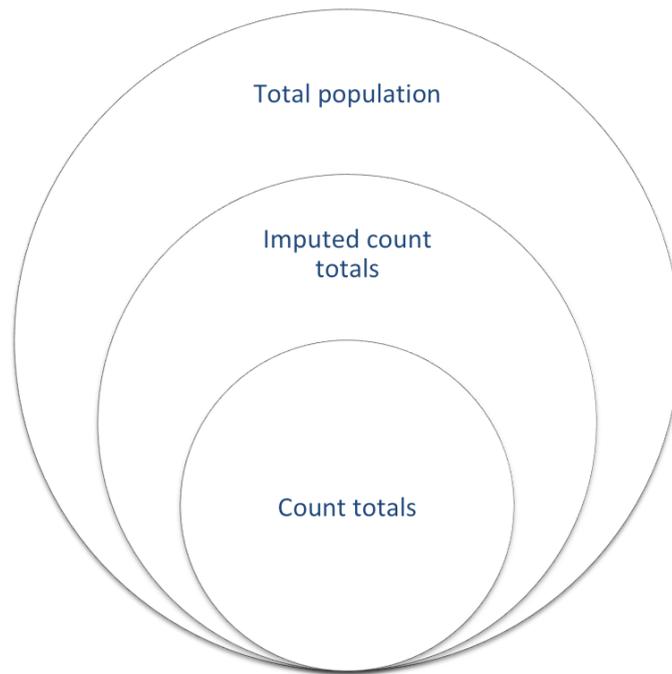


Figure 1. Relationship between count totals, imputed count totals and total population estimate.

Population estimates are not simple aggregations of count data. Apart from full censuses, counts include only a fraction of the population and thus represent an absolute minimum estimate of the population. Imputing and similar methods (Ter Braak et al. 1994) can account for missing counts from the site network included into the calculations and this may represent a good approximation of the total population if all or the vast majority of the population is included into the monitoring site network. However, this is rarely the case across the flyway and the proportion of the population not surveyed also need to be estimated even in countries with high coverage (Frost, Austin et al. 2019). As such estimates are rarely available for the entire population, and estimates based solely on count totals or count totals accounting for missing counts can be considered only as minimum population estimates.

The 8th edition of the AEWA Conservation Statuses Report coincides with the six-yearly national population status reporting under the auspices of AEWA and also with the national reporting under Article 12 of the EU Birds Directive for EU Member States. In the meantime, BirdLife International has also collected information from other European countries for the new edition of the European Red List and Wetlands International and BirdLife International have collected national population estimates from Central Asia.

If the source data is available only at country and not at subspecies or population-level, countries were allocated to populations based on their seasonal distribution and national estimates for the relevant countries were aggregated. Countries contributing to the estimate are listed in the notes using their two-letter ISO codes. In some cases, the national estimate is divided between populations using a certain fixed percentage of the population based data from the literature (e.g. (Thorup, O'Brien et al. 1997) or estimated based on distribution maps and atlas data (e.g. (Hagemeijer and Blair 1997).

Minimum & Maximum

The WPE Portal suggests that entering the same value as a minimum or maximum should be avoided where possible, unless the estimate quality is accurate down to the individual bird. Nevertheless, many references provide only a single figure. We apply the following guidelines:

- (1) We use the minimum and maximum estimates if only these are available;
 - (a) If the count total is higher than the minimum of the breeding estimate converted to total number of individuals, we use the count total as the minimum estimate;
- (2) We use the lower and upper confidence limits of a population estimate based on a statistically robust estimate because this represents the accuracy of the estimate better than a single figure;
- (3) We also use a single figure when time series data is available and
 - (a) The population is stable: in such case we use the five-year-mean;
 - (b) The population is monotonously increasing or decreasing: we use the number from the last year as a single figure;

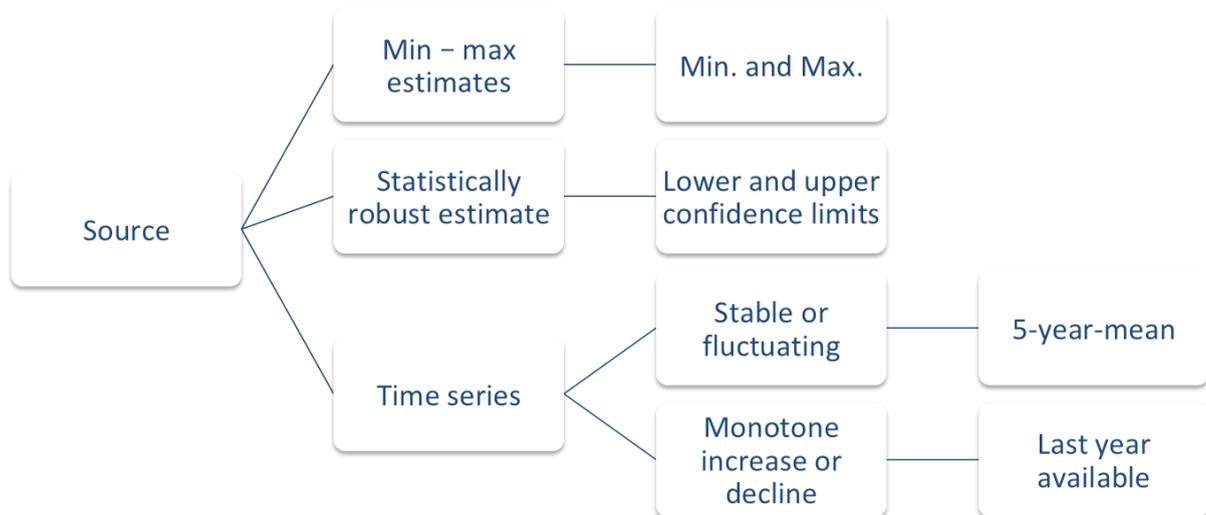


Figure 2. Decision tree showing the choice of population size estimate based on data availability and trend.

Estimate Quality

The WPE Portal uses a set of quality codes. These are clearly defined under the **Estimate quality** section on the [Population Estimates](#) page of the WPE Portal. However, we use the *Best guess* category not only when the population estimate is only possible with large or uncertain ranges that are equivalent to the letter coded ranges (A: <10,000, B: 10,000 - 25,000, C: 25,000 - 100,000, D: 100,000 - 1,000,000, E 1,000,000) in earlier editions of the WPE, but also when the maximum is more than two times larger than the minimum.

The WPE population size estimate quality codes were established before other organisations have developed their codes. Therefore, the relationship between the WPE quality codes and other systems are presented in Table 1.

Table 1. Correspondence amongst various population size estimate quality codes. Links provided to the detailed definitions.

WPE	BirdLife International/IUCN	EU/AEWA method codes (see page 25)
No estimate		Insufficient or no data available
Best guess	Poor	Based mainly on expert opinion, with very limited data
Expert opinion	Medium	Based mainly on extrapolation from a limited amount of data
Census based	Good	Complete survey or a statistically robust estimate

Population Trends

Population trends were assessed according to the information requirements of AEWA Table 1 and the AEWA Strategic Plan:

- The **10-year trend** is used to measure progress towards the purpose level indicators of the AEWA Strategic Plan (AEWA 2018) and to assess whether a population is in rapid short-term decline, which is criterion (e) for Category 3 in Column A and for Category 2 in Column B in AEWA Table 1.
- The population change over **three generations** is important in the context of application of criterion (c) to classify populations in Category 3 in Column A and for Category 2 in Column B in AEWA Table 1.
- The **overall trend** is used to provide context to judge whether a population has been already depleted in the last three generations.

In general, we use a trend classification that is consistent with the reporting guidelines under AEWA and the Article 12 of the EU Birds Directive (DG Environment 2017) that are also harmonized with each other. We report a population increasing or decreasing if the population growth rate (multiplicative slope of the population trend) is significantly different from 1.00. The population is considered being stable if the population growth is within the range of 0.95 – 1.05 and not significantly different from 0.

However, robust monitoring data is often not available for waterbird populations across the agreement area. Even if waterbird monitoring is adequate, year-to-year changes are often so large that the short-term trend becomes statistically not significant even if it was significant in the longer term and the growth rate of the two trends are identical. In such cases, we follow the recommendation of the AEWA and EU guidance (DG Environment 2017) and classify a short-term trend decreasing or increasing if the population change probably exceeds 10%.

If the source data is available only at national level, countries were allocated to flyways based on the seasonal distribution of populations and national estimates for the relevant countries were aggregated following the methodology developed for the IUCN Red List assessments and applied in the context of the European Red List of Birds (BirdLife International 2015).

If the source data is available only at regional level, the trend information was used only if region approximately matches the population.

If no trend data is available from the last 10 years, then the trend is recorded as **Unknown**.

The trend assessment is based on the 10-year trend in most cases:

- Trend directions are reported without a '?' mark if short-term trends from all source are statistically certain and point into the same directions.
- Trend directions are reported with a '?' mark if
 - The trend is statistically uncertain but there is a clear tendency in the data (i.e. the population is estimated to decrease or increase by more than 10% in the short-term).
- Multiple trend directions are reported with a '/' if different sources report different short-term trends and none of them is considered more reliable than the other.

The short-term trend is reported as Uncertain, if the data show no clear tendency and the confidence limits of slope estimate exceeded the $\pm 5\%$ range in either direction.

If available, the 3-generation and the overall trend as well as other available evidence is mentioned in the notes.

Start & End Year

The start and end years typically represent the period of the short-term trend. As short-term trends are derived from different data sources, the trend periods can differ. The standard periods for trends based on some key references are:

- European Red List of Birds (BirdLife International in prep.): 2007-2018;
- Flyway trend analyses based on data from the African-Eurasian Waterbird Census from the period of 1967-2018 (Nagy and Langendoen 2020): 2009-2018.

In other cases, the reported start and end year reflects the information provided in the reference. If the trend period is not stated explicitly in the reference, similar approximations were used as in case of defining start and end years for the population size estimates.

The short-term trend was reported as **Unknown**, if the end year of the last available trend period is before 2009. This means that trend estimates in references dated before that date were not carried forward any longer as they do not necessarily represent the short-term trend of the population.

Trend Quality

The WPE Portal provides the standard trend quality codes. During the CSR8 process these codes were interpreted further as follows:

1. **No idea:** No monitoring at international scale in either breeding or non-breeding/wintering periods. Trends unknown. This category also includes populations where trends are statistically uncertain unless other evidence allows estimation of the trend.
2. **Poor:** Some international monitoring in either breeding or wintering periods although inadequate in quality or scope. Trends assumed through partial information.
 - a. Assumed based anecdotal information or based on habitat change;
 - b. Unrepresentative coverage;
 - c. Short-term trend based on <5 years of data
3. **Reasonable:** International monitoring in either breeding or non-breeding/wintering periods that is adequate in quality or scope to track direction of population changes.
 - a. Trend is statistically uncertain but has adequate quality and scope.
 - b. Different sources provide different trend direction
4. **Good:** International monitoring in either breeding or non-breeding/wintering periods that is adequate in quality or scope to track direction of population changes with defined statistical precision.
 - a. Trend is statistically certain and has adequate quality and scope.

The WPE population trend estimate quality codes were established before other organisations have developed their codes and it is based on the system of the International Wader Study Group. Therefore, the relationship between the WPE quality codes and other systems are presented in Table 2.

Table 2. Correspondence amongst various population trend quality codes. Links provided to the detailed definitions.

<u>WPE</u>	<u>BirdLife International/IUCN</u>	<u>EU/AEWA method codes (see page 28)</u>
No estimate		Insufficient or no data available
Poor	Poor	Based mainly on expert opinion, with very limited data
Reasonable	Medium	Based mainly on extrapolation from a limited amount of data
Good	Good	Complete survey or a statistically robust estimate

Notes

Listing populations in Categories 3b, 2b of Column A and B respectively of AEWA Table 1 requires the assessment whether the population is in long-term decline or not. This is measured as at least 10% decline over three generations (AEWA 2018). Because of its importance for classifying populations in AEWA Table 1, it is always pointed out in the Note field

- If a population is in long-term decline or;
- If evidence shows that it is no longer in significant long-term decline;
- If a population is in rapid short-term decline.

References

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