# Integrated monitoring of coastal waterbird populations along the East Atlantic Flyway:

# a framework and programme outline for Wadden Sea populations

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**Developed under the Wadden Sea Flyway Initiative, in cooperation with: BirdLife International, Wetlands International & The African-Eurasian Waterbird Monitoring Partnership**

**Colophon**

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"In an ideal world, all monitoring programmes would be designed on the basis of sound statistical principles with appropriately stratified random sampling and sufficient sample sizes determined from prior power analyses (Bart *et al.* 2000). In a pragmatic world, monitoring programmes rely on harnessing the efforts of (often pre-existing) local groups and enthusiasts in collaboration to derive information on the parameters of interest (Robinson *et al.* 2005)".

## 1. Introduction

- The Wadden Sea is one of the largest sites for coastal waterbirds in the world and many conservation and management measures are in place (Marencic & de Vlas 2009). However for proper conservation and management of its migratory waterbird populations, of which many are in decline (Laursen *et al*. 2010, van Roomen *et al.* 2012, JMBB 2013), knowledge from a much larger area than the Wadden sea itself is needed. The geographic region used by typical Wadden Sea waterbird populations extends from the Arctic where many of them breed to the tropical wetlands in West Africa were many populations spend the northern winter (van de Kam *et al*. 2004). The total geographic range used by these populations is called the East Atlantic Flyway (Boere & Stroud 2006).
- This document is a contribution to the request of the World Heritage Committee at the inscription of the Wadden Sea as a World Heritage Site in 2009 '*to strengthen cooperation on management and research activities with States Parties on the African Eurasian Flyways*'.
- This framework and program aim to benefit the conservation of Wadden Sea coastal waterbirds along the East Atlantic Flyway by enhancing and expanding existing monitoring to provide a strong information base for effective and efficient conservation policy and management.
- The principal aims of this plan are:
    - Enhancing flyway monitoring of the population sizes and trends of the coastal waterbird populations through the International Waterbird Census (IWC) in the East Atlantic Flyway. Flyway trends and population sizes are essential baseline information for defining conservation priorities and identifying important sites, and provide context values for the interpretation of national and local developments;
    - Improving site monitoring of coastal sites which are important for waterbird populations in the East Atlantic Flyway, through enhancement of the Important Bird Areas (IBA) programme. This will focus on the monitoring of bird numbers, the state of their habitats, human use and pressures and the existence of conservation measures.
    - Enhancing vital rates monitoring through establishing a platform for the international coordination and joint reporting and analysis of demographic data relating to coastal waterbirds throughout the East Atlantic Flyway. This will enable the identification of the drivers of population trends by bringing together currently dispersed and largely unpublished data;
    - Expanding and improving the integration, availability and communication of the results of this waterbird monitoring in the East Atlantic Flyway for different stakeholders needing this information for management and policy.
- Besides this document focusing on the East-Atlantic Flyway as a whole, a further implementation document for West Africa has also been prepared concentrating on the implementation of abundance and environmental monitoring at the important coastal sites from Mauritania south to Sierra Leone.

## 2. Definitions

### 2.1 Which species and populations

- The populations of waterbird species included under this framework are those occurring in internationally important numbers in the international Wadden Sea and typically using estuarine habitats to a large extent (n=46, Appendix 1). Secondly, waterbird populations are included which largely overlap with the Wadden Sea populations along the East Atlantic Flyway in the same estuarine sites (n=29, Appendix 1).

### 2.2 Geographic coverage

- The geographic region included under this framework includes all countries where the waterbird populations of the Wadden Sea (as defined in Appendix 1) occur in important numbers during their annual cycle (breeding, migration, wintering). These countries (belonging to the Arctic, West-Europe and West Africa, n=39), are listed in Appendix 2.

### 2.3 Types of Monitoring

- Monitoring has been defined as "the systematic measurement of variables and processes over time for a specific reason" (Spellerberg 2005). With reference to the current plan, the specific reason could be described as "assessing whether the populations of interest remain in a healthy, viable state", and if this is not the case "assessing where, when and why the viable state is under threat". In this framework plan we define four (partly overlapping) types of monitoring. The links and hierarchical relationships between these are visualized in Figure 1.

#### 2.3.1 Abundance monitoring

- Abundance monitoring consists of the regular assessment of waterbird numbers within sites or across sites in the whole flyway.
- Outside the breeding season, abundance monitoring based on counts proceeds as follows:
  - To monitor the abundance of populations at the flyway scale, coordinated counts are organized in January (or other specific months in a minority of populations), at as many sites as possible across their wintering range, as exemplified by the International Waterbird Census (IWC) monitoring programme of Wetlands International;
  - To monitor the importance of sites, counts are organized in several months of the year especially focusing on the presence of maximum numbers or average numbers across the year, as exemplified by monitoring of waterbirds in the Wadden Sea and many other national monitoring programs (JMMB 2012, Holt *et al*. 2012). Timing and frequency of counts needed depend on the position of the sites in the flyway, the species making use of the sites and the specific aims of the monitoring program.
- Within the breeding season, different methods are used to monitor abundance depending on both the abundance and occurrence pattern of the species (common dispersed species, colonially breeding species, and rare or scarce species).

#### 2.3.2 Vital rates monitoring

- Vital rates monitoring is the regular collection of data on productivity and survival, for example by recording the hatching and fledging probabilities of breeding birds' eggs and young, by observing the proportions of juvenile birds in migrating and wintering flocks, or by using ringing and mark-resight studies to estimate survival. Vital rates monitoring and abundance monitoring link together (usually through the use of population models) to form **demographic monitoring** (fig. 1).

### 2.3.3 Environmental monitoring

- Environmental monitoring is the regular and standardized recording of information about (a) the biotic characteristics of sites and (b) environmental and/or anthropogenic pressures on sites, as exemplified by the Important Bird Areas (IBA) monitoring program of BirdLife International.

### 2.3.4 Integrated monitoring

- Integrated monitoring involves the regular joint, integrated analysis of data collected by the monitoring of abundance, vital rates and environmental conditions and threats. Its aim is to further knowledge of waterbird population sizes and trends as well as of the causes of changes in these parameters.

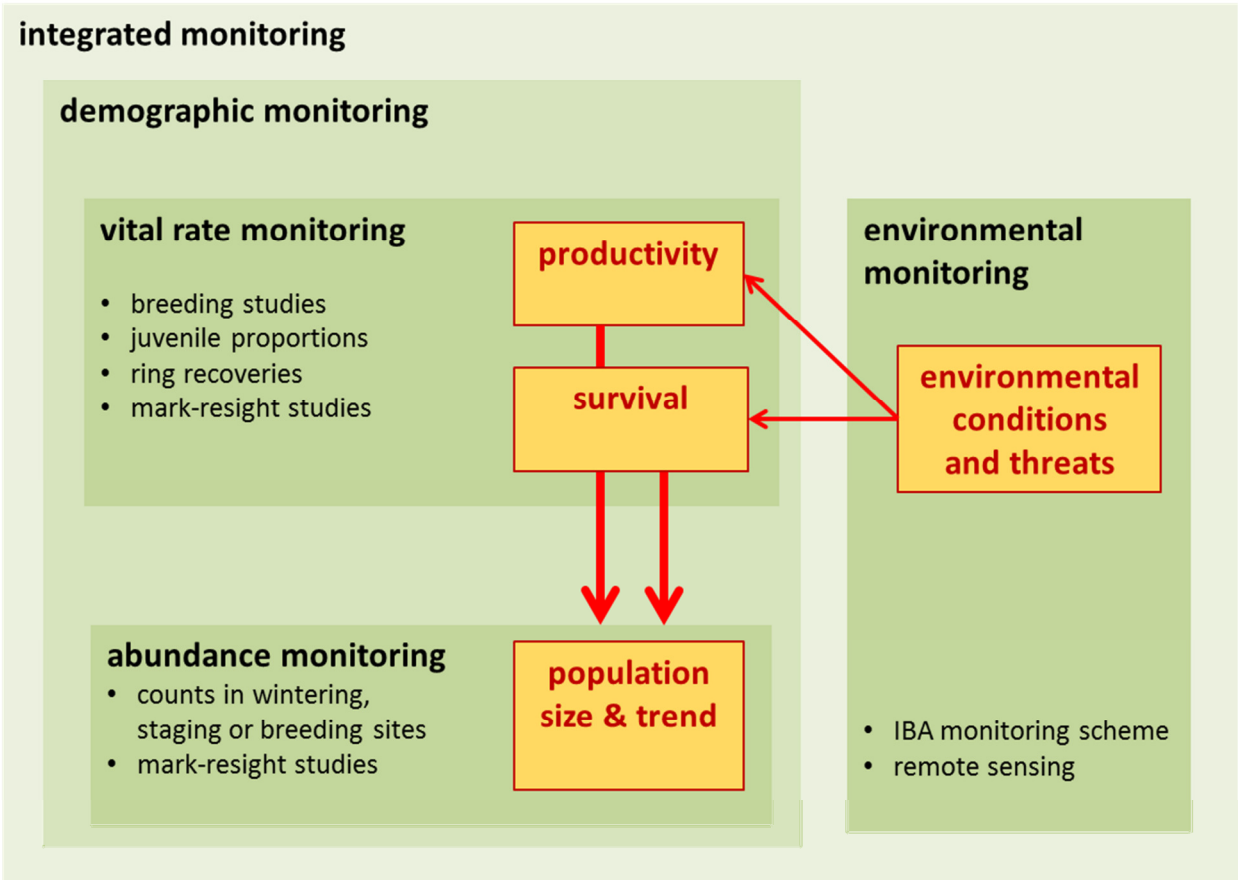


**Figure1.** Different types of monitoring, their relations and techniques to collect the data.

## 3. Information needs

### 3.1 Why monitoring.

- Data and information about waterbird numbers and trends , and about the causes of changes in these parameters, are needed by a wide variety of organizations and institutes both governmental and non-governmental, at local, national and international levels.
- Much national and international legislation aims tomaintain (water)bird populations in a favourable conservation status, and monitoring is needed to evaluate this status, often in relation to questions of the effectiveness of conservation measures and policy, and in relation to questions of possibilities of, and consequences for economic development.
- Waterbirds are also bio-indicators for the quality of the sites they use, giving information about the state and changes of their environment. Monitoring of waterbirds is a quick and cost-effective way of making a general assessment of environmental conditions and changes in these conditions.

### 3.2 Monitoring at different geographic scales

#### 3.2.1 Site level

- In order to set priorities for conservation and management, site managers need to know the proportion of each flyway population held by their site at different times of the year, and which of these populations are increasing, stable or decreasing at the site .
- Site managers also need to know whether the causes of these changes are local at their site or if they are located elsewhere on the flyway. The comparison of site trends with the trends in the whole flyway is a first step to answer this question (see figure 2).
- Site Managers also need to know the environmental conditions and pressures at their site and which conservation measures are working and which not. All these information needs require monitoring.

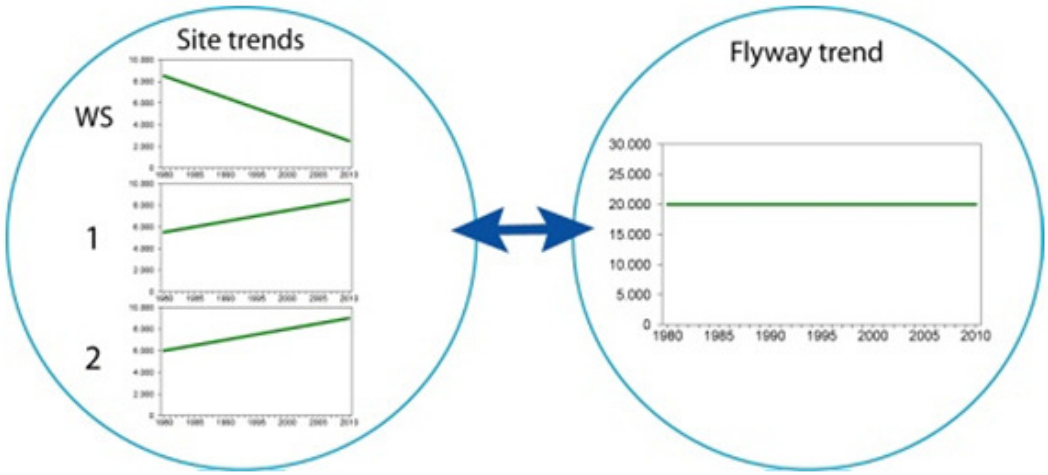


**Figure 2.** Hypothetical trends at three sites (left) in comparison with the flyway trend (right). If a site trend differs substantially (more decrease or increase) from the flyway trend it is likely that local factors are causing the difference. If the site trend is the same as the flyway trend, drivers outside the site itself are likely to be operating, like climate change.

### 3.2.2 National level

- Government agencies and national NGOs responsible for nature conservation need to know which sites in their country are important for which species and at what time of the year.
- They need knowledge of the national and international population size, population trend, and conservation status as a basis for decisions about conservation and management priorities.
- National-level practitioners need information about the causes of changes, and whether these are positioned in their country or outside.
- In cases of management and conservation measures taken, it is important to monitor the effects of these measurements on the conservation status of species and sites targeted.

### 3.2.3 International level

- The Multilateral Environmental Agreements and international legislation (see Table 1) require international data and information on waterbird numbers and trends as input to biodiversity conservation policy (see timeline below). Important ones are the Waterbird Population Estimates (WPE) which is especially connected to the Ramsar Convention, The Conservation Status report on waterbirds in Africa-Eurasia (CSR) which is prepared for the AEWA Agreement and the Birds in Europe assessments which are prepared for the EU Birds Directive.
- Most of these Agreements and international legislation, which are legally binding, have formal reporting mechanisms requiring government agencies to submit National reports as well.

Table 1. Multilateral Environmental Agreements and international legislation affecting the East Atlantic Flyway which require monitoring data for their effective implementation

- Convention on Biodiversity (CBD)
- African-Eurasian Migratory Waterbird Agreement (AEWA)
- Ramsar Convention on Wetlands
- Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (Abidjan Convention)
- The EU Birds Directive.

**Long-term timeline of policy initiatives requiring monitoring data. WPE is the global Waterbird Population Estimates, CSR is the Conservation Status report of waterbirds in the AEWA region and BiE is the Art12 reporting and Birds in Europe assessments.**

| Instrument | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ramsar** | | | WPE 6 | | | WPE 7 | | | WPE 8 | | | WPE 9 |
| **AEWA** | | CSR 6 | | | CSR 7 | | | CSR 8 | | | CSR 9 | |
| **EU** | BiE3. | | | | | | BiE4 | | | | | |

### 3.3 Different types of monitoring

#### 3.3.1 Abundance monitoring

- Abundance monitoring is the basis for several information needs.
- There is a need to expand beyond the current baseline and improve count coverage both in space and time. More frequent counts will lead to a better understanding of seasonal changes in bird distribution and site usage, and will help identify bottlenecks and key sites in the birds' annual cycles.
- To be able to better estimate total flyway population sizes and trends, periodically all the key wintering sites in (regions of) the East Atlantic Flyway should be counted in the same winter, so

that doubts can be avoided that changes in numbers are caused by redistributions rather than changes in population size.

### 3.3.2 Vital rates monitoring

- Data on productivity and survival will help in finding the drivers behind trends in bird numbers and can act as early warnings for changes in bird numbers (see Box 1).

### 3.3.3 Monitoring of environmental conditions and pressures

- The principal reason for collecting data about the condition of sites and the threats they face is the need to understand what is happening to them in order to formulate appropriate conservation actions. In the context of this plan, these data are needed to help identify the drivers of changes in numbers and distribution of waterbirds.

### 3.3.4 Integrated monitoring

- The identification of the demographic and environmental factors that influence population size is a key requirement for species conservation programmes. Integration of the different types of data in analyses will allow them to go beyond mere description of numbers and trends of a selection of species, and to include discussion of causes of the observed changes. Improvements in the availability and diversity of high-quality monitoring data and the use of sophisticated statistical and population modelling techniques will be of great value here (van der Jeugd *et al*. 2008) .
- Through this modelling, integrated monitoring can provide much improved understanding of changes in bird numbers and distribution, and of the causes underlying these changes, enhancing the basis for conservation measures for these species throughout the East Atlantic Flyway.

## 3.4 The need for communication of knowledge

- The need for more diverse and comprehensive monitoring data, compiled efficiently at the flyway scale, is matched by the need for improved communication of the results of this monitoring.
- A majority of participants in monitoring are volunteers and their satisfaction, goodwill and participation levels are maximized by providing timely and appropriate feedback of results.
- Good communication is also required to ensure that all appropriate evidence is available for policy makers and managers.
- Effective communication between all these groups is essential, and requires the communication of the most important storylines in simple, appealing, engaging publications and other media to policy makers, site managers, volunteers and the wider public, together with convincing communication between scientists about the relevance of their work to species and site management and conservation policy.
- A particular issue is also the need for communication of knowledge and capacity building in countries with less of a history in environmental monitoring, in the areas of field methods, organization of monitoring schemes, and data capture, storage and analysis.

**BOX 1: The added value of demographic monitoring**

Currently, monitoring of waterbird populations is for most species restricted to repeated assessment of numbers of birds, either in important sites or across a flyway. Any changes in numbers observed in this way must be caused by changes in either **reproductive output** or **mortality/survival** of individuals making up the population. If a local subpopulation of the flyway population is monitored, an additional possible cause is a change in the balance of **immigration** from and **emigration** to other sites within the flyway. These demographic processes, also called **vital rates**, are the mechanistic drivers of population change. Two important reasons why collecting information on these vital rates, in addition to information on numbers (thus extending 'abundance monitoring' to 'demographic monitoring', see fig. 1), is of value to management and conservation, are (1) that it is a prerequisite for identifying causation, and (2) that it may enable earlier detection of relevant changes.

**Causation**

When abundance monitoring reveals a change in population size, the question arises whether this should lead to concern and eventually to management or conservation actions. Is the change a phenomenon that may affect long-term population viability or just a transient 'natural' variation? Do man-induced changes play a role? Which counter measures will be effective? All these questions revolve around the **cause** of the observed change. Identifying which vital rate(s) drives a change is a necessary first step towards identifying the cause: it narrows down the possibilities by focusing attention on specific parts of the annual cycle, and in migratory animals also on specific geographic regions (e.g. breeding vs. migration/wintering range). It is therefore also key to the planning of more in-depth studies into causal mechanisms. Sometimes, a local or global pressure may have already been identified, and be suspected to relate to the change. Linking such pressures mechanistically to changes in specific vital rates, and demonstrating that these indeed take place, enhances the strong scientific case necessary to convince stakeholders to take specific actions in the face of costs and opposing interests.

An example is the 70% decline since the early 1990s of the population of Red Knot *Calidris canutus rufa* migrating along the Atlantic seaboard of the Americas. This decline has been linked to overfishing of Horseshoe Crabs *Limulus polyphemus*, leading to strong reduction of the Knots' primary food source during their ultimate spring migration stopover on the beaches of Delaware Bay, before the flight to their arctic breeding grounds. Field data showing that the ability of Knots to build up fuel stores here depends on crab egg abundance, and that their annual survival rate is related to the size of these fuel stores, have been crucial in the ongoing political and legal process towards limiting the crab harvest (Baker et al. 2004, Niles et al. 2009, McGowan et al. 2011).

**Early warning**

The basis of the process leading to management or conservation measures is the detection of change. Because population counts are subject to short-term fluctuations, caused by both environmental effects and by counting errors, it necessarily takes time to distinguish systematic changes from such stochastic variation, in order to not 'raise the alert' unnecessarily. Earlier detection of change allows more time to evaluate it, identify its cause and develop remedial action if necessary. Here, demographic monitoring is helpful in two ways. First, in long-lived animals (which many waterbirds are), breeding population size may respond to changes in vital rates only after several years, for instance due to the existence of a non-breeding surplus. A relevant change may thus be detected in a vital rate before it can be detected in the population size. Second, demonstrating changes in vital rates that are consistent with observed changes (trends) in count data reduces the likelihood that the latter arose from counting errors, and therefore enables earlier assessment of a trend as 'significant'.

# 4. Current status of waterbird monitoring in the East Atlantic Flyway

## 4.1. Collection, analysis and reporting of abundance data for monitoring

- Waterbird abundance data for flyway monitoring (January counts) are compiled at site and country level by national coordinators and submitted to Wetlands International for international level analysis (e.g. Gilissen *et al*. 2002, Delany *et al.* 2009, Nagy *et al*. 2012, Wetlands International 2012).
- Abundance data for national and site level monitoring (several counts a year) are reported in many countries by the organizations which coordinate counting schemes. (e.g. JMMB 2012, Hornman *et al.* 2012, Holt *et al*. 2011, Keller & Burkhardt 2011)
- A web portal, The *Critical Site Network Tool*, provides an online platform for reporting and communicating selected results of Waterbird monitoring in Africa-Eurasia.
- Abundance data for many common and dispersed breeding waterbird species are collected within Europe by the PECBMS programme coordinated by the European Bird Census Council.
- Once in 6-10 years also the status of European birds (including all waterbirds) are assessed in the so called Birds in Europe projects organized by BirdLife International.
- For a few species (Red Knot, Bar-tailed Godwit, Sanderling) estimates of total population size are available on the basis of mark-recapture methodology (Spaans et al. 2011, see box 2).

## 4.2 Collection, analysis and reporting of vital rates data

- Demographic data are collected, analysed and reported by a number of scientific institutes and groups. Although volunteers and students contribute to many of these studies, most also involve major investments in professional staff and logistics and materials, for both the fieldwork and data analysis. Some of this work is part of governmental monitoring programs, but much is also funded through sources for scientific research as projects with a limited duration (usually 2-4 years at a time).
- The Trilateral Monitoring and Assessment Program (TMAP), undertakes monitoring of breeding productivity of key breeding birds in the international Wadden Sea.
- The Arctic Birds Breeding Conditions Survey (ABBCS) brings together information on breeding conditions and breeding performance of waterbirds at several locations in the Arctic, contributed by a variety of expeditions and research projects with their own individual objectives and funding (Soloviev & Tomkovich 2003, www.arcticbirds.net).
- The most extensive demographic monitoring programme for a selection of species is the Global Flyway Network (e.g. Piersma 2006), an alliance of wader research groups from all over the world. The network conducts very detailed and thorough studies of long-distance migrants. For coastal species in the East Atlantic Flyway they cover Red Knot *Calidris canutus*, Bar-tailed Godwit, *Limosa lapponica*, Sanderling *Calidris alba* and Eurasian Spoonbill, *Platalea leucorodia*.
- Based on the extensive databases on ringed and recovered waders in countries such as the UK, France and The Netherlands, mainly brought together by volunteer ringing groups, coordinated by national ringing centers and coordinated within Europe through EURING several species have been or could be analyzed with regard to patterns in reproduction and especially survival.
- An overview on the availability of studies which currently provide data on reproduction and/or survival for populations which make use of the Wadden Sea that could contribute to vital rates monitoring in the East Atlantic Flyway are summarized in Table 2 (more details in van Roomen *et al.* 2011).
- For a number of Dutch Wadden Sea populations current knowledge on trends in survival and reproduction are summarized in van der Jeugd & Schekkerman 2013.

**BOX Counting by marking**

Keeping track of the sizes of entire flyway populations is often not easy. Some species can be counted with relative ease, because they are conspicuous and flock together in a few accessible sites in countries with good observer coverage during the nonbreeding season. More often, the birds are spread across many sites, some better covered than others, or concentrate in remote areas with few observers. An example is shorebirds wintering in coastal West-Africa. Apart from difficulties with site access and resources leading to intervals of many years between count expeditions, conditions for counting can also be difficult, e.g. because birds roost in mangroves or in huge multi-species flocks. Such circumstances lead to considerable uncertainty surrounding the counts and estimates of population size and trend.

An alternative approach to counting entire populations is the mark-recapture (or mark-resight) approach, in which a captured sample of animals from the population receive field-readable marks (e.g. colour-rings or neck-bands), and sometime after their release the proportion of animals wearing such marks is assessed in further samples of the population. Provided that several assumptions are met (most importantly, no animals enter or leave the population between sampling occasions, and marked animals distribute themselves freely within the population), total population size can be estimated from such data. Visually establishing the proportion of marked birds in a (large) sample is generally easier than counting entire sites or populations, but it often takes much effort to mark a sufficiently large number of birds. However, sometimes this is already done for other purposes, most commonly studying individual movements or survival.

An example is the colour-marking program of Spaans *et al*. (2011) on Red Knot *Calidris canutus* and Bar-tailed Godwit *Limosa lapponica* in the international Wadden Sea and the Banc d'Arguin, Mauritania. This group assessed the proportion of colour-marked birds in large samples far away from the sites where most were initially marked, assuming that the necessary mixing of marked and unmarked individuals had occurred during the intervening migrations. For Red Knot, population sizes estimated with the mark-recapture approach were reasonably close to those based on winter counts. For West-African wintering Bar-tailed Godwits, however, the estimates were c. 240,000 and 600,000 birds respectively.

Although in this case the mark-resight estimate may well be more accurate than the winter count (e.g., numbers counts on spring staging sites in the Wadden Sea usually fall far below 600,000), one approach is not intrinsically better than the other, as violation of the necessary assumptions leads to bias in the mark-resight estimates. Yet, it is very valuable to have multiple independent estimates of population size, boosting confidence when they match, and signaling potential problems when they do not. When establishing counts across a population's wintering range is particularly difficult or expensive, the mark-resight approach may form a feasible alternative, particularly when large-scale ringing studies already exist for other purposes. This is a further example of how abundance monitoring can be improved by including demographic studies.

Table 2. Availability of information (number of studies, ranges indicate incomplete information) on breeding output and annual survival for flyway populations of birds important in the international Wadden Sea. Populations are marked 'x' under 'Both' if both reproduction and survival are covered by at least one study.

| Species | Population | Repro-duction | Survival | Both |
|---|---|---|---|---|
| Great Cormorant | sinensis, N, C Europe | 3 | 2 | X |
| Eurasian Spoonbill | leucorodia, E Atlantic | 2 | 1 | X |
| Barnacle Goose | N Russia, E Baltic (bre) | 1 | 1 | X |
| Brent Goose | bernicla | 1 | 1 | X |
| Brent Goose | hrota, Svalbard, N Greenland (bre) | 1 | 1 | X |
| Common Shelduck | NW Europe (bre) | 0 | 0 | |
| Eurasian Wigeon | NW Europe (non-bre) | 2 | 0 | |
| Common Teal | crecca, NW Europe (non-bre) | 1 | 0 | |
| Mallard | platyrhynchos, NW Europe (non-bre) | 1 | 0 | |
| Northern Pintail | NW Europe (non-bre) | 1 | 0 | |
| Greater Scaup | marila, W Europe (non-bre) | 1 | 0 | |
| Common Eider | mollissima, Baltic, Wadden Sea | 3 | 2 | X |
| Red-breasted Merganser | NW & C Europe (non-bre) | 0 | 0 | |
| Eurasian Oystercatcher | ostralegus | 7 | 4 | X |
| Pied Avocet | W Europe (bre) | 3 - 5 | 0 - 2 | |
| Common Ringed Plover | hiaticula | 1 | 1 | X |
| Kentish Plover | E Atlantic, W Mediterranean | 1 | 1 | X |
| Grey Plover | squatarola, E Atlantic (non-bre) | 0 | 0 - 1 | |
| Red Knot | canutus | 2 | 1 | X |
| Red Knot | islandica | 1 | 1 | X |
| Sanderling | E Atlantic (non-bre) | 1 | 1 | X |
| Curlew Sandpiper | W Africa (non-bre) | 1 | 0 | |
| Dunlin | alpine | 1 | 1 | X |
| Dunlin | schinzii, Baltic (bre) | 2 | 2 | X |
| Bar-tailed Godwit | lapponica | 0 | 1 - 2 | |
| Bar-tailed Godwit | taymyrensis, W, SW Africa (non-bre) | 0 | 1 | |
| Whimbrel | phaeopus, NE Europe (bre) | 0 | 0 | |
| Eurasian Curlew | arquata | 1 | 1 | X |
| Spotted Redshank | Europe (bre) | 0 | 0 | |
| Common Redshank | robusta | 0 | 0 | |
| Common Redshank | totanus Northern Europe (breeding) | 2 | 1 - 2 | x |
| Common Greenshank | NW Europe (bre) | 0 | 0 | |
| Ruddy Turnstone | interpres, Fennoscandia, NW Russia (bre) | 0 | 0 | |
| Ruddy Turnstone | interpres, NE Canada, Greenland (bre) | 1 | 2 | x |
| Black-headed Gull | West & Central Europe (bre) | 4 | 4 | x |
| Common Gull | canus | 1 | 3 | x |
| Lesser Black-backed Gull | intermedius | 5 - 6 | 4 - 6 | x |
| Herring Gull | argentatus | 0 | 0 - 1 | |
| Herring Gull | argenteus | 6 - 8 | 6 - 7 | x |
| Great Black-backed Gull | NW Atlantic | 0 - 2 | 1 - 4 | |
| Sandwich Tern | sandvicensis, W Europe (bre) | 2 | 0 | |
| Common Tern | hirundo, N, E Europe (bre) | 0 | 0 | |
| Common Tern | hirundo, S, W Europe (bre) | 4 | 3 | x |
| Arctic Tern | N Eurasia (bre) | 3 | 1 | x |
| Little Tern | albifrons, W Europe (bre) | 0 | 0 | |

### 4.3 Collection, analysis and reporting of environmental monitoring

- BirdLife International has developed a systematic approach to describe and monitor pressures on sites as part of their Important Bird Areas (IBA) programme (BirdLife International 2006).
- Data on the condition of and environmental and human pressures on sites are compiled at country level by national coordinators under the IBA programme and reported to the World Bird Database. Some national reports have been produced as well (Sanou 2008).
- Other studies of environmental conditions at different sites and the pressures acting on them are many and varied, and already provide some important data which help identify environmental factors affecting population change in waterbirds, including climate change (e.g. Maclean *et al*. 2008), eutrophication (e.g. Macdonald 2006), fisheries (e.g. van Gils *et al.* 2006), human disturbance (e.g. Rogers *et al.* 2006), infrastructure development (e.g. Benitez-Lopez *et al.* 2010) and introduction of non-native species (e.g. Troost 2010).
- Within the TMAP project for the Wadden Sea, comprehensive monitoring of various important parameters is carried out giving an overview of the environmental factors important for waterbirds as well. Every six years this information is summarized in a Quality Status Report.
- Monitoring of pressures at coastal sites in West Africa is already being enhanced by projects under the CMB/WSFI initiative in the short term.

# 5. Assessment of status against needs

## 5.1 Gaps in abundance monitoring

- Currently, data and information about waterbirds in the East Atlantic Flyway are only available at the required level of detail from a small number of countries, most of which are situated in Western Europe (Fig 3). This results in flyway trends for Wadden Sea relevant populations being available for only a selection of populations (Fig 4).
- The IWC database is one of the most comprehensive international biodiversity databases, but it has limitations as a source of information on waterbird population estimates and trends. For example, the inconsistent coverage in space and time of IWC counts mean that large parts of many flyways, particularly in Africa, are only infrequently included in counts. This severely complicates the assessment of flyway population sizes and trends.
- The quality of abundance data currently available for conservation purposes is low. The most recent status review of waterbird populations in the AEWA region (Nagy *et al.* 2012) presented population estimates for 98% of all waterbird populations on the AEWA list, but only 5% of these were classified as "census based", with 73% relying to a varying extent on expert opinion and 20% being "best guess" estimates.
- The inclusion in the database of only one or two counts per year from each site reduces the usefulness of the database as a source of information about site importance, because such infrequent counts are unlikely to coincide with peak numbers of the great majority of species.
- Trend data for many breeding waterbird species are collected by the PECBMS program for Europe (PECBMS 2013) however, they mainly concentrate on common dispersed species. Colonially breeding waterbirds are mostly not covered by these programmes although they are especially important in this framework. In West-Africa, a program for the monitoring of colonially breeding gulls, terns and seabirds is under development by FIBA. .

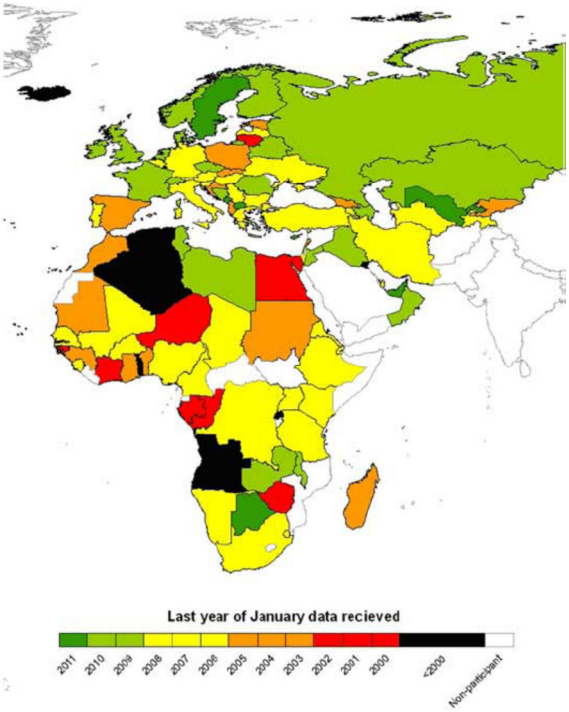


Fig 3. Overview of the availability of Waterbird count data by country and year

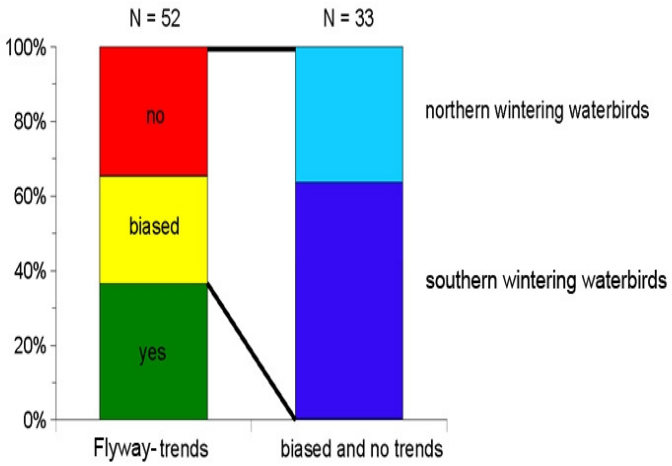


Fig 4. Percentage of Wadden Sea Populations with flyway trends

### 5.2 Gaps in vital rates monitoring

- The many demographic studies of waterbirds in the Flyway do not currently add up to a comprehensive monitoring programme (covering all the vital rates) for most of the species, except for a very small number (van Roomen *et al.* 2011).
- More work is already being directed to monitoring of reproductive output than to monitoring of survival (Table 2). However, as breeding success may be more variable between different sites than survival, it is important to achieve sufficient spatial sampling coverage.
- There is unused potential for monitoring variation in breeding output by assessment of age ratios on autumn migration stopovers or in wintering areas in shorebirds, gulls and some duck species. In many goose species such age ratio data are collected annually on a wide geographic scale and provide a very useful measure of the reproductive output of populations (Ebbinge *et al*. 2002).
- Existing monitoring of survival is less well spread across taxonomic groups than monitoring of productivity, with geese, Great Cormorant and European Spoonbill receiving most, ducks and terns least, and shorebirds and gulls intermediate coverage (Table 2).
- Most existing work on vital rates takes place in Europe and there is a relative dearth of data from African countries, and hence from populations wintering mainly in Africa.

### 5.3 Gaps in environmental monitoring

- Despite the running IBA program, for many sites information about environmental and anthropogenic pressures is lacking or out of date. There is a need to increase the effort to collect this data along with the counting of the birds.
- Much information about environmental factors is collected but it is difficult to get an overview for the sites along the flyway.

### 5.4 Gaps in integration of results

- The integrated analysis of abundance, vital rates and environmental monitoring data is relatively new. It can significantly improve the information and knowledge needed for conservation and management at different geographic scales. This includes both the classical two-step analysis of data on reproduction and survival followed by the use of matrix population models and the comparison of the predicted population trajectories with the available count data, and the recently developed ‘integrated population models’ (Schaub *et al*. 2012) which integrate the demographic information contained in both population counts and data on vital rates in a comprehensive description of population development. This allows the estimation of vital rates that cannot be directly observed, like the survival of Sandwich Terns in their second calendar year, when they remain in Africa.

# 6. Framework and programme outline for integrated monitoring of coastal waterbirds in the East-Atlantic Flyway

## 6.1 Principles

- This programme builds on existing initiatives and aims to give added value through bringing together information which is valuable for many stakeholders.
- It will not be possible to raise funding centrally for all initiatives needed, including the labour-intensive collection of vital rates, count data and environmental data at the site and national level. It is proposed that funding needs to be found for coordination among research groups and institutions involved in demographic monitoring and the communication of results.
- An exception is made for count and environmental data collection in coastal Western Africa, which is currently a big gap in the possibilities for flyway analyses. For this region the programme aims to raise funding to support local initiatives to improve the basis for monitoring (see also Waterbird Monitoring Strategy for coastal West Africa in prep.).
- This programme is intended as a platform for cooperation among existing organizations; there is no intention to create a new organization.
- Contributing to the programme should benefit both the community making use of its results and the contributing research groups. The former benefit through the availability of flyway-wide data summaries and analyses. Contributing research initiatives may benefit from the availability of comparable and complementary data for their study populations, adding to the scientific value and scope of their own data. The project will also contribute to illustrate the usefulness of demographic and integrated monitoring to a wide audience, including potential sources of research funding.
  It is hoped that this programme can grow through time as more initiatives join during the running of the project. At present the goals for the improvement of abundance and environmental monitoring are seen as the first priority.

## 6.2 Coordination, organization and governance

- A consortium will be responsible for planning and development of the project. An appointed coordinator should keep the project moving.
- BirdLife International and Wetlands International as coordinators of the IBA and IWC programmes, respectively will be important in this consortium.
- This consortium could be positioned under the African-Eurasian Waterbird Monitoring Partnership, which enables synergies with the monitoring in other African-European flyways and cooperation with Wetlands International, BirdLife International, and the AEWA Secretariat, among others.
- Steering of the programme should be carried out by the funders and additional users of the data.
- It is proposed that the vital rate monitoring should be organized by several institutes who each take the responsibility for one or more populations of the target species. They would contribute information from these populations in the form of summarized data (e.g. annual estimates of abundance and vital rates), but maintain the control and responsibility of the basic data and the freedom to use them themselves.

### 6.3 Enhancement of abundance data collection and compilation

#### 6.3.1 Non-breeding counts

- Simultaneous counts in January will be carried out along the whole East-Atlantic Flyway,. In principle, annual coverage is the best way to achieve the assessment of flyway trends. In countries and regions where this is not feasible a selection of sites will be counted and a simultaneous 'total' count once in six years, is aimed for. For West Africa this is under development (see Waterbird Monitoring Strategy for coastal West Africa).
- For sites which are important during migration and moult, more frequent counts in a year will be organized and these data will be brought together internationally. This will allow a better understanding of the changing seasonal distributions of waterbird populations and the timing of peak numbers of different populations at different sites.
- Enhanced data collection and compilation will be achieved by stronger coordination of the programme, with improved communication of results as feedback to all participants.

#### 6.3.2 Breeding season counts

**Colonially nesting species**

- A variety of species in the following families breed in colonies where large concentrations of birds are relatively easy to monitor: cormorants, pelicans, herons, egrets, storks, ibises, spoonbills, flamingos, gulls & terns. Establishment of internationally coordinated monitoring of colonial waterbirds on the scale of Europe, Africa or along the whole flyway is beyond the scope of this plan, but should be considered a priority for the future. An inventory of existing site- and country-based monitoring programmes for these birds should be compiled, as a first step.

**Common breeding birds**

- Many European countries compile annual indices of common breeding birds and submit them to the Pan-European Common Bird Monitoring Scheme (PECBMS), where the national data are integrated and weighted to form 'European wild bird indicators' for the EU. A few waterbird species are included in these indices and it should be investigated how these data can also be used on the flyway level.
- With the Arctic Breeding Bird Survey as a basis, compilation of monitoring data for breeding birds in arctic regions should be continued with some standardization of methods.

### 6.4 Enhancement of vital rates monitoring

#### 6.4.1 Species and populations

- Table 2 and Appendix 1 list species and populations of the Wadden Sea for which ringing, sometimes also colour-marking schemes and reproduction measurements already exist and for which vital rates monitoring will be most useful and appropriate. In most cases the effort for these populations needs to increase and to be carried out more systematically to result in meaningful results. Additional species for which such studies would also be appropriate are Shelduck, Whimbrel, Spotted Redshank, Greenshank and Little Tern.
- Whether such studies will indeed be initiated will depend on the interest of research groups and the financial resources available to them; the budget of the current programme plan does not include the running costs of these research projects. However, the potential of these projects should serve as a stimulus and a recommendation to funding agencies and governments.

### 6.4.2 Monitoring of productivity

**Studies on the breeding grounds**

- Many studies in the temperate zone and to a lesser extent in the Arctic, collect data on clutch size, fledging rates, brood sizes and other breeding parameters. Submission of these data, or at least of metadata from these studies, to the groups responsible for a species/population will enable more integrated and comprehensive analyses for that species/population. Support should be given to the Arctic Breeding Bird Survey to continue the coordination of data collection in the Northern countries.

**Studies on the non-breeding grounds**

Visual recording of proportions of juveniles in flocks

- The Goose and Swan Specialist Groups (IUCN/WI) are collecting coordinated age counts of many goose and swan species in Europe to gain an understanding of variations in breeding success. Many more waterbird species (including waders, gulls and terns, and some ducks) can be aged in the field and their conservation would benefit from similar coordinated age counts.
- Waterbird counting schemes already exist in a majority of countries in the East Atlantic Flyway, and national coordinators would be asked to start to collect age ratio data from a selection of sites and species in their country. These data would then be brought together internationally and analysed. The methodology would be simple, but a high level of competence is required to accurately identify and count young birds in mixed flocks. A manual needs to be prepared and online available guidance is necessary (see for example Lemke *et al.* 2012 for Sanderling).

Recording of proportions of juveniles in birds trapped

- Most European countries have national bird ringing schemes and migrating waterbirds are trapped and ringed at many sites and countries along the flyway.
- Data on age ratios of ringed birds are collected by national ringing schemes and should be stored in their national databases and the EURING databank (EDB). These data could be compiled and analysed to provide annual productivity indices.

Recording of proportions of juveniles in samples of shot birds

- In some countries (e.g. Denmark, UK) and for some species the collection of hunting statistics includes information gathering on age composition of the hunting bag, e.g. via wing surveys in which hunters send in wings of shot birds, from which their age (and sometimes sex) can be assessed. These data could be collected and used for demographic monitoring.

### 6.4.3 Monitoring of survival

- There are many studies, mainly in the temperate zones, where birds are trapped and marked with coloured leg rings, neck collars or similar conspicuous individual marks.
- These studies yield information about the movements of birds, and resighting data can be used to estimate survival (e.g. Clausen *et al.* 2001, Kraan *et al*. 2010, van de Jeugd & Schekkerman 2013, White & Burnham 1999).
- Institutions collecting such data will be asked to be responsible for a species/population, to maintain their own raw data and to contribute summarized results to the flyway cooperation.
- Internet based reporting databases for read colour-marks will be stimulated to facilitate the reporting of rings by readers and the usage of these data by researchers (for instance www.geese.org, www.wadertrack.nl and www.animaltrack.org).

### 6.5 Enhancement of environmental monitoring

#### 6.5.1 Collection of environmental data during counts

- Collection of Pressure and Responses data, following IBA methodology (BirdLife International 2006), will be encouraged at coastal sites along the East Atlantic flyway.
- This enhancement will be achieved through stronger coordination, together with more comprehensive analyses of results and regular feedback to participants.

#### 6.5.2 Using of data from other monitoring programs

- Monitoring of factors such as land use, hydrology, fisheries, eutrophication, weather and climate change, are highly relevant to waterbird conservation and could be used as a source of explanatory variables which should be included in analyses of integrated monitoring data. The TMAP programme and the WaLTER project are already working on an overview and integration of this data for the Wadden sea itself. It will be important to select a few parameters for which it is important to have data for all sites along the flyway as well.

### 6.6 Enhancement of integration and communication

#### 6.6.1 Data ownership and sharing

- A basic principle of this framework and programme is that monitoring is participatory. This means that data are held and owned by the organizations and individuals that collect them. Data (counts, environmental conditions, pressures ) from sites are used at national level and national results feed up further to the regional and flyway levels, coordinated by internationally organisations. Data on vital rates will mainly be collected for different species by organizations concentrating on these species and populations. In general, observers participate in the monitoring for their own benefit and submit their data for national and international analysis (counts) or use (demographic estimates) because of the value this adds to their work.
- Good feedback of results to all participants is essential to the success of participatory monitoring.

#### 6.6.2 Availability of knowledge and communication through a web portal

- The principal platform for all reporting and communication on the integrated monitoring will be a web portal linking the contributing organizations and making knowledge available to stakeholders. Preferably, summaries of data (e.g. population trends, annual estimates of demographic variables) and analyses should be available on this website itself, with links to websites of the various contributing countries, institutions or groups where further information is available.
- Many of the analyses conducted by contributing organizations will result in detailed scientific papers which will be published in peer-reviewed scientific journals. These should also be summarized and linked to on the reporting platform.
- Online content will also be used by a wide variety of other practitioners such as site managers, conservation NGOs, government decision makers, and international Conventions and organizations.
- Accessible, appealing storylines will be needed to raise awareness of the work among the general public and less technically minded conservation professionals.

- Summaries of data in particular formats may help to meet governmental reporting requirements to the international Conventions.

### 6.7 Capacity development needs

- Capacity development and training are needed for data collection, analysis and reporting.
- Most countries in the African part of the East Atlantic Flyway would benefit from further capacity development and training.
- Most European countries on the East Atlantic Flyway have the necessary capacity already but their principal need is better cooperation, communication and sharing of data and information.

### 6.8 Priority activities for further development of the programme

- This section gives an overview of priorities for implementation activities for the continuation and further implementation of the integrated flyway monitoring plan.

**Basic implementation of flyway monitoring plan**

- Form consortium of participating organizations.
- Create Website.
- Appoint a programme coordinator (contacts with steering group, coordinating the consortium, further implementation of programme, additional fundraising, communication.

**Continuing and enhancing monitoring in West Africa**

- Organizing annual count of selection of sites.
- A new total count in January 2019 (in 6th year after 2013 (which was the original planning for the total count).
- Organize Local coordination and training.

**Monitoring demographic parameters**

- Adding additional species to Animaltrack to facilitate the collection and analyses or colour marking resightings for survival estimates.
- Starting age counts in non-breeding populations for appropriate populations (for reproduction monitoring).
- Stimulate Arctic monitoring through the Arctic Breeding Bird Survey (especially important for reproduction monitoring).

**Outputs**

- Produce a Flyway Report for the East Atlantic Flyway about the status of species and sites, threats and conservation actions in 2019/20 after the new total count.
- Contribute to the Quality Status Reports for the Wadden Sea from the perspective of Flyway developments.
- Create online availability and update of trends for flyway populations.

**Further implementation**

- Stimulate the collection and analyses of non-breeding counts in NW European coastal sites from months during spring and autumn migration.
- Implementation of the West Africa monitoring Strategy to countries further to the South: Liberia – South Africa.

- Prepare an online atlas of movements and connectivity between sites and countries for Wadden Sea populations along the EA flyway (based on ring recoveries, colourring recoveries, satellite and logger information).

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# Annex 1. Species and populations included in the strategy for the Wadden Sea Flyway Initiative monitoring

| SpcCommonName | Population | International important numbers international Wadden Sea and largely estuarine species | other coastal populations overlapping largely with the same sites as used by Wadden Sea populations | Populations with (some) existing vital rates monitoring | comments |
|---|---|---|---|---|---|
| Red-throated Loon | NW Europe (non-bre) | o | | | 1% in waddensea region but no real estuarine species |
| Great White Pelican | W Africa | | x | | |
| Great Cormorant | sinensis, N, C Europe | x | | x | |
| Great Cormorant | lucides Coastal W Africa | | x | | |
| Great Cormorant | maroccanus | | x | | |
| Grey Heron | monicae | | x | | |
| Western Reef Heron | Coastal W. Africa | | x | | |
| Eurasian Spoonbill | leucorodia, E Atlantic | x | | x | |
| Eurasian Spoonbill | balsaci | | x | | |
| Greater Flamingo | roseus W Africa | | x | | |
| Lesser Flamingo | W Africa | | x | | |
| Tundra Swan | bewickii, NW Europe (non-bre) | o | | | 1% in waddensea region but no real estuarine species |
| Bean Goose | rossicus | o | | | 1% in waddensea region but no real estuarine species |
| Pink-footed Goose | Svalbard (bre) | o | | | 1% in waddensea region but no real estuarine species |
| Greater White-fronted Goose | albifrons, Baltic - North Sea | o | | | 1% in waddensea region but no real estuarine species |
| Greylag Goose | anser, NW Europe (bre) | o | | | 1% in waddensea region but no real estuarine species |
| Barnacle Goose | N Russia, E Baltic (bre) | x | | x | |
| Brent Goose | bernicla | x | | x | |
| Brent Goose | hrota, Svalbard, N Greenland (bre) | x | | x | |
| Common Shelduck | NW Europe (bre) | x | | | |
| Eurasian Wigeon | NW Europe (non-bre) | x | | x | |
| Gadwall | strepera, NW Europe (bre) | o | | | 1% in waddensea region but no real estuarine species |
| Common Teal | crecca, NW Europe (non-bre) | x | | x | |
| Mallard | platyrhynchos, NW Europe (non-bre) | x | | x | |
| Northern Pintail | NW Europe (non-bre) | x | | x | |
| Northern Shoveler | NW & C Europe (non-bre) | o | | | 1% in waddensea region but no real estuarine species |
| Greater Scaup | marila, W Europe (non-bre) | x | | x | |
| Common Eider | mollissima, Baltic, Wadden Sea | x | | x | |
| Common Scoter | nigra | o | | | 1% in waddensea region but no real estuarine species |
| Red-breasted Merganser | NW & C Europe (non-bre) | x | | | |
| Eurasian Oystercatcher | ostralegus | x | | x | |
| Pied Avocet | W Europe (bre) | x | | x | |
| Northern Lapwing | Europe (bre) | o | | | 1% in waddensea region but no real estuarine species |
| Eurasian Golden Plover | apricaria | o | | | 1% in waddensea region but no real estuarine species |
| Eurasian Golden Plover | altifrons, N Europe, extreme W Siberia (bre) | o | | | 1% in waddensea region but no real estuarine species |
| Grey Plover | squatarola, E Atlantic (non-bre) | x | | x | |
| Common Ringed Plover | hiaticula | x | | x | |
| Common Ringed Plover | psammodroma | x | | | |
| Common Ringed Plover | tundrae | x | | | |
| White-fronted Plover | mechowi Coast Angola to Cameroon | | x | | |
| White-fronted Plover | arenaceus SW Africa | | x | | |
| White-fronted Plover | marginatus | | x | | |
| Kentish Plover | alexandrinus, E Atlantic, W Mediterranean | x | | x | |
| Black-tailed Godwit | limosa, W Europe (bre) | o | | | 1% in waddensea region but no real estuarine species |
| Black-tailed Godwit | islandica | o | x | | 1% uncertain |
| Bar-tailed Godwit | lapponica | x | | x | |
| Bar-tailed Godwit | taymyrensis, W, SW Africa (non-bre) | x | | x | |
| Whimbrel | phaeopus, NE Europe (bre) | x | | | |
| Whimbrel | islandicus | | x | | |
| Eurasian Curlew | arquata | x | | x | |
| Spotted Redshank | Europe (bre) | x | | | |
| Common Redshank | totanus Northern Europe (breeding) | x | | x | |
| Common Redshank | robusta | x | | | |
| Common Redshank | britannica | x | | x | |
| Common Greenshank | NW Europe (bre) | x | | | |
| Ruddy Turnstone | interpres, NE Canada, Greenland (bre) | x | x | x | |
| Ruddy Turnstone | interpres, Fennoscandia, NW Russia (bre) | x | x | | |
| Red Knot | canutus | x | | x | |
| Red Knot | islandica | x | | x | |
| Sanderling | E Atlantic (non-bre) | x | x | x | |
| Curlew Sandpiper | W Africa (non-bre) | x | | x | |
| Dunlin | alpina | x | | x | |
| Dunlin | schinzii, Iceland (bre) | | x | | |
| Dunlin | schinzii, Baltic (bre) | x | | x | |
| Dunlin | schinzii, Britain & Ireland (bre) | | x | | |
| Dunlin | arctica | | x | | |
| Ruff | W Africa (non-bre) | o | | | 1% in waddensea region but no real estuarine species |
| Common Gull | canus | x | | x | |
| Audouin's Gull | Mediterranean br | | x | | |
| Great Black-backed Gull | NW Atlantic | o | | | 1% in waddensea region but no real estuarine species |
| Herring Gull | argentatus | x | | x | |
| Herring Gull | argenteus | x | | x | |
| Lesser Black-backed Gull | graellsii | x | | x | |
| Grey-headed Gull | poiocephalus | | x | | |
| Black-headed Gull | West & Central Europe (bre) | x | | x | |
| Little Gull | N, C & E Europe (bre) | o | | | 1% in waddensea region but no real estuarine species |
| Lesser Crested Tern | par Mediterranean | | x | | |
| Sandwich Tern | sandvicensis, W Europe (bre) | x | | x | |
| Royal Tern | albididorsalis | | x | | |
| Roseate Tern | dougalli, W Europe (bre) | | x | | |
| Common Tern | hirundo, S, W Europe (bre) | x | | x | |
| Common Tern | hirundo, N, E Europe (bre) | | x | | |
| Common Tern | hirundo, W. Africa (bre) | | x | | |
| Arctic Tern | N Eurasia (bre) | o | | x | 1% uncertain, not realy estuarine |
| Little Tern | albifrons, W Europe (bre) | x | | | |
| Little Tern | guineae | | x | | |
| Damara Tern | | | x | | |
| Black Tern | niger | o | | | 1% in waddensea region but no real estuarine species |
| | | 46 | 29 | | |

Annex 2. Countries with breeding and or wintering populations of the Wadden Sea Flyway Initiative. Indicated are the number of populations breeding or wintering per country.

| Country | Breeding | | Country | wintering |
|---|---|---|---|---|
| Sweden | 36 | | France | 36 |
| Russia | 34 | | Netherlands | 33 |
| Norway | 32 | | Germany | 32 |
| Finland | 27 | | United Kingdom | 31 |
| Germany | 24 | | Denmark | 29 |
| Netherlands | 23 | | Ireland | 26 |
| Denmark | 22 | | Spain | 26 |
| Estonia | 21 | | Belgium | 22 |
| United Kingdom | 21 | | Mauritania | 22 |
| France | 15 | | Portugal | 19 |
| Belgium | 14 | | Morocco | 18 |
| Iceland | 14 | | Senegal | 14 |
| Ireland | 13 | | Gambia | 13 |
| Poland | 9 | | Guinea-Bissau | 13 |
| Latvia | 8 | | Sweden | 12 |
| Greenland | 7 | | Tunisia | 12 |
| Lithuania | 7 | | Guinea | 10 |
| Spain | 7 | | Italy | 10 |
| Portugal | 5 | | Ghana | 9 |
| Canada | 4 | | Sierra Leone | 9 |
| Svalbard | 4 | | Ivory Coast | 7 |
| Italy | 2 | | South Africa | 7 |
| Algeria | 1 | | Algeria | 6 |
| Mauritania | 1 | | Namibia | 6 |
| Morocco | 1 | | Norway | 6 |
| Senegal | 1 | | Angola | 5 |
| Tunisia | 1 | | Latvia | 5 |
| Benin | 0 | | Poland | 5 |
| Gabon | 0 | | Nigeria | 4 |
| Gambia | 0 | | Cameroon | 4 |
| Ghana | 0 | | Gabon | 4 |
| Cameroon | 0 | | Estonia | 3 |
| Guinea | 0 | | Finland | 2 |
| Guinea-Bissau | 0 | | Lithuania | 2 |
| Angola | 0 | | Benin | 1 |
| Namibia | 0 | | Iceland | 1 |
| Sierra Leone | 0 | | Russia | 1 |
| Ivory Coast | 0 | | Togo | 1 |
| South Africa | 0 | | Canada | 0 |
| Nigeria | 0 | | Greenland | 0 |
| Togo | 0 | | Svalbard | 0 |