

# OSPAR CEMP Guidelines

## Common Indicator: Marine Bird Abundance (B1)

(OSPAR Agreement 2016-09)<sup>1</sup>

*This OSPAR biodiversity indicator is still in the early stages of implementation and as a result of iteration and learning, it is anticipated that there will be evolution of the methods and approaches documented in the CEMP guidelines. Version updates will be clearly indicated and be managed in a phased approach via ICG-COBAM through its expert groups and with the oversight and steer of BDC.*

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<sup>1</sup> This document exists in English only

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# 1 Introduction

The OSPAR Common Indicator: B1 – Marine bird abundance will contribute to assessments of the state of marine bird populations and assessments of Good Environmental Status under the Marine Strategy Framework Directive: MSFD criterion: 1.2 Population Size; MSFD indicator: 1.2.1 Population abundance (superseded in Comm. Dec. (EU) 2017/848 by Primary Criterion D1C2 *The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.*)

This indicator includes information on marine bird species, which at some point in their annual life cycle, are reliant on coastal and offshore areas. The indicator is constructed from species-specific trends in annual abundance. The monitoring and data collation described below, concern marine birds when they are:

- a. on land at breeding colonies or sites, nesting close to the coast and using marine environment (e.g. for food); and/or
- b. on land or at sea during migration or over-winter i.e. ‘non-breeding’ : abundance is estimated from counts of adult birds in intertidal areas or close to the shore and counted from land or from the air.

In the context of MSFD, abundance indicators could also be constructed from time-series data collected at sea (see Annex 1).

In this context, ‘marine birds’ include the following taxonomic groups that are commonly aggregated as ‘waterbirds’ and ‘seabirds’:

*Waterbirds*: shorebirds (order Charadriiformes); ducks, geese and swans (Anseriformes); divers (Gaviiformes); and grebes (Podicipediformes);

*Seabirds*: petrels and shearwaters (Procellariiformes); gannets and cormorants (Pelecaniformes); skuas, gulls, terns and auks (Charadriiformes).

Shorebirds, some duck species and some gulls feed on benthic invertebrates in soft intertidal sediments and on rocky shores. Geese mostly graze on exposed eelgrass beds (i.e. *Zostera* spp.). Diving duck species feed on invertebrate benthos in shallow inshore waters. All other marine birds, including some gulls, spend the majority of their lives at sea, feeding on prey living within the water column (i.e. plankton, fish and squid) or picking detritus from the surface. Divers, piscivorous ducks, grebes, cormorants, gulls and terns tend to be confined to inshore waters; whereas petrels, shearwaters, gannets, skuas and auks venture much further offshore and beyond the shelf break.

This indicator and its assessment values (aka ‘thresholds’) are derived from the OSPAR EcoQO on *Seabird population trends as an index of seabird community health* (ICES, 2008, 2010, 2011, 2012), which was adopted by OSPAR’s Biodiversity Committee (BDC) in 2012 (see OSPAR 2012). This indicator supersedes the EcoQO as it incorporates data on more species, including waterbirds and also uses data on non-breeding abundance.

This indicator has gone through extensive testing and development (see ICES, 2013a, b, c, d, 2015). OSPAR IA2017 indicator assessment values are not to be considered as equivalent to proposed European Union Marine Strategy Framework Directive (MSFD) criteria threshold values, however they can be used for the purposes of their MSFD obligations by those Contracting Parties that wish to do so.

## 2 Monitoring

### 2.1 Purpose

Marine bird species represent a variety of feeding guilds, from herbivores to top predators. Abundance changes slowly under 'natural' conditions due to the long life-span of these species, thus rapid changes in their numbers might indicate human-induced impacts.

This indicator will be affected by pressure from fishing, predation by non-indigenous mammals and habitat loss. Fishing impacts include competition for food and mortality from bycatch. Many seabird species have benefited from food provided by the fishing industry through discards. This indicator may help us monitor the impact on seabird populations of the new EU Landings Regulations aimed at eliminating discards.

The indicator and its threshold are derived from the OSPAR EcoQO on Seabird population trends as an index of seabird community health. Abundance is used as an indicator of seabird community health because it is

- a) measured widely and relatively easily;
- b) a good indicator of long-term changes in seabird community structure;
- c) likely to change slowly under 'natural' conditions, so rapid changes in their numbers might indicate human-induced impacts, thereby providing a cue for immediate management actions.

### 2.2 Quantitative Objectives

#### *Temporal and spatial distribution for the monitoring programme*

The monitoring required for indicator B1 is ideally, annually-repeated counts of breeding pairs or adult birds; and of number of birds per species per site per year that are counted from the land or air during migration and over winter. Monitoring should be conducted on a site by site basis but needs to be representative of each sub-region and sub-division therein. Data from at-sea monitoring (i.e. from boats and planes) may be added to the indicator in future years once a joint large-scale survey programme has been developed and implemented (see Annex 1).

The IA2017 assessment is based on data from transitional waters as well as coastal and marine, in order to provide a more meaningful sub-regional assessment of marine bird populations. Estuarine water bodies or 'transitional waters' are generally not included by Member States as 'coastal waters' as defined by Article 3 (1) of the EU Marine Strategy Framework Directive. Such areas within the north-east Atlantic are used by millions of migrating waterbirds each year. Many estuaries are considered to be internationally important for migrating or wintering aggregations of waterbirds. Excluding estuarine populations of migrating and wintering waterbirds would miss out a large and important part of the marine bird community in the north-east Atlantic. For instance, in the southern North Sea, the exclusion of data from estuarine sites would omit from the assessment of B1 species hundreds of thousands of birds from around 10-15 species.

Marine birds are highly mobile and cross between sub-regions within a year. Monitoring should be representative of all sub-regions in order to identify impacts and threats.

All the countries in the Celtic Seas and Greater North Sea conduct annual monitoring of abundance of breeding and non-breeding marine birds. All these schemes need to continue in order to make the indicator B1 operational at a sub-regional scale in the Celtic Seas and the Greater North Sea.

Monitoring in some countries may need to be expanded to construct a more robust indicator. For example, monitoring of non-breeding waterbirds (including waders) in the Greater North Sea and Celtic Seas is

concentrated in transitional waters, so additional monitoring of non-estuarine coasts may be required to construct the indicator for these species.

#### *Power to detect change*

Currently, many of the species-specific indicators of abundance have a large margin of error. It will not always be possible to ascertain, with a high degree of confidence, whether or not an assessment value has been exceeded or not. In most of the monitoring schemes that contributed data to the B1 indicator assessment in IA2017, more sites could be monitored and others could be monitored more frequently. These enhancements will improve the precision of the indicators and hence, the confidence we will have in our assessments against thresholds for GES. One example of this is the UK, where, despite having a large long-running co-ordinated scheme for monitoring breeding birds (The Breeding Bird Survey – BBS), the data generated from surveys of waterbird species breeding at coastal sites was insufficient to provide representative trends for each of OSPAR Region II and III.

### **2.3 Monitoring Strategy**

Data collection is currently carried out and funded by national monitoring schemes. Monitoring of breeding abundance of marine birds is conducted in all OSPAR regions and as part of nationally coordinated schemes. The contribution of monitoring data by Contracting Parties for the assessment of indicator B1 in the IA2017 is described in Annex 1. It also identifies gaps in data availability (see Table A1-1) and describes the potential for an operational indicator B1 in each OSPAR Region.

Most national schemes have a central data storage mechanism (e.g. national database).

Most countries monitor a sample of their colonies, with some but not all counted annually. Periodically, all colonies may be surveyed as part of a total census, sometimes carried out successively (area-by-area) over a number of years (e.g. 10-yr mapping scheme in Norway).

The intensity of monitoring (i.e. number of colonies and frequency) also varies depending on species. The minimum amount of monitoring locations depends on species and the inherent variability in trends between locations, and the magnitude of change that needs to be detected with statistical confidence. If a compromise between frequency and spatial coverage needs to be made, then the counts should be made less frequently but at more sites to better represent the distribution of birds within a sub-region.

### **2.4 Monitoring methods**

In 2016, the following data were requested from Contracting Parties on counts of breeding and non-breeding adult birds collected during the period 1980–2015:

1. Breeding seabird colonies and breeding waterbirds nesting close to the coast and using the marine environment (e.g. for food): counts of breeding pairs (preferably, or failing that adult birds) per species per colony per year.
2. Wintering and migrating waterbirds: numbers of birds per species per site per year that are counted from land or from the air. These data mostly comprise maximum or single counts conducted in January (N.B. within the Arctic Circle counts are conducted in March when there is sufficient daylight to do so). Data from the Wadden Sea Trilateral (Germany, Netherlands and Denmark) Monitoring and Assessment Programme and from the United Kingdom Wetland Bird

Survey also comprised a mean of counts conducted throughout a one-year period (from July in one year to June in the next).

Most data refer to individual colonies or sites rather than large stretches of coastline. Exceptions are the Wadden Sea, the Dutch Delta and for non-breeding data in the United Kingdom, where colonies have been aggregated to regions and sub-divisions.

Monitoring breeding abundance is more straightforward in some species than others, so species-specific methods have been designed and are widely used (see e.g. Walsh et al. 1995, Koffijberg et. al. 2011). Generally, the number of nests, pairs or individuals within an entire colony, or specially selected sub-sections, or plots are counted. This requires one or two observers visiting a colony several times during the breeding season (i.e. usually May-Aug, but varies with species and latitude). Resources required for these visits are dependent on how accessible the colony is, i.e. colonies in remote areas and on uninhabited offshore islands are more expensive to monitor than colonies on mainland coasts in populated areas.

The time required for data collection depends on the number of sites and types of marine bird being surveyed (e.g. breeding seabird at colonies on remote offshore islands or wintering waders along mainland stretches of coast). Each national monitoring programme currently manages time allocations.

Monitoring costs in most countries are minimised by using volunteer observers, but professional observers are sometimes used to monitor the less accessible colonies –especially in the north. Hence, monitoring costs will vary between countries depending on the number of colonies to be monitored, the accessibility of these colonies and on how much of the monitoring can be done by volunteers. During colony visits for abundance monitoring, some data on breeding success for common indicator Breeding success/failure of marine bird species (B3) can also be collected. Monitoring costs for both indicators are thus not necessarily additive.

## **2.5 Quality assurance/ Quality Control**

Each national monitoring scheme has QA/QC protocols, but European standards should be developed. A minimum standard should be to follow internationally recognised monitoring methods (e.g. Walsh et. al. 1995; Koffijberg et. al. 2011).

## **2.6 Data reporting, handling and management**

Each CP has its own data storage mechanism. Within each sub-region and sub-division therein, indicator B1 is constructed from all available data from constituent CPs before being assessed. CPs are asked to submit their data in response to data-calls issued to OSPAR HoDs via written procedure.

The frequency of OSPAR data-calls is to be decided, but will be no more frequent than annually. Data are stored in the OSPAR Marine Bird Database hosted by ICES Data Centre via the ICES Biodiversity Data Portal at <http://www.ices.dk/marine-data/data-portals/Pages/Biodiversity.aspx>.

Data undergo a series of validation checks during the uploading process. .

*Reporting format (Available via a link in the CEMP Appendices)*

Data entry forms can be downloaded from <http://www.ices.dk/marine-data/data-portals/Pages/Biodiversity.aspx>

Guidance for submitting data is available at [http://www.ices.dk/marine-data/Documents/biodiversity/Birds\\_Reporting\\_Format\\_Guidance.pdf](http://www.ices.dk/marine-data/Documents/biodiversity/Birds_Reporting_Format_Guidance.pdf)

The following data are requested from contracting parties:

- a) breeding seabird colonies (incl. gulls and terns) and breeding waterbirds (incl. waders) nesting close to the coast and using marine environment (e.g. for food) – counts of breeding pairs (preferably or failing that - adults) per species per colony per year.
- b) wintering and passage waterbirds (incl. waders) – numbers of birds per species per site per year that are counted from land.

Note 1: data on seabirds or waterbirds at-sea, collected from boats or from planes are not required. Except, data collected by aerial surveys in the Wadden Sea for Eider (January) and Shelduck (July/August - moulting).

Note 2: All data under a) and b) should preferably come from individual colonies or sites rather than over large stretches of coastline.

Note 3: Data on non-breeding waterbirds will be requested for two time periods, depending on availability: a) max count in January; and b) mean count during July to June. (b) is currently used by TMAP in the Wadden Sea. This will be used to provide an indicator in the southern North Sea subdivision of OSPAR II, but may not be used elsewhere. Maximum January counts are more widely used (e.g. by International Waterbird Census) and will be used to construct indicators for each OSPAR Region.

Note 4: Abundance data CAN include previously modelled estimates that account for temporal and spatial gaps in data coverage. This is recorded in the Excel using the field 'Count\_method' to distinguish modelled and observed records.

- c) Baselines (all species) - The baseline for each species, should be set at a population size that is considered desirable for each individual species within: i. the whole of the relevant OSPAR Region and ii. in each subdivision of OSPAR Regions I and II, where applicable (see Figure 1).
- d) Regional weightings (all species) -size of the population of each species in each subdivision of OSPAR Regions I and II, and each sub-division (see Figure 1). These data will be used to weight the annual estimates of abundance from the sample of sites monitored in each country (see below).

## 3 Assessment

### 3.1 Data acquisition

See section 2.6 above

### 3.2 Preparation of data

This indicator is assessed for each OSPAR Region and sub-divisions therein (see Figure 1). The smaller sub-divisions may help to interpret the assessment results. The sub-divisional boundaries are based on a coarse assessment of the main oceanographic features such as currents and depth, and some relatively clear-cut differences in seabird / waterbird community structure and population trends (ICES, 2013c,d; Cook et al., 2011). OSPAR Region II – the Greater North Sea is divided into five subdivisions (Figure 1), defined as follows:

- a) Northeast coast of Britain: Duncansby Head (in the north) to Staithes (in the south);

- b) West coast of Norway: Northwest from Lindesnes;
- c) Skagerrak/Kattegat area: all coasts east of Lindesnes (NO) and Hanstholm (DK), i.e. the Skagerrak and the Kattegat; equals ICES Area IIIa;
- d) Southern North Sea: all coasts south of Teesmouth (UK) and Hanstholm (DK), and north of the Channel subdivision (e);
- e) The Channel: all coasts of OSPAR II south of Dover (UK) and Calais (FR).
- f) North coast of Scotland and the Northern Isles: OSPAR II/III North Boundary to Duncansby Head, plus Orkney and Shetland.

OSPAR Region I – Arctic Waters, encompasses several very different ecosystems in terms of key species and trophic interactions. It would be very difficult to set appropriate thresholds and reference levels for the population of a seabird species across such a large area, because in different ecosystems it may respond very differently to pressures and environmental factors. In the IA2017, the assessment of this indicator in the Arctic was restricted to Norwegian waters only, because no data were available from elsewhere in the Region. Norwegian Arctic waters were divided into the Barents Sea (North and South) and Norwegian Sea. As data become available from other parts of the arctic, further subdivisions could be added which could be similar to the large marine ecosystems (LMEs) that have been recommended for the Arctic Council, and are implemented for various assessment purposes in the work of CAFF.

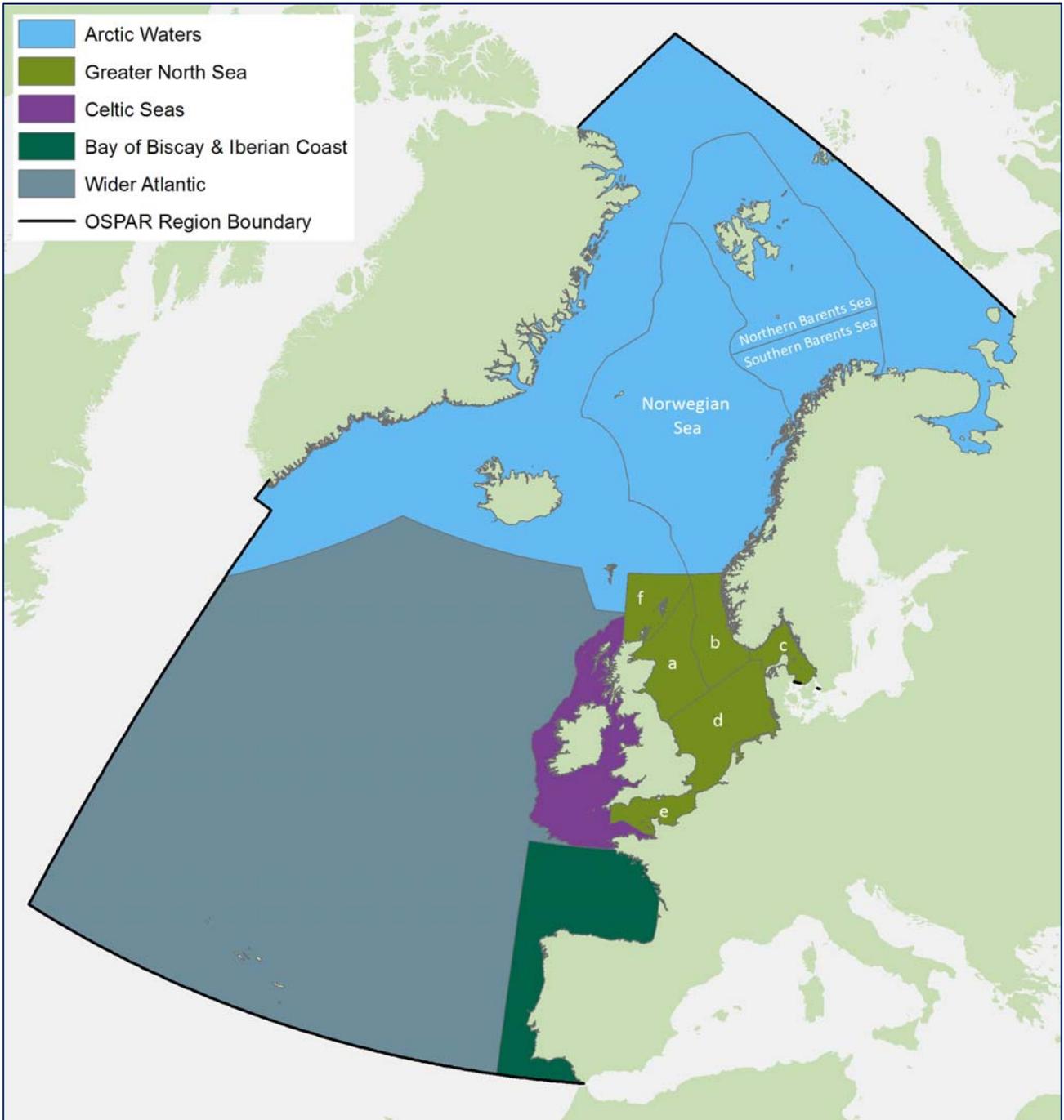


Figure 1. Marine Bird assessment units.

### 3.3 Species aggregation – functional groups

Species were assigned to the functional groups given in the Table 1. The species assessed during the testing and the functional groups to which they were assigned, are given in the table in Annex 3. The table also lists additional species which could be brought into the indicator following inclusion of additional OSPAR sub-regions and/or if existing monitoring programmes were extended. These functional groups were proposed by JWGBIRD (ICES 2014) and have been adopted in the EU Commission Decision (2017/848)<sup>2</sup>

Table 1: Marine bird functional groups

Functional group	Typical feeding behaviour	Typical food types	Additional guidance
Wading feeders	Walk/wade in shallow waters	Invertebrates (molluscs, polychaetes, etc.)	
Surface feeders	Feed within the surface layer (within 1–2 m of the surface)	Small fish, zooplankton and other invertebrates	“Surface layer” defined in relation to normal diving depth of plunge-divers (except gannets)
Water column feeders	Feed at a broad depth range in the water column	Pelagic and demersal fish and invertebrates (e.g. squid, zooplankton)	Include only spp. that usually dive by actively swimming underwater; but including gannets. Includes species feeding on benthic fish (e.g. flatfish).
Benthic feeders	Feed on the seafloor	Invertebrates (e.g. molluscs, echinoderms)	
Grazing feeders	Grazing in intertidal areas and in shallow waters	Plants (e.g. eelgrass, saltmarsh plants), algae	Geese, swans and dabbling ducks, coot

### 3.4 Spatial Analysis and / or trend analysis

#### *Trend Analysis*

This indicator assessment requires for each species an annual estimate of either breeding or non-breeding abundance (depending on species) per site or colony. Not all the colonies and sites in the data provided will have been observed every year. Missing annual observations need to be interpolated from the observed data using statistical models. The minimum number of years of counts for a particular species required for a colony or site to be included in the analysis should be set at two for all species except northern fulmar (*Fulmarus glacialis*), which should be set at a minimum of five years (ICES, 2010, 2011). In the IA2017, some Contracting Parties provided data that had no missing values because these had already been interpolated prior to submission, using tried and tested methods.

<sup>2</sup> EU Commission Decision (2017/848) - laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU

For all other data submitted by Contracting Parties, missing annual observations are interpolated using a modified chain method, first developed by Thomas (1993). This method estimates values of missing observations based on information in other years and sites. The advantage of this method is that it allows for site-specific variation, thereby avoiding the conventional assumption that changes in abundance at different sites occur synchronously. A further advantage of this approach is that it can easily incorporate counts of whole colonies and counts from smaller plots within the same colonies that are monitored more frequently than the whole colony. The Thomas estimation method has been used to construct trends in abundance for earlier iterations of this indicator and its OSPAR Ecological Quality Objective (EcoQO) predecessor. Details of the method are as reported by ICES (2008: Annex 3).

#### *Applying Regional Weightings to Abundance Trends*

Not all the colonies or sites in an assessment unit will be monitored and present in the dataset. The proportion of a population that is monitored varies between species and between countries. There is a resultant bias, in that those countries where few sites are monitored are under-represented in the trends for a given assessment unit, compared to those countries where a larger proportion of sites are monitored.

To remove such bias, the annual estimates of breeding and non-breeding abundance in each country should be weighted according to the size of the population in that country. Each Contracting Party is asked to provide recent estimates of total abundance for each species along their coastline within each of the assessment units in Figure 1. To apply a regional weighting, each annual estimate of abundance in each assessment unit was divided by a proportion  $p$ , where  $p$  is the proportion of the total population that is present within the sites or colonies that are included in the data provided. The total number of adult birds or pairs in an assessment unit are, in most instances, taken from national censuses.

As an example, the weighted annual breeding abundance of a species in the Celtic Seas region,  $y_{IIIj}$  in year  $j$ , is calculated from annual estimates of abundance in each constituent country, i.e. the United Kingdom Celtic Seas coast ( $y_{UKj}$ ) and Ireland ( $y_{IREj}$ ) as follows:

$$y_{IIIj} = (y_{UKj} / p_{UK}) + (y_{IREj} / p_{IRE})$$

where  $p_{UK}$  and  $p_{IRE}$  are the proportions of the respective populations in the United Kingdom (UK) and Ireland (IRE) that are contained in the sample of colonies that are monitored in each constituent country in the Celtic Seas region.

Regional weightings are not necessary where data contains all the colonies or sites in that area. In Belgium, all the breeding and non-breeding sites in the country are monitored, so no weightings are required for these data. Regional weighting are also not necessary for estimates of annual abundance that had been interpolated before submission.

### **3.5 Assessment criteria**

#### *Parameter/metric*

The indicator metric is *relative abundance*: annual abundance as a proportion of the baseline.

$$\text{relative abundance} = \text{annual abundance} / \text{baseline abundance}$$

#### *Baseline level*

The baseline for each species, should be set at a population size that is considered desirable for each individual species within each geographical area.

Baselines should be set as follows:

- a) 'Historical reference' where we know abundance a point in the past long before the time-series began; but don't know why it may have changed since.
- b) Reference level- where we would expect the population size to be if anthropogenic impacts were negligible (this can be derived from known population sizes either historically or from within time-series).
- c) Start level of time-series- at the start: first ten years, use start point if a significant trend was present, or the mean if no trend was present. Use the mean for non-breeding data.

It is preferable to set baselines objectively (i.e. a) or b)) rather than arbitrarily (i.e. c)). Option a) potentially provides the most objective baseline, but the limited length of the time-series available may mean some assumptions are made in setting them. The following criteria can be used to steer and standardise expert judgement when selecting baselines.

- Use historical population estimates that were recorded:
  - i. before known human impacts; and /or
  - ii. before other major declines in population; or
  - iii. at known plateaus in population trends, following increases and peaks in population size.
- Use the highest known population estimate when the population has decreased in size, as a result of human impacts (e.g. periods of severe contamination) or following stochastic natural impacts (e.g. severe weather wrecks).
- Use start level of time-series when no historical data or reference level are available.
- Use recent population estimate (e.g. previous five year mean) when a species is colonising.

Note: In the IA2017, a baseline equal to the abundance at the start of the time series (i.e. 1992) was used because most Contracting Parties did not provide other baselines.

### *Species-specific Assessment values*

The assessment values for each species-specific indicator of trends in relative abundance are set on the magnitude of change relative to a baseline of 1.0: species-specific annual relative breeding or non-breeding abundance should be more than 0.8 for species that lay one egg, or more than 0.7 for species that lay more than one egg (ICES 2008, 2010, 2011).

These different assessment values were set according to the resilience of populations to decline. These assessment values could be changed or set individually for each of the species-specific trends.

An upper assessment value of 1.3 (i.e. 130% of the baseline) are applied to the annual relative abundance of all species. This upper assessment value is used to identify potentially disruptive increases in some species that might impact on other species (ICES 2008). For instance, large predatory seabird species have benefited from the provision of food from fishery discards. The increase in numbers of species such as great black-backed gull and great skua have, in some areas, led to declines in species such as kittiwake that they prey on. However, this has the potential to wrongly identify a species as having a detrimental impact on other species when in fact it is in recovery to levels in excess of the baseline (ICES, 2010, 2011, 2013b). As a result, this upper assessment value is not used as an indicator of status and is only used to provide a trigger for further research and / or management, if increases in one species are likely to result in decreases

in others. When reporting on the annual results of the species-specific indicators, species that have exceeded 130% of the baseline, should be highlighted.

#### *Integration of species-specific assessments*

The status of marine bird communities was assessed in the IA2017 by calculating the proportion of species exceeding the lower assessment values, as previously used for breeding seabirds in the EcoQO on seabird population trends as an index of community health (ICES, 2008), according to the following integration rule:

*Changes in abundance of marine birds should exceed species-specific assessment values in 75% or more of species that are assessed.*

Humphreys et al. (2012) also recommended a value of 75% for non-breeding shorebirds and coastal breeding waterbirds in the United Kingdom because it is comparable to the assessment values used for shorebirds by the WeBS Alerts system.

In the IA2017, relative breeding abundance and relative non-breeding abundance were assessed separately in each Region. This is because most species in the breeding assessment are seabirds that use the wider marine environment and most species in the non-breeding assessment use intertidal and inshore areas. The breeding and non-breeding assessments therefore indicate impacts from different suites of pressures, operating in different parts of the marine environment. To provide further insight into causes of change, species-specific assessments of breeding abundance and non-breeding abundance can also be integrated for each functional group (Table 1).

#### *Spatial assessments and integration*

To provide greater insight into the likely impacts operating on relative breeding abundance and on relative non-breeding abundance, species-specific assessments can be integrated at different spatial scales: for each OSPAR Region and for each sub-division of the Greater North Sea and Arctic Waters.

The following steps will be required in order to complete an assessment in e.g. OSPAR Region II or in other subregions that are subdivided:

1. Produce separate indicators for each subdivision of OSPAR Region II. This consists of a suite of species-specific trends in relative abundance; species composition may vary between subdivisions.
2. Assess each species-specific trend against its respective assessment value (i.e.  $\geq 70\%$  for species that lay  $> 1$  egg and  $\geq 80\%$  for species that lay 1 egg).
3. Count the number of species in each subdivision that have met their respective assessment values. Assess proportion of species meeting assessment value against the 75% threshold in each subdivision.
4. Construct indicator for the whole of OSPAR Region II. This consists of a suite of species-specific trends in relative abundance that are weighted for the respective total population sizes in each subdivision.
5. Assess each OSPAR Region II species-specific trend against its respective assessment value (i.e.  $\geq 70\%$  for species that lay  $> 1$  egg and  $\geq 80\%$  for species that lay 1 egg).
6. Count the number of species in OSPAR Region II that have met their respective assessment value. Assess proportion of species meeting assessment value against the 75% threshold in OSPAR Region II.

### 3.6 Presentation of assessment results

The indicator should be updated as frequently as possible; annually is preferable. The assessments of the indicator against its assessment value should be conducted and reported annually also. This will enable management measures to address impacts before the state of indicator declines too much, which may save considerable resources. Annual reports would also enable the effectiveness of the management measures to be frequently assessed and adjusted if required.

Figure 2 shows how the trends and target assessment for individual species indicators can be presented.

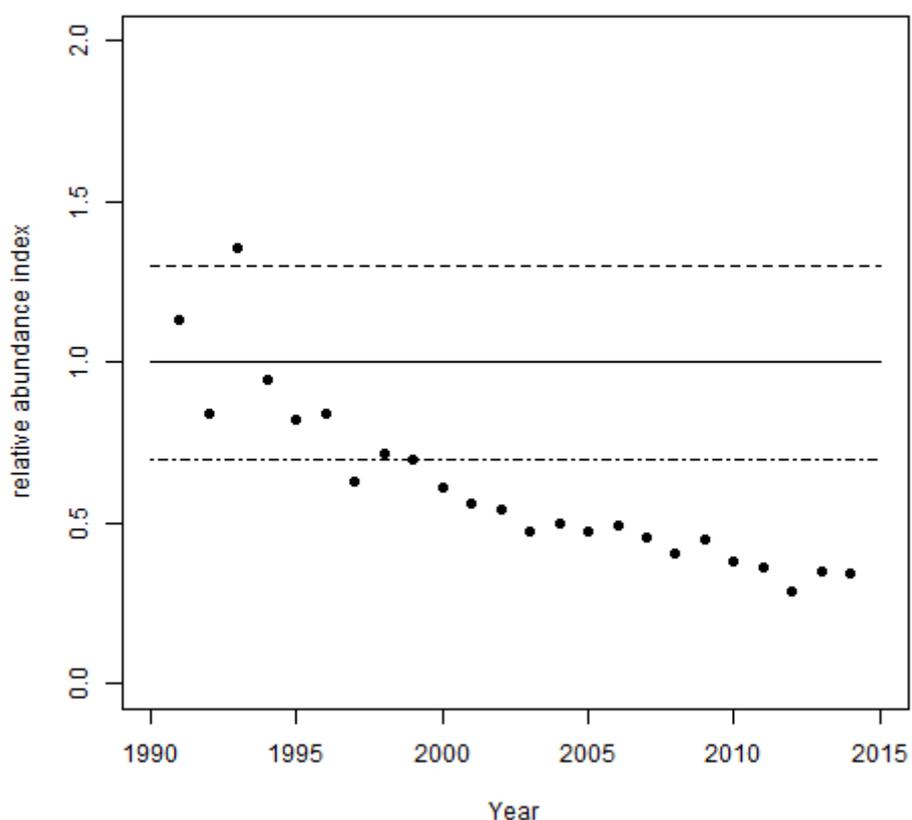


Figure 2: Example of a species-specific trend in relative breeding abundance: black-legged kittiwake in the Greater North Sea 1992–2015. The baseline is where relative abundance = 1.0. The black dotted line indicates the lower assessment value of 0.7 (for species that lay >1 egg); the black dashed line indicates the upper assessment value of 1.3. (Source IA2017)

Figure 3 provides an example of a regional assessment using an integration across species assessments and a multi-species assessment value of 75%.

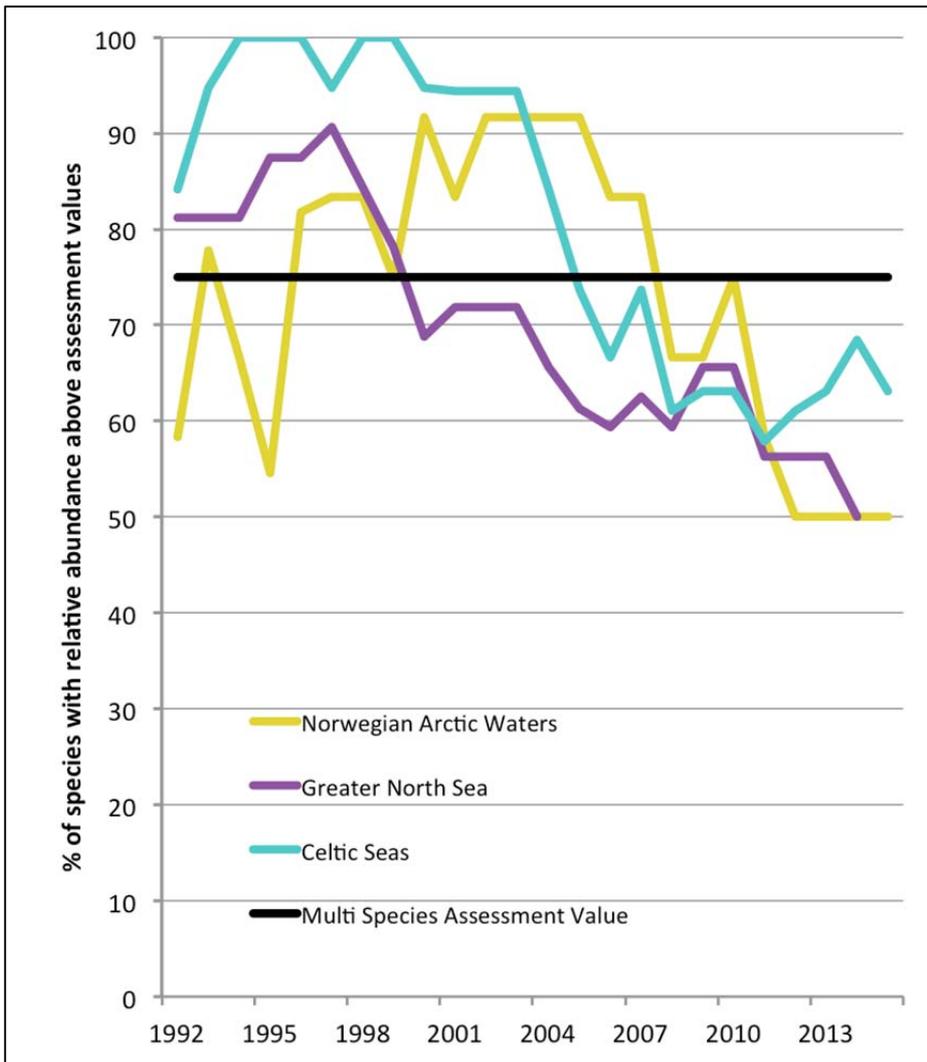


Figure 3: Change in the annual proportion of species exceeding assessment values for the relative breeding abundance of marine birds in the Norwegian part of the Arctic Waters (12 species) and Celtic Seas (19 species) regions during the period 1992–2015, and in the Greater North Sea region (32 species) during the period 1992–2014. The black line denotes the multi-species assessment value of 75% (Source IA2017).

Figure 4 shows how the species-specific assessments in the different Regions can be presented side by side and visually interpreted via a traffic light system. The colour coding in Figure 4 denotes if relative abundance has exceeded the lower assessment value (i.e. 0.7 or 0.8 depending on clutch size) or upper assessment value (i.e. 1.3). The arrows in Figure 4 illustrate recent direction of change and are useful in identifying those species that are either recovering after being below target, or those species that are currently on target, but decreasing and may drop below the lower assessment value in the near future. The IA 2017 presents change between the most recent year and the preceding year. However, it is probably more informative to present the annual rate of change over a longer period, which could represent the length of time between successive assessments e.g. 6 years between each MSFSD Art 8 Assessment. The rate of change per annum, should be categorised as strong (>5% p.a.) or weak (2–5% p.a.) increases or decreases and no change (<2% p.a.) (following Blew *et al.*, 2013). Note the imputation method use to estimate trends (see above) is non-parametric and cannot be used to determine if a change from one period to the next is significant or not.

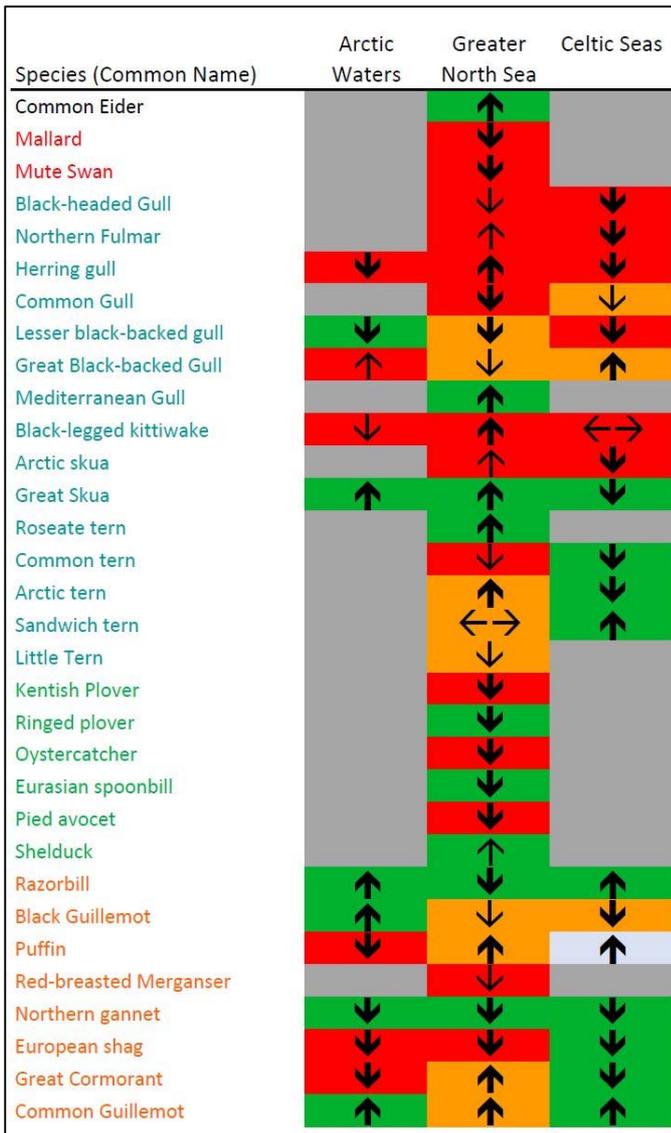


Figure 4: Figure b: Species-specific assessment of relative breeding abundance for marine birds for the Norwegian part of the Arctic Waters and for the Celtic Seas in 2015, and for the Greater North Sea in 2014.

Population change 2014-2015 (2013 - 2014 for Greater North Sea)		Species assessment	Functional Groups
↑	strong increase (>5% p.a.)	Relative abundance in 2015 <0.7 or 0.8 (depending on clutch size)	Benthic Feeders
↑	weak increase (2-5% p.a.)	Relative abundance in 2015 $\times \geq 0.7$ or 0.8 (depending on clutch size)	Wading Feeders
↔	no change (<2% p.a.)	Relative abundance in year $\times \geq 1.3$	Water Column Feeders
↓	weak decrease (2-5% p.a.)	Insufficient data	Grazing Feeders
↓	strong decrease (>5% p.a.)		Surface Feeders

## 4 Change Management

Change management of the indicator and the document is carried out by JWG BIRD which reports to ICG-COBAM that in turn is a group under BDC.

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## Annex 1:

### Utilisation of at-sea data

Data on seabirds or waterbirds at-sea, collected from boats or planes were not included in the abundance indicator so far. However this needs to be done in the future to obtain reliable results on trends of species that occur in substantial numbers in the offshore regions. Indicators could then be generated for non-breeding ducks, divers and grebes (i.e. in inshore waters outside the breeding season) and seabirds at sea (i.e. seabird species in inshore and offshore waters throughout the year). Such indicators may give an early warning of declines in some breeding populations and include species and populations not breeding in the area of assessment. In contrast to other supporting indicators of B1 (non-breeding shorebirds and waterbirds, breeding seabirds), which are more or less restricted to coastal waters, indicators for waterbirds and seabirds at sea would help to assess the status of inshore and offshore areas. Furthermore, bird data can be directly linked to environmental parameters, helping to interpret observed trends, and bird data themselves (e.g. biomass) can be incorporated into food web indicator D4 for the respective marine areas.

However, considerable development of such indicators is required. The necessary data basis for these indicators is to be derived by joint coordinated surveys of all CPs at the level of the whole OSPAR area which are not available at the current stage. At the moment several CPs carry out or plan national at-sea monitoring programmes while there are no or only limited at-sea surveys in other countries. Overall, coordination of surveys, e.g. with regard to timing, between countries is lacking. Consequently, there is a need to develop (a) a concept for survey efforts delivering the necessary data basis for the abundance indicator work, (b) implement this concept in the frame of national survey programmes in future years and (c) develop a methodological approach for aggregating and analysing the data. Similar work is being undertaken in the Baltic Sea by HELCOM.

A potential approach for the North Sea could follow a preliminary trend analysis that has been conducted on time-series data from German waters. Germany is conducting an at-sea monitoring of marine birds, based on ship-based and aerial transect surveys and with data available back to 1990. Trends are calculated on the basis of trend boxes scattered all over the German section of the North Sea (including EEZ) by the help of TRIM. It is proposed to expand this monitoring approach to the Greater North Sea according to a preliminary study (Garthe *et al.*, in prep.). An example of boxes for the calculation of trends is shown in Figure A1-1. Baselines and targets can be set in the same way as in other sections of the indicator B-1.

Using these boxes and aggregating data from three-year-periods, data from the ESAS database (version 5.0) already allowed calculating trends for the period 1980-82 to 2007-09 for the following species:

Breeding season / summer: Northern Fulmar, Northern Gannet, Great Skua, Lesser Black-backed Gull, Herring Gull, Great Black-backed Gull, Black-legged Kittiwake, Common Guillemot, Razorbill, Atlantic Puffin.  
Non-breeding season / winter: Northern Fulmar, Northern Gannet, Herring Gull, Great Black-backed Gull, Black-legged Kittiwake, Common Guillemot, Razorbill, Atlantic Puffin.

Currently, not all CPs are running at-sea monitoring programmes supporting this approach. In the Greater North Sea, operational or planned monitoring schemes can be found in the France, Belgium, Denmark, The Netherlands, Germany and Sweden. Offshore monitoring is also conducted in OSPAR subregions I (Norwegian Barent's Sea) and IV (Spain). As density estimates rather than raw data are needed for the trend calculation, it is possible to include results from other studies such as SPA monitoring and EIA into the

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analysis, also retrospectively. It is aimed to cover all subdivisions of OSPAR II, and at-sea monitoring should be encouraged in order to enlarge the geographical coverage.

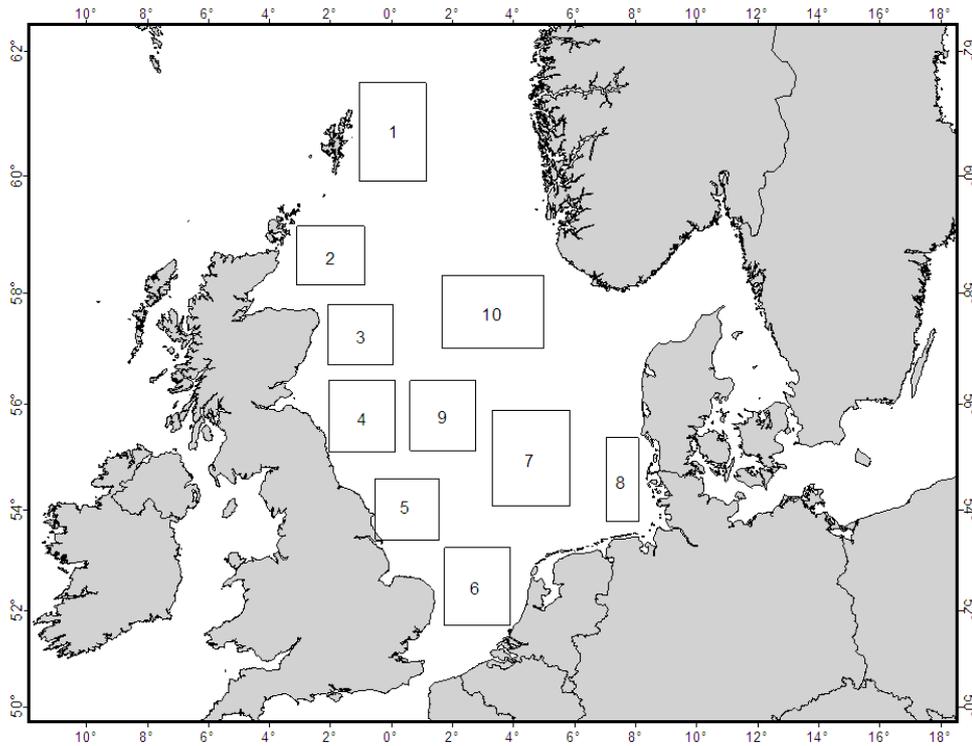


Figure A1-1: Trend boxes in OSPAR II designed for the preliminary analysis of seabird-at-sea trends, based on data of ship-based transect surveys (Garthe *et al.* in prep.).

## Annex 2:

### Data availability and utilisation

This Annex describes the contribution of Contracting Parties to provide data for the assessment of indicator B1 in the Intermediate Assessment 2017. It also identifies gaps in data availability (see Table A2-1) and describes the potential for an operational indicator B1 in each OSPAR Region.

#### *Arctic (OSPAR Region I)*

The arctic sub-region contains the highest concentrations of marine birds in the NE Atlantic. None of the Contracting Parties in the sub-region are implementing the MSFD there. Norway intend to construct indicators (similar to OSPAR common indicators) in their seas within the Arctic and have provided data on non-breeding and breeding abundance for inclusion in B1 in IA2017.

It would be beneficial if other CPs in the sub-region would mobilise their monitoring data in a similar way. Iceland is a CP of OSPAR, but have so far not provided any data input to the work of the relevant ICES/OSPAR working groups on this subject. Russia is not a CP of OSPAR. Greenland and the Faeroes are represented in OSPAR by Denmark. None of these countries have provided any data input to the work of the relevant ICES/OSPAR working groups on this subject. There are known shortcomings in the monitoring of marine birds in these areas that are likely to restrict the full implementation of B1 in OSPAR I to Norwegian areas.

The Arctic sub-region encompasses several very different ecosystems in terms of key species and trophic interactions. It would be very difficult to set appropriate assessment values and reference levels for the population of a seabird species across such a large area, because in different ecosystems it may respond very differently to pressures and environmental factors. ICES (2008) suggested that the EcoQO on seabird population trends should be based on trends within sub-divisions of OSPAR Region I. They recommended sub-divisions similar to the eco-regions for Greenland and Iceland Seas, Barents Sea, Faroes and Norwegian Sea that were proposed to ICES (and subsequently rejected) as part of the ecosystem approach in European waters (ICES 2004): i) Barents Sea, ii) Norwegian Sea, iii) Greenland and Iceland Seas, iv) Faroes.

#### *Greater North Sea (OSPAR Region II)*

All Contracting Parties bordering the Greater North Sea, with the exception of France, have provided all their available data on breeding seabirds and waterbirds and on non-breeding waterbirds. Data on at-sea abundance has not been provided so far.

The French regions of Nord Pas de Calais and Picardie have a lot of missing data due to lack of coordination for collating and formatting the data. Partial data have been provided for Normandie because of a lack of authorization to use annual data outside period of national censuses (every 10 years). Data on wintering birds is collected in both regions as part of Wetlands International's International Waterbird Census (IWC) and are potentially available. Efforts are underway to develop data sharing agreements between the French Government and the independent data holders.

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### *Celtic Seas (OSPAR Region III)*

The Republic of Ireland gave the UK permission to supply data on breeding seabird colonies that had previously been submitted to the Seabird Monitoring Programme Database. The future availability of these data will depend on whether seabird colony monitoring in Ireland is continued. Data on breeding waterbirds and non-breeding waterbirds were not accessible due to lack engagement in bird indicator development by experts from Ireland.

### *Bay of Biscay and Iberian Coast (OSPAR Region IV)*

Indicator B1 is applicable to the OSPAR Region IV. Of the 21 species breeding in OSPAR Region IV, ICES (2008) found nine to occur in very low numbers and no monitoring data has been collected on Cory's shearwater and band-rumped storm-petrel. The quality of data for six of the ten remaining species were assessed as 'good', three were assessed as sparse, and the quality of monitoring data on little terns breeding in Portugal was unknown (ICES 2008). France has supplied abundance data from breeding colonies of 15 species.

Spain has limited information regarding seabird colony monitoring. Occasional national counts have been coordinated by SEO/BirdLife, compiling existing information, for most seabird groups (excluding Procellariiforms so far). Best monitored (and most relevant) species in the Spanish area of OSPAR IV is the European shag, with two 'long-term' series (starting 1992 and 2003) and several colonies counted intermittently (with a national census in 2006). These series are the result of particular research initiatives, but should be easily accessed. No monitoring of breeding success is conducted extensively for other species. As for Procellariiforms, several colonies of European storm-petrel, with only a few small colonies regularly visited. Cory's shearwater which was recently discovered breeding in Galicia, are currently monitored.

The main barrier to the inclusion of data from Portugal has been the lack of engagement by experts from Portugal in the Bird indicator development process, which is preventing access to any data. Other possible barriers were identified by ICES (2008) that included questions over the extent of monitoring data available and the lack of any mechanism for collating monitoring data.

### *Macaronesia (OSPAR Region V)*

ICES (2008) concluded that sufficient data on breeding seabirds had been collected and collated on the Azores to construct an indicator for OSPAR Region V – Macaronesia. Only nine species of seabird breed on the Azores, but of these, good quality monitoring data exists for four: band-rumped storm-petrel, Bulwer's petrel, roseate tern and common tern. Engagement is required from Portugal in order to make the indicator operational in this sub-region

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Table A2-1: Utilisation of data from each Contracting Party in the assessment of B1 for the IA2017, indicated by 'Y' or 'N'. 'A' indicates data have been collected and are potentially available, but were not used in the assessment. '?' denotes no information obtained.

Contracting Party	OSPAR Region	Country Region	Counts of breeding seabird	Counts of breeding waterbirds	Counts of wintering and passage waterbirds
Norway	I (Barents Sea)	Barents Sea coasts, including Svalbard and Jan Mayen	Y	Y	Y
Russia	I (Barents Sea)		?	?	?
Denmark	I (Greenland and Iceland Seas)	Greenland	?	?	?
Iceland	I (Greenland and Iceland Seas)		A	?	?
Denmark	I (Faroes)	Faroe Islands	?	?	?
Norway	I (Norwegian Sea)	Norwegian Sea coast	Y	Y	Y
UK	II-a, d, e, f		Y	N*	Y
Norway	II-b	Coast of western Norway	Y	Y	Y
Denmark	II-c	Skagerrak/Kattegat coast	Y	Y	Y
Norway	II-c	Norwegian Skagerrak coast	Y	Y	Y
Sweden	II-c		Y	Y	Y
Belgium	II-d		Y	Y	Y
Germany	II-d	Wadden Sea	Y	Y	Y
Germany	II-d	Helgoland	Y	N	A
Denmark	II-d	Wadden Sea	Y	Y	Y
Denmark	II-d	North Sea coast Jutland	Y	Y	Y
Netherlands	II-d		Y	Y	Y
France	II-e	Nord Pas de Calais & Picardie	A	A	A
France	II-e	Normandy	Y/A	A	A
France	II-e	Brittany	Y	A	A
France	III	Brittany	Y	A	A
UK	III		Y	N*	Y
Rep. Ireland	III		Y	?	?
France	IV	Pays de Loire, Poitou Charente, Aquitaine	Y	A	A
Portugal	IV		?	?	?
Spain	IV		A	N	A
Portugal	V	Azores	A	N	N

## Annex 3:

### Species List - B1 Marine bird abundance

The species assessed during the IA2017 and the functional groups to which they were assigned are given in the table below. The table also lists additional species which could be brought into the indicator following inclusion of additional OSPAR subregions and/or if existing monitoring programmes were extended.

Species		Functional Groups					Assessed in IA2017	
English Name	Scientific Name	Grazing feeders	Wading feeders	Surface feeders	Water column feeders	Benthic feeders	non-breeding abundance	breeding abundance
Red-throated diver	<i>Gavia stellata</i>				X		x	
Black-throated diver	<i>Gavia arctica</i>				X			
Great Northern diver	<i>Gavia immer</i>				X		x	
White-billed diver	<i>Gavia adamsii</i>				X			
Great crested grebe	<i>Podiceps cristatus</i>				X		x	
Red-necked Grebe	<i>Podiceps grisegena</i>				X		x	
Slavonian grebe	<i>Podiceps auritus</i>				X		x	
Northern Fulmar	<i>Fulmarus glacialis</i>			X				x
Sooty Shearwater	<i>Puffinus griseus</i>			X	X			
Manx Shearwater	<i>Puffinus puffinus</i>			X	X			
Balearic shearwater	<i>Puffinus mauretanicus</i>			X	X			
Cory's Shearwater	<i>Calonectris diomedea</i>			X	X			
European Storm-petrel	<i>Hydrobates pelagicus</i>			X				
Leach's Storm-petrel	<i>Oceanodroma leucorhoa</i>			X				
Northern gannet	<i>Morus bassanus</i>				X			x
Great Cormorant	<i>Phalacrocorax carbo</i>				X	X	x	
European shag	<i>Phalacrocorax aristotelis</i>				X	X		x
Eurasian spoonbill	<i>Platalea leucorodia</i>		X				x	x
Mute Swan	<i>Cygnus olor</i>	X					x	x
Bewick's Swan	<i>Cygnus columbianus</i>	X					x	
Whooper Swan	<i>Cygnus cygnus</i>	X					x	
Greylag goose	<i>Anser anser</i>	X						
White-fronted goose	<i>Anser albifrons flavirostris</i>	X					x	
Canada Goose	<i>Branta canadensis</i>	X					x	
Barnacle Goose	<i>Branta leucopsis</i>	X					x	
Brent Goose	<i>Branta bernicla</i>	X					x	
Shelduck	<i>Tadorna tadorna</i>		X				x	x
Wigeon	<i>Anas penelope</i>	X					x	

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Species		Functional Groups					Assessed in IA2017	
English Name	Scientific Name	Grazing feeders	Wading feeders	Surface feeders	Water column feeders	Benthic feeders	non-breeding abundance	breeding abundance
Teal	<i>Anas crecca</i>		X				x	
Mallard	<i>Anas platyrhynchos</i>	X	X				x	x
Pintail	<i>Anas acuta</i>	X	X				x	
Shoveler	<i>Anas clypeata</i>	X					x	
Pochard	<i>Aythya ferina</i>					X	x	
Tufted Duck	<i>Aythya fuligula</i>					X	x	
Greater Scaup	<i>Aythya marila</i>					X	x	
Common Eider	<i>Somateria mollissima</i>					X	x	x
King eider	<i>Somateria spectabilis</i>					X	x	
Steller's eider	<i>Polysticta stelleri</i>					X		
Long-tailed Duck	<i>Clangula hyemalis</i>					X	x	
Common Scoter	<i>Melanitta nigra</i>					X	x	
Velvet Scoter	<i>Melanitta fusca</i>					X	x	
Goldeneye	<i>Bucephala clangula</i>					X	x	
Common merganser	<i>Mergus merganser</i>				X		x	
Red-breasted Merganser	<i>Mergus serrator</i>				X		x	x
Smew	<i>Mergellus albellus</i>				X		x	
Coot	<i>Fulica atra</i>	X					x	
Oystercatcher	<i>Haematopus ostralegus</i>		X				x	x
Black-winged Stilt	<i>Himantopus himantopus</i>		X					
Pied avocet	<i>Recurvirostra avosetta</i>		X				x	x
Lapwing	<i>Vanellus vanellus</i>		X				x	
Golden plover	<i>Pluvialis apricaria</i>		X				x	
Grey Plover	<i>Pluvialis squatarola</i>		X				x	
Ringed plover	<i>Charadrius hiaticula</i>		X				x	x
Kentish Plover	<i>Charadrius alexandrinus</i>		X				x	x
Bar-tailed Godwit	<i>Limosa lapponica</i>		X				x	
Black-tailed Godwit	<i>Limosa limosa</i>		X				x	
Whimbrel	<i>Numenius phaeopus</i>		X				x	
Eurasian Curlew	<i>Numenius arquata</i>		X				x	
Spotted Redshank	<i>Tringa erythropus</i>		X				x	
Redshank	<i>Tringa totanus</i>		X				x	
Greenshank	<i>Tringa nebularia</i>		X				x	
Wood Sandpiper	<i>Tringa glareola</i>		X					
Turnstone	<i>Arenaria interpres</i>		X				x	
Red-necked	<i>Phalaropus lobatus</i>			X				

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Species		Functional Groups					Assessed in IA2017	
English Name	Scientific Name	Grazing feeders	Wading feeders	Surface feeders	Water column feeders	Benthic feeders	non-breeding abundance	breeding abundance
Phalarope								
Grey Phalarope	<i>Phalaropus fulicarius</i>			X				
Red Knot	<i>Calidris canutus</i>		X				x	
Sanderling	<i>Calidris alba</i>		X				x	
Little Stint	<i>Calidris minuta</i>		X					
Curlew Sandpiper	<i>Calidris ferruginea</i>		X				x	
Purple sandpiper	<i>Calidris maritima</i>		X				x	
Dunlin	<i>Calidris alpina schinzii &amp; arctica</i>		X				x	
Ruff	<i>Philomachus pugnax</i>		X				x	
Arctic skua	<i>Stercorarius parasiticus</i>			X				x
Long-tailed Skua	<i>Stercorarius longicaudus</i>			X				
Pomarine Skua	<i>Stercorarius pomarinus</i>			X				
Great Skua	<i>Stercorarius skua</i>			X				x
Glaucous gull	<i>Larus hyperboreus</i>							
Great Black-backed Gull	<i>Larus marinus</i>			X			x	x
Herring gull	<i>Larus argentatus</i>		X	X			x	x
Lesser black-backed gull	<i>Larus fuscus intermedius/graellsii</i>		X	X				x
Common Gull	<i>Larus canus</i>		X	X			x	x
Mediterranean Gull	<i>Larus melanocephalus</i>			X				x
Black-headed Gull	<i>Croicocephalus ridibundus</i>		X	X			x	x
Little Gull	<i>Larus minutus</i>			X				
Black-legged kittiwake	<i>Rissa tridactyla</i>			X				x
Ivory gull	<i>Pagophila eburnea</i>			X				
Little Tern	<i>Sternula albifrons</i>			X				x
Roseate tern	<i>Sterna dougallii</i>			X				x
Common tern	<i>Sterna hirundo</i>			X				x
Arctic tern	<i>Sterna paradisaea</i>			X				x
Sandwich tern	<i>Sterna sandvicensis</i>			X				x
Black Tern	<i>Chlidonias niger</i>			X				
Razorbill	<i>Alca torda</i>				X			x
Common Guillemot	<i>Uria aalge</i>				X		x	x
Brünnich's guillemot	<i>Uria lomvia</i>							
Black Guillemot	<i>Cephus grylle</i>				X		x	x
Little Auk	<i>Alle alle</i>				X			

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Species		Functional Groups					Assessed in IA2017	
English Name	Scientific Name	Grazing feeders	Wading feeders	Surface feeders	Water column feeders	Benthic feeders	non-breeding abundance	breeding abundance
Atlantic puffin	<i>Fratercula arctica</i>				X			x
little egret	<i>Egretta garzetta</i>		X				x	