JWGBIRD REPORT 2017

Report of the Joint OSPAR/HELCOM/ICES Working Group on Marine Birds (JWGBIRD)

6–10 November 2017

Riga, Latvia

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Executive summary

Hosted by the Latvian Ministry of the Environment, the Joint ICES/OSPAR/HELCOM Working Group on Seabirds met in Riga, Latvia, 6–10 November 2017. The meeting was co-chaired by Morten Frederiksen, Ian Mitchell and Volker Dierschke, and was attended by 21 members and invited experts representing 11 countries. Following the tradition of the preceding meetings, the objectives of the meeting were to develop and implement indicators for seabirds under the Marine Strategy Framework Directive (MSFD), as well as to review and discuss seabird-related issues relevant for human uses of the sea. The meeting consisted of a series of interconnected workshops, where subgroups with floating membership discussed Terms of Reference. Report chapters were drafted by Term of Reference leads and collated by the chairs.

In response to requests from the parent organisations, the group drafted a work plan for 2018-2021. This work plan describes the overall themes within which most of the group's work is concentrated; specific issues will be identified as annual tasks in advance of the annual meeting. The plan also describes the way in which the group works, including annual meetings as well as intersessional work on specific tasks. Guidelines for group membership as well as reporting requirements for the three parent organisations are also described.

The group discussed refinements to the currently used indicator for seabird breeding success/failure in OSPAR (B3), which operates with a fixed threshold value. A more refined approach allowing the assessment of each seabird species against specific targets was suggested.

Guidelines for OSPAR's Coordinated Environmental Monitoring Program (CEMP) were reviewed and updated where necessary.

The group has worked intersessionally to carry out analyses and produce reports for the HELCOM core indicators for marine birds in order to contribute to the Holistic Assessment of the Baltic Sea (HOLAS II), due in 2018. At the meeting, the group reviewed the results of these analyses and identified key human activities, which might affect respectively breeding and wintering marine birds negatively. The group also identified that a key limitation of the current indicator for wintering birds is that data from at-sea surveys are not included, and discussed plans for how to incorporate data presently held by the European Seabirds at Sea (ESAS) group in a joint database to be hosted by ICES.

The group compared and discussed current results of OSPAR and HELCOM bird indicators, aiming to identify anthropogenic and natural drivers responsible for observed trends. This exercise will be continued at forthcoming meetings.

A revised text for the ICES Ecosystem Overview for the Baltic Sea was drafted.

The group discussed opportunities and challenges for extending the use of citizen science in monitoring of marine birds, based on a survey of group members. An overview of relevant existing citizen science programmes was produced.

Responding to a request from OSPAR's Intersessional Correspondence Group on the Marine Strategy Framework Directive, the group provided answers to a series of questions regarding how OSPAR's Bird Indicators compare with requirements of the revised (2017) European Commission decision on MSFD.

1 Introduction

The Joint OSPAR/HELCOM/ICES Working Group on Seabirds (JWGBIRD), chaired by Ian Mitchell (OSPAR/UK), Morten Frederiksen (ICES/Denmark) and Volker Dierschke (HELCOM /Germany), met at the Latvian Ministry of the Environment in Riga, Latvia, 6–10 November 2017 to address the following terms of reference:

a) Investigate alternative metrics and assessment thresholds for the OSPAR indicator on breeding success.

b) Produce a work plan for 2018-2022 to fulfil the terms of reference for the Intersessional Working Groups on the Coordination of biodiversity monitoring and assessment (ICG-COBAM) and on the Protection of Species and Habitats (ICG-POSH).

c) Update, if necessary, and finalise OSPAR CEMP Guidelines (technical specifications) for Bird Common Indicators. The OSPAR Common Indicators for birds are: B1- Marine bird abundance and B3 – Marine bird breeding success/failure.

d) Carry out analyses and produce reports for the HELCOM core indicators in order to contribute to the Holistic Assessment of the Baltic Sea (HOLAS II) due 2018 (intersessional). The HELCOM core indicators are "Abundance of waterbirds in the breeding season" and "Abundance of waterbirds in the wintering season".

e) Review assessments of waterbird abundance produced for the HELCOM Holistic Assessment of the Baltic Sea (HOLAS II) and propose further actions. Further actions include identifying species at risk and proposing mitigation measures.

f) Identify variables and processes that may explain key outcomes of the OSPAR and HELCOM assessments of marine birds. This will include:

   a. Identification of key trends and outcomes from the HELCOM & OSPAR Assessments. For example:
      i. Diverging population trends of surface and water column feeding seabird species
      ii. Differences in population trends of Common and Velvet Scoters
   b. Review of explanatory variables and processes for the selected key trends and outcomes. For example:
      i. A review of the current past, current and likely future trends in the availability of small pelagic fish for surface-feeding predators, with special focus on the period from 1990 onwards.
      ii. A review of differing life history traits of Common and Velvet Scoters.

g) Provide seabird information for the ICES Ecosystem Overviews (as required, ICES ToR).

h) Can we use Citizen Science more extensively in the study of seabird ecology? (ICES ToR). This ToR will include a review of past and present studies and an exchange of experience (e.g from the Norwegian experiences of the 2016 City gulls project – Tycho Anker-Nilsen). The aim of the ToR will be to propose the following:

   a. How can methods be standardised?
   b. How do we build capacity (i.e. increase appropriate skills in volunteers)?
   c. How do we make better use of those highly skilled individuals?

The meeting was attended by 16 group members and five invited experts (Annex 1), and one further member (Kees Koffijberg) and the following non-members provided input via correspondence: Aurélie Blanck, Sonia Carrier (both Agence française pour la Biodiversité), Mark Jessop (UCC), Ellie Owen (RSPB) and Carlos Pinto (ICES Secretariat).

2 Investigate alternative metrics and assessment thresholds for the OSPAR indicator on breeding success

Justification for this Term of Reference is provided in the IA2017 assessment of marine bird breeding success/failure and is based on previous recommendations by JWGBIRD:

"The ICES/OSPAR/HELCOM Joint Working Group on Marine Birds (JWGBIRD) developed this indicator assessment but has acknowledged some limitations (ICES 2015). The assessment methods for the marine bird breeding success / failure indicator currently focus on the extreme events of almost no chicks being produced by a colony, on average, per year. In doing so, they fail to identify other years where poor breeding success could still have significant negative impacts on the population in the longer term.

However, it is not straightforward to categorise annual breeding success as 'good' or 'poor'. The reason breeding has not been directly assessed as 'good' or 'poor' in this indicator is because the number of chicks that need to be produced each year to sustain a population or cause it to grow, varies substantially as other demographic parameters (e.g. survival rates) also vary in space and time. Information on demographics such as survival rate, age at first breeding and immature survival rates are more resource demanding to measure owing to the need to monitor individual birds from year to year. For well-studied species and at a few intensively studied sites these data do exist.

A possible step forward towards setting accurate and objective targets for annual breeding success rates would be to collate an inventory of ongoing monitoring of survival rates in the North-East Atlantic and conduct a review of published estimates. Once survival estimates and other demographics have been collated, some simple population modelling could be undertaken to produce some preliminary estimates of the levels of breeding success required to sustain or increase the population."

Consequently, at the Riga meeting in 2017 JWGBIRD started constructing an index of breeding productivity for marine birds that reflects more directly the expected impacts of reduced productivity at the population level, should the average survival rates observed to date remain unchanged. As a background, we collated species-specific information on adult survival rates for seabirds in European waters, and explored them according to both functional groups (pelagic, surface, benthic) and systematic groups (auks, gannets, Procellariiformes, cormorants, gulls, terns, skuas, divers, waders, seaducks, grebes). Although the latter seems to reflect interspecific similarities in survival rates and other demographic parameters reasonably well, we chose not to group the species at this level of analysis. This is not only to maintain the species approach to the extent requested by OSPAR, but also convenient because life-history traits for a species may vary geographically because the birds need to buffer spatial differences in environmental conditions (see e.g. Frederiksen *et al*. 2005). To make it possible to account for this in the analyses, we therefore suggest a flexible system allowing each regional population to be assigned to survival group independently of other populations of the same species.

We use the term 'breeding productivity' for the proposed indicator, which ideally measures the number of fledged chicks produced per female of breeding age. The proportion of females not breeding at all in a given year should therefore in principle also be measured and included as a component of breeding productivity, but this is rarely possible in practice. In this context, the term 'breeding productivity' is preferable to 'breeding success', which measures the proportion of females breeding successfully, or the proportion of eggs resulting in fledged chicks. Breeding success thus ranges from 0 to 1, whereas breeding productivity has no theoretical upper limit.

Seabirds show a large variation in life histories, with some species being very long-lived and producing few young per year, and others being much more short-lived and more productive. To illustrate the level of breeding productivity needed to maintain a stable population for different seabirds, we constructed simple demographic models for six hypothetical seabird groups, ranging from extremely slow (group A) to relatively fast (group F) along the life-history continuum. The groups were selected to include the full range of variation observed in adult survival probability of seabirds in the OSPAR area, see Table 2.1. Table 2.2 shows the demographic parameter values used in the models for each hypothetical seabird group.

Table 2.1. Reported values for adult survival rates of marine birds from various parts of the OSPAR and HELCOM areas (UK = United Kingdom, WS = Wadden Sea area, DK = Denmark, NO = Norway). The values for UK are those recommended by Horswill & Robinson (2012, but see also Dagys 2001), otherwise we present the mean of all available estimates (if more than one) from the region in question. All Norwegian data are from colonies in OSPAR I (Arctic), except for herring gull and lesser black-backed gull, which also include data from OSPAR II (North Sea). The species are listed in descending order according to the overall mean values, which were calculated given each region equal weight.

Species name	Scientific name	Functional group	UK	WS	DK	NO	Mean	Refs
Northern fulmar	Fulmarus glacialis	Surface	0.94				0.94	1,2
Common guillemot	Uria aalge	Pelagic	0.94			0.92	0.93	1,2
Northern gannet	Morus bassanus	Pelagic	0.92				0.92	1
Razorbill	Alca torda	Pelagic	0.90			0.94	0.92	1,2
Great skua	Catharacta skua	Surface	0.88			0.94	0.91	1,2
Arctic skua	Stercorarius parasiticus	Surface	0.91				0.91	1
Oystercatcher	Haematopus ostralegus	Wader		0.90			0.90	3
Common tern	Sterna hirundo	Surface	0.88	0.91			0.90	1,4
Atlantic puffin	Fratercula arctica	Pelagic	0.91			0.89	0.90	1,2
Brünnich's guillemot	Uria lomvia	Pelagic				0.89	0.89	2
Sandwich tern	Thalasseus sandvicensis	Surface	0.90		0.86		0.88	1,5
Great black-backed gull	Larus marinus	Surface	0.93			0.82	0.88	1,2
Great cormorant	Phalacrocorax carbo	Pelagic	0.87		0.88		0.87	1,6
Great northern diver	Gavia immer	Pelagic	0.87				0.87	1
Manx shearwater	Puffinus puffinus	Surface	0.87				0.87	1
Lesser black-backed gull	Larus fuscus	Surface	0.89			0.85	0.87	1,2
Black guillemot	Cepphus grylle	Pelagic	0.87		0.86	0.86	0.86	1,2,7
Common eider	Somateria mollissima	Benthic	0.89		0.88	0.81	0.86	1,2,8
European shag	Phalacrocorax aristotelis	Pelagic	0.86			0.83	0.85	1,2
Red-throated diver	Gavia stellata	Pelagic	0.84				0.84	1
Black-legged kittiwake	Rissa tridactyla	Surface	0.85		0.82	0.85	0.84	1,2,9

Species name	Scientific name	Functional group	UK	WS	DK	NO	Mean	Refs
Arctic tern	Sterna paradisaea	Surface	0.84				0.84	1
Common redshank	Tringa totanus	Wader		0.83			0.83	3
Little auk	Alle alle	Pelagic				0.83	0.83	2
Common gull	Larus canus	Surface	0.83				0.83	1
Black-headed gull	Larus ridibundus	Surface	0.83				0.83	1
Herring gull	Larus argentatus	Surface	0.83			0.81	0.82	1,2
Black-throated diver	Gavia arctica	Pelagic	0.82				0.82	1
Greater scaup	Aythya marila	Benthic	0.81				0.81	1
Little gull	Hydrocoloeus minutus	Surface	0.80				0.80	1
Little tern	Sternula albifrons	Surface	0.80				0.80	1
Glaucous gull	Larus hyperboreus	Surface				0.80	0.80	2
Common scoter	Melanitta nigra	Benthic	0.78				0.78	1
Pied avocet	Recurvirostra avosetta	Wader		0.78			0.78	3
Velvet scoter	Melanitta fusca	Benthic	0.77				0.77	1
Common goldeneye	Bucephala clangula	Benthic	0.77				0.77	1
Common ringed plover	Charadrius hiaticula	Wader		0.74			0.74	3
Long-tailed duck	Clangula hyemalis	Benthic	0.73				0.73	1
Great crested grebe	Podiceps cristatus	Pelagic	0.73				0.73	1
Kentish plover	Charadrius alexandrinus	Wader		0.70			0.70	3

References: 1) Horswill & Robinson, 2015 (UK); 2) SEAPOP programme, www.seapop.no (NO); 3) van der Jeugd *et al.*,2014 (WS); 4) Becker *et al.* 2001 (WS); 5) Frederiksen and Bregnballe, unpublished (DK); 6) Frederiksen and Bregnballe, 2000 (DK); 7) Frederiksen, 1999 (DK); 8) Tjørnløv *et al.*, 2013 (DK); 9) Lerche-Jørgensen *et al.*, 2012 (DK)

Table 2.2. Base demographic parameter values used for the six hypothetical seabird groups modelled, defined by adult survival probability. Columns 1Y S to 8Y S show the annual survival probability of the immature age classes, i.e. prior to the age of first breeding. Parameter values were selected based on Table 2.1 and expert knowledge. The models assumed no emigration or immigration and an equal sex ratio. The final columns show the main result of the modelling exercise, namely the level of breeding productivity (chicks fledged per female of breeding age) required to maintain a stable population.

Group (defined by adult survival)	Age of 1st breeding (years)	1Y S	2Y S	3Y S	4Y S	5Y S	6Y S	7Y S	8Y S	Adult survival	Required productivity
A: >0.95	8	0.70	0.80	0.85	0.90	0.93	0.96	0.96	0.96	0.96	0.23
B: 0.90–0.95	6	0.60	0.80	0.85	0.90	0.925	0.925			0.925	0.48
C: 0.85–0.90	5	0.55	0.75	0.825	0.85	0.875				0.875	0.99
D: 0.80–0.85	4	0.50	0.75	0.80	0.825					0.825	1.42
E: 0.75–0.80	3	0.45	0.75	0.775						0.775	1.73
F: 0.70–0.75	2	0.40	0.725							0.725	1.90

Having constructed a base model for each group in the demographic modelling software ULM (Legendre and Clobert, 1995), we adjusted breeding productivity iteratively to obtain a growth rate of 1, i.e. a stable population over time. We then explored the effect of deviations from the required productivity by multiplying productivity by factors of 1.4, 0.65, 0.35 and 0.1 to represent respectively high productivity, low productivity, very low productivity and breeding failure. The results of this exercise (see Table 2.3 and Figure 2.1) should be interpreted as the expected annual rate of population change, if this level of productivity was sustained in the long term.

Table 2.3. Modelled consequences for annual population growth of sustained changes in breeding productivity for the six hypothetical seabird groups (cf. Table 2.2).

Breeding productivity category	Group A	Group B	Group C	Group D	Group E	Group F
High (>120, mean 140%)	+1.2%	+2.0%	+3.1%	+4.2%	+5.8%	+8.2%
Basal (80–120%, mean 100%)	0%	0%	0%	0%	0%	0%
Low (50–80%, mean 65%)	-1.1%	-2.0%	-3.2%	-4.4%	-5.9%	-8.0%
Very low (20–50%, mean 35%)	-2.3%	-4.2%	-6.7%	-9.3%	-12.2%	-16.0%
Failure (0–20%, mean 10%)	-3.5%	-6.4%	-10.5%	-14.7%	-19.0%	-23.9%

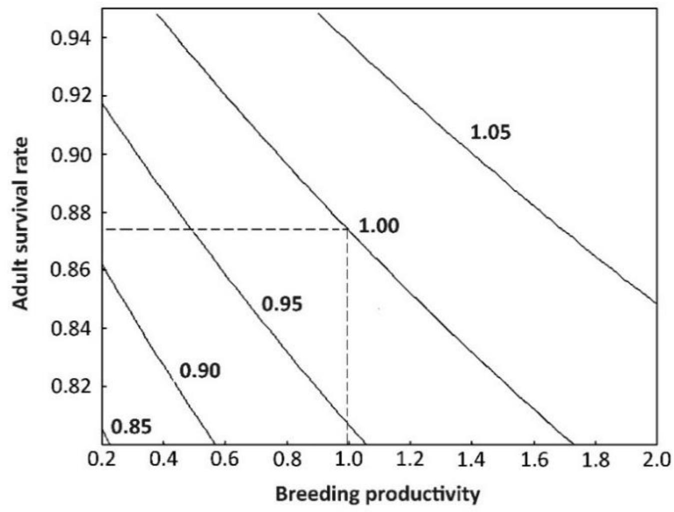

Figure 2.1. Example of the average "fitness landscape" for marine bird populations with a medium high survival rate (i.e. annual survival between 0.85–0.90). The graph shows the modelled relationship between productivity (chicks fledged per pair), adult survival rate and population growth (isolines), and illustrates how a stable population (growth rate = 1.00) can be obtained through various combinations of adult survival and breeding productivity. The dotted lines indicate the mean stable state for group C populations when the model parameters are as listed in Table 2.2.

For further development of the indicator, we suggest to annually score breeding success for each population monitored into one of five quantitative categories (high, basal, low, very low, failure) that indicate how the observed reproductive rate relates to what would be needed to keep the population stable over the longer term (Table 2.3). The expected effect on population growth rates of each level of breeding success, should it remain unchanged, is calculated using the same model approach and a mean breeding productivity relative to the base level for the below-normal categories (i.e. 0.65, 0.35, and 0.1 times the normal rate) and an arbitrary value (set at 1.4 times the base level) for the most successful group.

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3 Draft 3-year work programme of the Joint OSPAR/HELCOM/ICES Working Group on Marine Birds (JWGBIRD) for 2018–2020

This is a proposal for a 3year work programme for JWGBIRD. The proposal has been drafted by national bird experts working in the joint group JWGBIRD representing OSPAR, HELCOM and ICES, supported by the respective secretariats. Membership of JWGBIRD is obtained by experts seeking nomination from their national delegations to either ICES, OSPAR or HELCOM. It is important that all members of JWGBIRD have a firm connection to their national delegations. The work programme below was approved by OSPAR's Biological Diversity Committee in March 2018 and will be presented for adoption during spring 2018 to the relevant bodies of HELCOM and ICES. If needed based on the outcome of the relevant meetings, the work programme can be finalized in a web meeting between by chairs of JWGBIRD, a representative of the OSPAR, HELCOM, ICES secretariat, as well as the chairs of the respective organizations committee by 18 May 2018, after which a written procedure for adoption can be applied.

3.1 Background

The OSPAR/HELCOM/ICES Joint Working Group on Marine Birds (JWGBIRD) was established in 2015. The joint group formed in 2013, by merging the long-running ICES Working Group on Seabird Ecology and the OSPAR expert group on marine birds. HELCOM experts joined in 2015.

This group is led by three co-chairs representing each of the conventions: the OSPAR co-chair is Ian Mitchell (UK), HELCOM co-chair Volker Dierschke (DE) and ICES Co-chair Morten Frederiksen (DK). The co-chairs ensure that the joint group's activities meet the needs of each of the respective conventions. JWGBIRD experts are not restricted to working only on certain topics relevant to a specific convention(s) as the group and the issues being worked on benefit from the wide expertise from all expert members and the exchange of knowledge and information between the conventions. At present, the group is made up of experts from a wide-range of backgrounds including NGOs, government bodies and academic institutions. This combination of pure and applied ornithological expertise provides scientifically robust outputs that are also relevant to current conservation policy.

Members of JWGBIRD are encouraged to participate as much as possible in all of the group's activities. JWGBIRD provides a unique opportunity to address issues relating to marine bird science and conservation across all parts of the NE Atlantic including the Arctic, Baltic Sea and Mediterranean. To date, the joint working has enabled the development of bird indicators for both HELCOM and OSPAR that are comparable and have benefited from the wider input of expertise. The joint group is also able to provide an analysis and interpretation of the results of the HELCOM and OSPAR indicator assessments that provides a larger scale perspective that encompasses the Baltic Sea, North Sea, Celtic Seas, Norwegian Sea and Barents Sea.

3.2 JWGBIRD work themes

This work programme provides a thematic overview of the work carried out by JWGBIRD. Tasks under each theme will be specified on an annual basis.

The aim of describing a three-year work programme is to facilitate the sign-off process that follows different annual schedules for OSPAR, HELCOM and ICES. The aim is also to enable long-term planning and delivery of significant products that may require several components to be developed during consecutive years.

3.2.1 Database and data products

Work under this theme ensures JWGBIRD provides input to the ICES Data Centre that hosts the biodiversity portal containing the OSPAR seabird database, and can thus support the development of JWGBIRD data products and formats. This work theme encourages JWGBIRD to move towards a more transparent way of working with data and assessments (i.e. TAF, transparent assessment framework) and ensuring that JWGBIRD can produce seamless cross-regional data products. ICES Data Centre is currently in discussion with the steering group of the European Seabirds at Sea (ESAS) database to take over the hosting, maintenance and development from the current hosts. The ESAS database work will be steered by a dedicated ESAS subgroup of JWGBIRD. The ESAS database covers the entire ICES area, and can be used for both OSPAR and HELCOM assessments.

This work theme ensures transparent assessment frameworks and seamless cross-regional data products. Work under this theme includes:

a) Definition of appropriate, and whenever possible, compatible formats for data submissions and storage,
b) resolving data issues associated with the database and/or specific datasets,
c) providing checks for re-submissions to the databases,
d) developing data products
e) specifying technical aspects of how to make data stream processes operational, e.g. to automate delivery of indicator assessments through scripts.

3.2.2 Monitoring

Work under this theme includes:

a) Providing a forum for discussion of monitoring programmes, focusing on the development of joint or coordinated monitoring e.g. at-sea protocols.
b) Providing updates to OSPAR CEMP guidelines and appendices[1], HELCOM monitoring programmes and guidelines when required.
c) Providing expert opinion on the development and implementation of new monitoring strategies and guidelines for birds, e.g. in relation to threatened and declining species, bycatch, wintering birds, migration routes and distribution.

3.2.3 Assessments

Work under this theme includes:

a) Ensure information flow with regular communication to all three convention secretariats on policy development relevant to JWGBIRD and/or general bird related issues.
b) Providing updates of indicators to be delivered regularly, frequency to be decided.
c) Developing further, existing Candidate Indicators and/or develop new indicators, where a need has been identified by one or more of the Conventions.

[1] Co-ordinated Environmental Monitoring Programme (CEMP) – the CEMP guidelines and appendices are published for each OSPAR Common Indicator. They provide instructions on how to collect data to construct the indicators and on how to assess state or trends in the indicator.

d) Developing integration methods and other aspects of indicator assessment, which require further development to be in line with MSFD assessment requirements under the revised Commission Decision (2017).

e) Carrying out other assessments, including for example assessments of threatened and declining species, biogeographic analysis and ecosystem overviews.

f) Contributing bird-related information to assessments carried out by other relevant groups, e.g. on issues such as incidental bycatch.

3.2.4 Ad hoc expert consultation

Responding, as needed, to queries from the parent organisations and their respective subsidiary bodies relating to bird issues by providing expert opinions.

3.2.5 Provision of expert input to ICES advisory process

Provide expert input to advice requests in ICES. Such input would be peer reviewed and quality assured, before a formal advisory process.

3.3 Ways of working.

3.3.1 JWGBIRD annual meetings

To date much of the work of JWGBIRD has been concentrated around the annual meetings. These take place in either October or November and should, when possible, be timed to ensure delivery of products into the respective parent organisation's processes.

3.3.2 Intersessional work

JWGBIRD may be asked for expert opinion and/or intersessional work at short notice. These requests may not always be directly related to the environmental programmes of the conventions, but may be relevant to other international processes and policies. Expert opinion may be required at more frequent intervals than annual, and the annual meeting cycle and reporting format of the group may not necessarily be the most appropriate forum in which to deal with such requests (e.g. due to mismatched deadlines). Correspondence and intersessional work between relevant group members should be used to provide a timely delivery of required outputs. Contracting Parties of the various conventions will need to be made aware of the resources (i.e. time of experts) that will be required for all aspects of the Group's work.

3.3.3 Delivery of results

The JWGBIRD annual report includes products under each work theme that are specific to the annual list of tasks required of the group. Products developed and delivered intersessionally shall be appended to the report.

The group, or a co-chair as a representative of the group, can deliver communications or short expert opinions when required at short notice and independent of the annual timing of the JWGBIRD meeting. If possible, such responses should be summarised in the annual report

The group should also aim, where possible and appropriate, to submit some products for publication in scientific journals or to be presented at conferences.

At the end of the three-year period covered by this work programme, the group shall present an overview of the products delivered. The overview should detail the products delivered under each of the themes outlined above. The overview will feed into an ICES, peer review and advice process as relevant.

3.3.4 Group membership

Membership of JWGBIRD is obtained by experts seeking nomination from their national delegations to either ICES, OSPAR or HELCOM. It is important that all members of JWGBIRD have a firm connection to their national delegations.

The JWGBIRD co-chairs can also invite non-members to attend the annual meeting or to take part in intersessional work. Invited experts should demonstrate particular skills that are relevant to the delivery of a specific request. A list of members and their affiliations is available on the JWGBIRD web pages (link) and is updated annually.

The group is open to connect with other relevant bird groups and networks, for example groups working in the Arctic region and/or non-governmental organizations.

This group is led by three co-chairs representing each of the conventions. There is currently no limit on the length of tenure of each co-chair.[2] This arrangement should be reviewed by members on an annual basis. The arrangements of the relevant sponsoring convention for each chair should be followed if a chair is to be replaced.

3.4 Convention specificities

3.4.1 OSPAR

JWGBIRD reports to OSPAR's Biological Diversity Committee (OSPAR BDC) via the Intersessional Correspondence Group on Coordination of Biodiversity Assessment and Monitoring (ICG-COBAM). There is also a need for JWGBIRD to collaborate with national leads to deliver actions on OSPAR's Threatened and Declining bird species via ICG-POSH (Protected Species and Habitats) which is also under OSPAR BDC.

3.4.2 HELCOM

JWGBIRD reports to the HELCOM State and Conservation working group. JWGBIRD is required to collaborate, as needed, with national leads and co-leads of HELCOM indicators related to seabirds and with national leads of HELCOM recommendations, including but not limited to:

Recommendation 34E-1 'Safeguarding important bird habitats and migration routes in the Baltic Sea from negative effects of wind and wave energy production at sea', and

Recommendation 37-2 'Conservation of Baltic Sea species categorized as threatened according to the 2013 HELCOM red list'.

The group can also work on other HELCOM projects that support the commitments mentioned above.

3.4.3 ICES

JWGBIRD reports at present to ICES ACOM. The Group's task list will be reviewed annually by both ICES ACOM and SCICOM, but substantive comments will only be taken in relation to issues that are helping delivery of the ICES strategy, or have been put forward by ICES in response to an external request to ICES. At present such work includes:

- Development of an ICES region wide (i.e. across HELCOM/OSPAR) set of operational indicators in line with TAF and the ICES data centre.

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[2] ICES operate a 3-year limited tenure on the chairs of each of their working groups. This has not been applied, as yet, to JWGBIRD.

- Input to the ICES ecosystem overviews

4 Update, if necessary, and finalise OSPAR CEMP Guidelines (technical specifications) for Bird Common Indicators

CEMP is OSPAR's Coordinated Environmental Monitoring Program. The CEMP guidelines are technical specifications that for each indicator detail the monitoring and assessment methods. The CEMP guidelines were produced by JWGBIRD in 2015 for two Common Indicators: Marine bird abundance and Marine bird breeding success/failure. The CEMP Guidelines for these two indicators were signed off by OSPAR's Biological Diversity Committee (BDC) in 2016, but not published.

Since then, further amendments have been required to reflect agreement on assessment values and other details of assessment methods in OSPAR's Intermediate Assessment 2017. In connection with the group's 2017 annual meeting, JWGBIRD reviewed the CEMP guidelines and updated where necessary. Following a final check by OSPAR's Intersessional Correspondence Group on Coordination of Monitoring and Assessment (ICG-COBAM), the CEMP Guidelines will be published at https://www.ospar.org/work-areas/cross-cutting-issues/cemp.

5 Carry out analyses and produce reports for the HELCOM core indicators in order to contribute to the Holistic Assessment of the Baltic Sea (HOLAS II)

In order to assess and improve the status of their marine areas, EU has implemented a Marine Strategy Framework Directive (MSFD), in which indicators are used for assessments. Indicators were developed in the Regional Sea Conventions OSPAR and HELCOM and are also used for region-specific assessments. In the HELCOM area, two indicators measuring abundance of breeding and wintering waterbirds were developed in specific projects (HELCOM CORESET I and II). In continuation of that work, JWGBIRD is carrying out the development and analyses for the two indicators, which will contribute to the 2018 Holistic Assessment of the Baltic (HELCOM HOLAS II). The analyses currently build on data called for from national databases of breeding birds and coastal mid-winter counts (International Waterbird Census), respectively.

In a preliminary assessment, both waterbird abundance indicators were calculated for the entire Baltic Sea, using data from breeding bird surveys and coastal surveys in winter from the period 1991-2015. According to the proportions of species not achieving good status, the threshold for good status was not met. Species-specific graphs, tables with information on trends and more details on the results can be found in the two indicator reports (HELCOM 2017a, 2017b).

In May 2017, a data call was released in order to include data from 2016 into the analyses and into the HOLAS II assessment. Preparation of incoming data and analyses were part of the intersessional work of JWGBIRD together with indicator leads and co-leads nominated from Germany, Sweden and Finland. At the time of the JWGBIRD 2017 meeting, the analyses were still running.

References

HELCOM 2017a. Abundance of waterbirds in the breeding season. HELCOM core indicator report. Online 10 November 2017, http://helcom.fi/Core%20Indicators/Abundance%20of%20waterbirds%20in%20breeding%20season_HELCOM%20core%20indicator%20-%20HOLAS%20II%20component.pdf

HELCOM 2017b. Abundance of waterbirds in the wintering season. HELCOM core indicator report. Online 10 November 2017, http://helcom.fi/Core%20Indicators/Abundance%20of%20waterbirds%20in%20wintering%20season_HELCOM%20core%20indicator%20-%20HOLAS%20II%20component.pdf

6 Review assessments of waterbird abundance produced for the HELCOM Holistic Assessment of the Baltic Sea (HOLAS II) and propose further actions

As contribution to assessments of the Baltic Sea in the frame of MSFD and HELCOM HOLAS II, two HELCOM core indicators covering the abundance of waterbirds are dealt with by JWGBIRD (see chapter 5). The indicator results show species-specific trends of breeding and wintering waterbirds and compared to the baseline (average index value 1991-2000), the average index value 2011-2015 was used to assess the status of individual species for the entire Baltic preliminarily (HELCOM 2017a, 2017b). An update including data from 2016 was on the way at the time of the JWGBIRD 2017 meeting. The meeting recommended the following amendments of the analyses:

a) As already decided for wintering waterbird, the indicator for breeding waterbirds will be analysed for the entire Baltic Sea and for seven subdivisions, which are formed by aggregations of the 17 HELCOM sub-basins as outlined by ICES (2017). The analyses for the subdivisions are treated as a test run, and JWGBIRD will discuss later, whether or not this approach appears to be appropriate and should be adopted.

b) Along the coastline of the Baltic Sea, not all stretches are covered to the same degree by the International Waterbird Census (IWC), which supplies data for the wintering waterbird abundance indicator. Therefore, JWGBIRD recommends to apply weighting according to the coverage of coastline.

c) The preliminary assessment of breeding waterbird abundance included Lesser Black-backed Gull. This species occurs in the HELCOM region with two subspecies, *Larus fuscus intermedius* in the southwest and *L. f. fuscus* in the east and north of the Baltic Sea. Since the two subspecies show different trends in population size (Herrmann *et al*. 2013), it appears problematic to merge them in the analysis. Therefore, JWGBIRD recommends to use only assessments of those seven subdivision, in which only one subspecies occurred during the whole period covered (i.e. 1991-2016). In the future, monitoring and analyses should be carried out on the level of subspecies.

d) The preliminary assessment (with data up to 2015) referred to as many species as possible. So far, it was not possible to include data from offshore surveys, i.e. the indicator of wintering waterbird abundance was almost completely relying on coastal counts (mostly mid-January counts in the frame of IWC). The meeting agreed on removing those species from the forthcoming analyses (with data up to 2016), which do not occur in representative proportions in coastal waters and thus cannot be assessed with IWC data only in a reasonable way. Therefore, some seaducks (Common Eider, Long-tailed Duck, Common Scoter, Velvet Scoter), grebes (Red-necked Grebe, Slavonian Grebe) and divers (Red-throated Diver, Black-throated Diver) shall not be considered in the assessment. The same applies to alcids (Razorbill, Common Guillemot, Black Guillemot), which were already not included in the preliminary assessment. Coastal counts of the species mentioned above will be part of the analyses and combined with offshore data in the way described in ICES (2017) as soon as the latter kind of data become available for the indicator.

One of the aims of MSFD and HELCOM HOLAS II is to identify reasons for environmental components of the Baltic Sea failing to achieve good status and to promote conservation measures (e.g. according to MSFD, Article 13) in order to improve the status of the respective components. Possible reasons for the poor status of some breeding and wintering waterbird species were discussed during the JWGBIRD 2017 meeting. The results shall support HEL-

COM and its Contracting Parties to identify which anthropogenic activities and natural drivers should be addressed when implementing measures to improve the conservation status of waterbirds in the Baltic Sea. A more detailed analysis of traits possibly responsible for the observed trends is discussed in chapter 7.

During the meeting, JWGBIRD experts from the Baltic Sea countries were asked to mark in a spreadsheet, which activities and pressures (as defined in Tables 2 and 3 of MSFD Annex III, EC Directive 2017/845) are negatively affecting breeding and wintering waterbirds in their country. This query was restricted to waterbirds with significant negative trends in the preliminary analyses of the abundance indicators (HELCOM 2017a, 2017b), with the addition of species classified as vulnerable, endangered or critically endangered in the "HELCOM Red List of Baltic breeding and wintering birds" (Herrmann *et al.* in HELCOM 2013). Relevant anthropogenic activities (and related pressures) to be checked by the experts were (in the terminology of MSFD Annex III):

- agriculture (input of nutrients),
- extraction of minerals (disturbance of species owing to human presence, physical disturbance of seabed, extraction/mortality of species),
- renewable energy generation (disturbance of species owing to human presence, physical disturbance of seabed, extraction/mortality of species, input of litter, input of substances),
- hunting (disturbance of species owing to human presence, extraction/mortality of species),
- shipping (disturbance of species owing to human presence, input of litter, input of substances) and
- tourism and leisure (disturbance of species owing to human presence).

In addition, experts were asked to note whether natural drivers (prey availability, climate change, predation, competition, habitat change) are affecting the declining and/or threatened (red-listed) waterbird species in their countries. It has to be stressed that large part of problems with predation are actually man-made due to introductions of predatory mammals (see below), but none of the activities listed in MSFD Annex III identified to suit this peculiar variant of the pressure "input/spread of non-indigenous species". Entries into the spreadsheet were generated by experts from eight Baltic Sea countries (i.e. all HELCOM CPs except Russia).

According to this brainstorming exercise, breeding birds at the Baltic Sea appear to be mostly affected by natural drivers, especially predation by invasive mammals and changing habitats (Tables 6.1 and 6.3). Breeding productivity is often strongly reduced by predation of eggs, chicks and adults by mammalian carnivores, and this can lead to complete abandonment of breeding sites (Hario 2002, Nordström *et al*. 2003, Kube *et al.* 2005). Various breeding habitats suffer from overgrowth or agricultural intensification (Herrmann *et al.* 2013). Further, reduced prey availability has caused decreases in breeding waterbirds (Laursen & Møller 2014). In contrast, most of the anthropogenic activities were scarcely mentioned as being problematic for breeding birds, except for tourism and leisure with disturbance as the only pressure (Mikola *et al.* 1994, Berndt *et al.* 2005), an activity not addressed by Herrmann *et al*. (2013). Therefore, conservation measures for breeding waterbirds shall be foremost directed to protect the coastal breeding sites from predation by invasive mammals and disturbance by humans.

A much higher number of entries into the spreadsheet indicate that wintering birds are affected by several activities (Tables 6.2 and 6.3). By far most problematic appears to be fish harvesting, which was mentioned by the experts for 16 out of 18 declining or threatened species (Table 6.3). Although experts were not explicitly asked to connect effects on species with specific pressures, it is quite obvious that mortality due to bycatch in fishing gear (namely gillnets) is a major problem for declining waterbird species wintering in the Baltic Sea (Žydelis *et al.* 2009, Sonntag *et al*. 2012), but other pressures, e.g. the physical disturbance of seabed by bottom trawling and the related effects on prey availability for benthic feeders (Herrmann *et al*. 2013), also play a role. Ten species are apparently affected by respectively hunting (i.e. the removal of individuals from the populations and disturbance; Herrmann *et al*. 2013, Luigujõe *et al*. 2013) and extraction of minerals, the latter causing disturbance and habitat degradation (including extraction of benthic prey items, Herrmann *et al*. 2013). Three more activities were mentioned for eight species each: renewable energy generation (i.e. offshore windfarms and their effects mainly on habitat utilization and waterbird survival; Furness *et al*. 2013, Dierschke *et al*. 2016), shipping (disturbance, oil pollution; Larsson & Tydén 2005, Žydelis *et al.* 2006, Schwemmer *et al*. 2011) and tourism and leisure (disturbance by presence of humans, Berndt *et al*. 2005, Krüger 2016). Natural drivers were only scarcely felt to be problematic in expert opinion, with entries only for prey availability and climate change (Table 6.3). However, the manyfold impacts of climate change on waterbirds wintering in the Baltic Sea such as distributional shifts and changes in migratory behaviour (Skov *et al*. 2011) were not explored in depth. The same applies to eutrophication owing to input of nutrients from agriculture, as there are various effects on the prey and its availability for waterbirds (Hansson & Rudstam 1990, Rönkä *et al.* 2005, Skov *et al.* 2011)

In general, the threats identified in the "HELCOM Red List of Baltic breeding and wintering birds" (Herrmann *et al.* in HELCOM 2013) appear to be confirmed and thus continue to act on wintering waterbirds. In order to protect these birds in the Baltic Sea, JWGBIRD experts recommend to develop and apply conservation measures acting on a variety of anthropogenic activities. It appears to be important to reduce the loss of individuals from hunting and drowning in fishing gear, but also to decrease or limit disturbance by shipping and tourism as well as habitat loss from wind farming, sand extraction and bottom trawling. Measures in these subject areas would help to reach the goals of "viable populations of species" and "thriving and balanced communities of plants and animals" in the Baltic Sea Action Plan (HELCOM 2007) as well as to achieve a good status for birds under MSFD and for bird species under the EU Birds Directive.

Table 6.1: Anthropogenic activities and natural drivers affecting breeding waterbirds from the Baltic Sea with significant negative trend in population size (HELCOM 2017a) and/or classified as vulnerable (VU), endangered (EN) or critically endangered (CR) in the "HELCOM Red List of Baltic breeding and wintering birds" (Herrmann *et al.* in HELCOM 2013); NT: near threatened). Numbers in each cell represent the number of countries for which an activity or natural driver is assumed to pose a threat for the respective species.

			Anthropogenic activities							Natural drivers					
Species	Indicator trend	HELCOM Red List	Agriculture	Extraction of minerals	Renewable energy generation	Fish harvesting	Hunting	Shipping	Tourism and leisure	Prey availability	Climate change	Predation	Competition	Habitat change
Common Eider	↓↓	VU					1	1	1	2	1	3		1
Velvet Scoter	↓	VU							3	1		3		1
Goosander	↓											1		
Red-breasted Merganser	↓								1			2		1
Eurasian Oystercatcher	↓								2			3		2
Pied Avocet	↓											3		1
Turnstone	↓↓	VU										2		
Dunlin	↓↓	EN										5		6
Arctic Skua[1]	?								1					
Common Gull	↓		1						2	2		3	1	1
Great Black-backed Gull	↓↓								1	1				
Herring Gull	↓		1						2	1				1
Lesser Black-backed Gull *fuscus*	→[2]	VU							3			2		
Black Guillemot	↓	NT				3			2			2		
total entries			2	0	0	3	1	1	18	7	1	29	1	14

[1] **Species included owing to its poor status in the HELCOM core indicator (no trend calculated).**

[2] **Trend includes *L. f. intermedius*.**

Table 6.2: Anthropogenic activities and natural drivers affecting wintering waterbirds from the Baltic Sea with significant negative trend in population size (HELCOM 2017b) and/or classified as vulnerable (VU), endangered (EN) or critically endangered (CR) in the "HELCOM Red List of Baltic breeding and wintering birds" (Herrmann *et al.* in HELCOM 2013). Numbers in each cell represent the number of countries for which an activity or natural driver is assumed to pose a threat for the respective species.

			Anthropogenic activities							Natural drivers				
Species	Indicator trend	HELCOM Red List	Agriculture	Extraction of minerals	Renewable energy generation	Fish harvesting	Hunting	Shipping	Tourism and leisure	Prey availability	Climate change	Predation	Competition	Habitat change
Mute Swan	↓								2					
Bewick's Swan	↓						1							
Mallard	↓						3							
Common Pochard	↓			1		2	2			1				
Tufted Duck	↓			1		4	2	1		1				
Greater Scaup	↓			1		4	2		1	1				
Steller's Eider	↓↓	EN				2					1			
Common Eider	↓	EN		1	1	3	1	1	1	1	1			
Long-tailed Duck	↓	EN		2	4	7	2	3		3	1			
Common Scoter	↑↑	EN		1	2	7	1	2	1	2	2			
Velvet Scoter	→	EN		2	3	5	1	2	1	2	1			
Goosander	↓					5		1						
Red-breasted Merganser	↓	VU				4			1					
Red-necked Grebe	↓	EN		1	1	2			1					
Red throated Diver	↑	CR		1	2	6		2						
Black-throated Diver	↓	CR		1	1	6		2						
Eurasian Coot	↓					2	1		1					
Herring Gull	↓				2									
total entries			0	12	16	59	16	14	9	11	6	0	0	0

Table 6.3: Anthropogenic activities and natural drivers affecting declining and threatened waterbirds breeding and wintering in the Baltic Sea: summary of relevant species and entries (species-country combinations) per activity or natural driver from Tables 6.1 and 6.2. If the number of entries exceeds the number of countries, a species-country combination occurs in more than one country.

	Activities (anthropogenic pressures)							Natural drivers				
	Agriculture	Extraction of minerals	Renewable energy generation	Fish harvesting	Hunting	Shipping	Tourism and leisure	Prey availability	Climate change	Predation	Competition	Habitat change
breeding waterbirds												
no. species (n=14)	2	0	0	1	1	1	10	5	1	11	1	8
no. entries (countries)	2	0	0	3	1	1	18	7	1	29	1	14
wintering waterbirds												
no. species (n=18)	0	10	8	16	10	8	8	7	5	0	0	0
no. entries (countries)	0	12	16	59	16	14	9	11	6	0	0	0

Having identified subject areas needing action for the protection of declining and threatened waterbirds, the HELCOM core indicators on waterbird abundance shall be optimized in order to allow to direct measures as precisely as possible. In addition to some amendments mentioned above, the variety of problems for wintering waterbirds, many of which are predominantly occurring offshore, point on the inclusion of offshore surveys into the assessments. The methodology for how to combine coastal counts with offshore surveys and a database structure for the latter have already been developed by HELCOM BalticBOOST and ICES (2017).

A necessary prerequisite for further action regarding coordinated surveys and analyses is an operative database. Such a database has been run for the North Sea and other OSPAR regions for many years and was administered by the UK Joint Nature Conservation Committee (ESAS database, Reid & Camphuysen 1998). The HELCOM indicator on wintering waterbird abundance would gain much by also using this database.

Together with some invited ESAS experts, JWGBIRD discussed the establishment of a comprehensive database holding available offshore data from compatible survey schemes throughout the HELCOM and OSPAR regions. The discussion group, comprising previous ESAS data providers and additional offshore data holders, evaluated a setup and work plan for migration and hosting of ESAS data and further offshore data that had previously been developed by the ESAS database task group and the ICES data centre.

It was agreed to migrate the ESAS database to the ICES data centre. ICES data policy applies and exceptions can be made within the scope of the policy and described with a supporting statement document. The final data model was agreed to be based on the ESAS database structure extended according to the suggestions by HELCOM BalticBOOST (see ICES 2017). The envisaged setup comprises a template-based data entry procedure via the ICES data portal. As an alternative or additional means, it was discussed to investigate the possibility of harvesting data from servers that already hold suitable offshore data. Access to the data will be granted via the ICES data portal with access levels differing between users and datasets.

It was agreed to grant open access for the public to data products in the form of data aggregated temporally and spatially. Depending on the specific dataset, access to raw data will either be open via the ICES data portal or by request to the specific data holder. Extended access options will be available for management purposes (details to be specified with ICES). Contributors to the ESAS database will be granted full access to the complete dataset.

Further it was agreed to form a dedicated ESAS subgroup within JWGBIRD to steer the work on the database. ESAS database work accordingly was included in the work programme of JWGBIRD for 2018-2021. Necessary next steps for the development of the database at the ICES data centre will be tackled by the ESAS database task group in close collaboration with the ICES data centre and other group members. These will include communication of the agreed approach and work plan to absent group members, drafting of data policy agreements, development of a final data model, templates for data entry and validation rules for cleaning of archived and new data, metadata work and investigating funding options supporting the envisaged activities.

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7 Identify variables and processes that may explain key outcomes of the OSPAR and HELCOM assessments of marine birds

7.1 Introduction

Common indicators of OSPAR and core indicators of HELCOM on marine bird abundance (OSPAR 2017a, HELCOM 2017a, 2017b) and breeding productivity (OSPAR 2017b) have successfully contributed to the assessments of the North-East Atlantic and the Baltic Sea (OSPAR 2017c, HELCOM 2017c) and are available for the use in assessments in the frame of MSFD. First runs of the indicators have shown strong differences in trend results between different species and functional groups in the OSPAR and HELCOM regions. As indicator results shall identify species (groups) having problems and give guidance for adequate conservation measures, JWGBIRD examined those results in order to identify any patterns that may be evident across species and geographical areas (section 7.2). We use these patterns to provide a preliminary indication of the drivers for declines of marine bird populations (section 7.3). Finally, we identify priorities for further work by JWGBIRD (section 7.4).

7.2 Review of the results of OSPAR and HELCOM marine bird indicators

Altogether, the four operating OSPAR and HELCOM indicators examine three parameters describing the status of a population: non-breeding abundance, breeding abundance and breeding success/failure. During the assessment with data up to 2015, they covered a total of 80 bird species belonging to eight orders (Anseriformes, Gaviiformes, Procellariiformes, Podicipediformes, Pelecaniformes, Suliformes, Gruiformes, Charadriiformes) and 15 families (Anatidae, Gaviidae, Procellariidae, Podicipedidae, Threskiornithidae, Sulidae, Phalacrocoracidae, Rallidae, Haematopodidae, Recurvirostridae, Charadriidae, Scolopacidae, Laridae, Stercorariidae, Alcidae), respectively (taxonomy according to Gill & Donsker 2017). The status of marine birds was assessed for four marine regions: Arctic waters (OSPAR subregion I, Norwegian part only), Greater North Sea (OSPAR II), Celtic Seas (OSPAR III) and Baltic Sea. Depending on marine region and parameter, the number of species and their distribution over families differs significantly (Table 7.1).

Table 7.1. Number of species per taxonomic group (family) assessed in four marine regions with indicators on non-breeding abundance (nba), breeding abundance (ba) and breeding success/failure (bs) (OSPAR 2017a, 2017b, HELCOM 2017a 2017b).

	Arctic waters			Greater North Sea			Celtic Seas			Baltic Sea		
Family	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS
Anatidae	8			24	5		20			16	8	
Gaviidae	1			1						2		
Procellariidae			1		1	1		1	2			
Podicipedidae	2			2			1			3	1	
Threskiornithidae				1	1							
Sulidae		1	1		1	1		1	1			
Phalacrocoracidae	2	2	2	1	2	2	1	2	1	1	1	
Rallidae				1			1			1		
Haematopodidae				1	1		1				1	
Recurvirostridae				1	1						1	
Charadriidae				4	2		4				1	
Scolopacidae	2			13			12				2	
Laridae	3	4	5	4	12	11		9	10	4	7	
Stercorariidae		1	1		2	2		2	2		1	
Alcidae	1	4	6		4	3		3	4		3	

7.2.1 Comparing single species

Eighty species were assessed in at least one of the four marine regions. Sixty-five of these species were assessed in more than one region. Eighteen species passed all indicator assessments in all marine regions assessed, whereas 12 failed in at least one indicator assessment in every region where they were assessed. The majority of 35 species did not show a consistent pattern, i.e. they had passes and failures in the different marine regions.

Though passes and failures show some nesting for certain marine regions and taxonomic groups (e.g. many failures in gulls in the Greater North Sea, Table 7.2), it appears that extensive analytic work would be necessary to identify the main drivers responsible for good and poor status seen in the indicator results. Grouping the species according to various traits with subsequent checks for similarities or differences represents one approach to identifying the underlying processes and variables.

Table 7.2. Assessment results for non-breeding abundance (nba), breeding abundance (ba) and breeding success/failure (bs) of seabirds. Species are ordered by functional groups. + (green): passed indicator assessment, - (red): failed indicator assessment (see OSPAR 2017a, 2017b, HELCOM 2017a 2017b for details). For explanation of abbreviated names of family see Table 7.1.

		Arctic Waters			Greater North Sea			Celtic Seas			Baltic Sea		
Species	Family	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS
grazing feeders													
Mute Swan	Anat.				+	-		+			+	+	
Whooper Swan	Anat.	-			+			+			+		
Bewick's Swan	Anat.				-			-			-		
Brent Goose	Anat.				+			+					
Canada Goose	Anat.				-								
Barnacle Goose	Anat.				+								
Greylag Goose	Anat.											+	
Greenland White-fronted Goose	Anat.				+			-					
Mallard	Anat.	+			+	-		-			+		
Pintail	Anat.				+			+					
Shoveler	Anat.				+			+					
Wigeon	Anat.				+			+					
Eurasian Coot	Rall.				+			+			-		
wading feeders													
Common Shelduck	Anat.				+	+		-				+	
Teal	Anat.				+			+					
Eurasian Spoonbill	Thr.				+	+							
Eurasian Oystercatcher	Haem.				+	-		+				+	
Pied Avocet	Rec.				+	-						-	
Lapwing	Char.				+			-					
Golden Plover	Char.				+			+					
Grey Plover	Char.				-			-					

		Arctic Waters			Greater North Sea			Celtic Seas			Baltic Sea		
SPECIES	FAMILY	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS
Ringed Plover	Char.				+	+		-				+	
Kentish Plover	Char.					-							
Black-tailed Godwit	Scol.				+			+					
Bar-tailed Godwit	Scol.				+			-					
Whimbrel	Scol.				+								
Eurasian Curlew	Scol.				+			-					
Spotted Redshank	Scol.				+			+					
Common Redshank	Scol.	-			+			+					
Greenshank	Scol.				+			+					
Turnstone	Scol.				+			-				-	
Red Knot	Scol.				+			-					
Sanderling	Scol.				+			+					
Purple Sandpiper	Scol.	-			-			-					
Dunlin	Scol.				-			-				-	
Ruff	Scol.				-			+					
surface feeders													
Northern Fulmar	Proc.			-		-	+		-	+			
Manx Shearwater	Proc.									+			
Arctic Skua	Ster.					-	-		-	+		-	
Great Skua	Ster.		+	+		+	+		+	+			
Common Gull	Lar.	+			+	-	-		+	-	+	-	
Great Black-backed Gull	Lar.	+	-	+	+	+	-		+	+	+	-	
Herring Gull	Lar.	+	-	+	-	-	+		-	-	+	-	
Glaucous Gull	Lar.			+									
Lesser Black-backed Gull	Lar.		+	-		+	-		-	-		+	
Mediterranean Gull	Lar.					+							

SPECIES	FAMILY	ARCTIC WATERS			GREATER NORTH SEA			CELTIC SEAS			BALTIC SEA		
		NBA	BA	BS	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS
Black-headed Gull	Lar.				+	-	-		-	-	+		
Black-legged Kittiwake	Lar.		-	-		-	-		-	+			
Little Tern	Lar.					+	+			+		+	
Roseate Tern	Lar.					+	+						
Common Tern	Lar.					-	+		+	-		+	
Arctic Tern	Lar.					+	+		+	+		+	
Sandwich Tern	Lar.					+	-		+	+			
pelagic feeders													
Smew	Anat.				-						+		
Goosander	Anat.				+			+			+	+	
Red-breasted Merganser	Anat.	-			+	-		-			+	+	
Great Crested Grebe	Pod.				+			-			+	+	
Red-necked Grebe	Pod.	-									-		
Slavonian Grebe	Pod.	-			+						+		
Red-throated Diver	Gav.	-			-						+		
Black-throated Diver	Gav.										-		
Northern Gannet	Sul.		+	+		+	+		+	+			
Great Cormorant	Phal.	+	-	+	+	+	+	+	+		+	+	
European Shag	Phal.	-	-	-		-	+		+	+			
Razorbill	Alc.		+	+		+	+		+	+		+	
Common Guillemot	Alc.		+	-		+	+		+	+		+	
Brünnich's Guillemot	Alc.			-									
Black Guillemot	Alc.	-	+	+		+			+	+		+	
Puffin	Alc.		-	-		+	+			+			
Little Auk	Alc.			+									
benthic feeders													

		Arctic waters			Greater North Sea			Celtic Seas			Baltic Sea		
SPECIES	FAMILY	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS	NBA	BA	BS
Common Pochard	Anat.				-			-			-		
Tufted Duck	Anat.				+			+			+	+	
Greater Scaup	Anat.				-			-			-		
Steller's Eider	Anat.										-		
King Eider	Anat.	+											
Common Eider	Anat.	+			+	+		+			+	-	
Long-tailed Duck	Anat.	-			-			-			+		
Common Scoter	Anat.				+			+			+		
Velvet Scoter	Anat.	-			+						+	-	
Common Goldeneye	Anat.	+			-			-			+		

7.2.2 Comparing species groups

Rather than for single species or for birds in total, MSFD assessment results are given for five functional groups, which are mainly defined by their mode and location of foraging (grazing feeders, wading feeders, surface feeders, pelagic feeders[3] and benthic feeders, see ICES (2016) for definitions and assignment of species to functional groups). The coverage of functional groups and the respective species numbers varied considerably among indicators and parameters assessed (Table 7.3). The results show much divergence within functional groups in given marine regions. Consistent results for the different indicators only occur in surface feeders (poor status in Arctic waters), water column feeders (poor status in Arctic waters, good status in Greater North Sea and Baltic Sea) and benthic feeders (poor status in Baltic Sea). Apart from the Arctic waters, where all assessments did not show good status, it appears that water column feeders are doing better than other functional groups, as they only fail for non-breeding abundance in the Celtic Seas (Table 7.3).

Table 7.3. Number of species per functional group assessed in four marine regions with indicators on non-breeding abundance (nba), breeding abundance (ba) and breeding success/failure (bs). Good status (green) is achieved when 75% or more of the species in a group reached the threshold level (for details see OSPAR 2017a, 2017b, HELCOM 2017a, 2017b).

	Arctic waters			Greater North Sea			Celtic Seas			Baltic Sea		
	nba	ba	bs	nba	ba	bs	nba	ba	bs	nba	ba	bs
grazing feeders	2			10	2		9			5	2	
wading feeders	2			22	6		19				6	
surface feeders	3	5	7	5	15	14	1	12	14	4	8	
pelagic feeders	7	7	9	7	8	6	4	6	6	9	7	
benthic feeders	5			9	1		7			9	3	

In order to identify species' traits other than foraging behaviour (as defined by the five functional groups) that might explain some of the variation in the assessment results, the 80 species were grouped according to eight traits describing their ecology and distribution patterns (Table 7.4). For such groups (inside one region or for all regions together) the proportion of species passing the threshold level of the respective indicator ('pass rate') was calculated. The pass rate was compared between groups for each trait (e.g. cliff-nesters compared to ground-nesters).

[3] ICES (2016) and OSPAR (2017) employ the term „water column feeder" rather than "pelagic feeder", which is used in MSFD documents (EU COM Dec 2017/848) and by HELCOM (2017a, 2017b).

Table 7.4. Traits describing ecology and distribution patterns of species used for analysing indicator results.

TRAIT	CHARACTERISTICS
breeding strategy	colonial breeder non-colonial breeder
nest site	ground cliff tree
clutch size	1 egg 2-4 eggs >4 eggs
niche width	generalist specialist feeder
use of discards	yes no
taxon	15 families
breeding area	High Arctic Arctic taiga temperate
wintering area	inside HELCOM and OSPAR region inside HELCOM region inside OSPAR region outside HELCOM and OSPAR region outside HELCOM region outside OSPAR region inside & outside OSPAR region

It turned out that groups formed on the basis of these traits showed few results consistent across marine regions and/or indicators. For example, in Arctic waters the breeding abundance indicator showed low pass rates in ground nesters (threshold reached in only 37% of species) compared to cliff nesters (75% passes), but the results are the other way round in the breeding success indicator in the same region (33% of species pass on cliffs, 70% on ground). Given the large variation in the number of species per taxonomic group covered by the different indicators within and between the four marine regions (Tables 7.1 and 7.3), proportions of species failing to achieve good status appear to be strongly biased by species selection. The identification of relevant traits by comparing indicator results would need more even coverage of species and species groups across the indicators. Furthermore, the single trait approach used here is probably too simplistic and a grouping based on multiple traits may prove more insightful.

However, this single trait-based approach was useful to identify considerable gaps in coverage of the indicators. For example, breeding success was only assessed for pelagic and surface feeders and only for colonial breeders, whereas other functional groups are not represented and assessments from the Baltic Sea are lacking completely. In winter, no cliff nesters were assessed anywhere, and the only specialist feeder (trait: niche width) assessed so far in winter is the King Eider in Arctic waters. Further, non-colonial breeders (trait: breeding strategy) were not assessed during the breeding season (i.e. for breeding abundance or breeding success/failure) in Arctic waters and the Celtic Seas. Filling these and other gaps may help to give more powerful results in future, allowing more detailed analyses (see conclusions in section 7.4).

7.2.3 Comparing indicator parameters

7.2.3.1 Breeding abundance vs. breeding success/failure

Breeding success/failure was assessed only in the OSPAR maritime area and was restricted to seabird species (i.e. no waterfowl or waders were included due to insufficient data). Both breeding abundance and breeding success/failure was assessed in 20 species in the Greater North Sea, 17 in the Celtic Seas, and 12 in the Arctic waters. In these 49 cases there was a higher level of agreement (65%) between the two indicators than comparisons of breeding and non-breeding abundance (Table 7.2). This level of agreement was similar in each region. In 45% of cases, both indicators passed. Passing rate in the breeding abundance indicator was higher in those species also passing in the breeding success/failure indicator (69%, n = 32) compared to species failing in the breeding success/failure indicator (41%, n = 17). Failure of both indicators was recorded in only 20% of all cases, mostly involving gulls (Black-headed Gull, Common Gull, Lesser Black-backed Gull and Herring Gull) but also including European Shag, Arctic Skua and Puffin. More species failed both indicators in the Arctic Waters and Greater North Sea, compared to the Celtic Seas.

The aim of the assessment of breeding success/failure is to provide an early warning of future declines in breeding abundance in species that take several years to reach maturity. However, in Table 7.2, there were more cases of a species failing the breeding abundance assessment and passing the assessment of breeding success/failure than the other way round. Such cases may occur when a species has undergone decline in abundance and is still below the threshold and the positive results for breeding success assessment may indicate a recovery. Alternatively, a poor assessment for breeding abundance and a good assessment for breeding success/failure may be an artefact of the conservative assessment methods used for the breeding success/failure indicator that currently captures extreme events of breeding failure only. A revised approach of the assessment methodology as proposed in chapter 2, may provide assessments of breeding success that better reflect unfavourable conditions and provide an early warning of declines in breeding abundance.

It might be worthwhile testing how well the current breeding success/failure indicator can predict positive or negative assessments of the breeding abundance indicator in later years. This could be done by checking if breeding abundance assessments in year (x) are better linked to assessments of breeding success/failure conducted in year (x-f) where the value of ‘f’ equals the age of first breeding.

7.2.3.2 Breeding vs. non-breeding abundance

Both breeding and non-breeding abundance were assessed in relatively few of the species assessed in each region. (Baltic Sea: 12 of 42 species–29%, Greater North Sea: 14 out of 71–20%, Arctic Waters: 5 out of 30–17%, Celtic Sea: 1 out of 60–2%).

The assessment results for each of the two indicators were compared in each species in each region. The result was the same in both indicator assessments (i.e. both indicators failed or both passed) in only 15 out of 32 species-specific assessments overall. At a regional level, agreement between indicator assessments was also found in only half of the species assessed in each of the Celtic Seas, Greater North Sea and the Baltic Sea, but in only 1 out of 5 species in Arctic Waters.

The low level of agreement in species-specific assessments was also found within each functional group (Table 7.3). This is probably because different populations of the same species are included in the assessments of breeding and non-breeding abundance. These differ in a variety of life-history traits and are thus subject to disparate drivers and pressures.

In the current composition, breeding and non-breeding results do not complement one another but have to be viewed and interpreted as separate indicators reflecting the status of separate systems. This will be important when deciding how to integrate assessments of non-breeding and breeding abundance to assess the status of a single species (as required under the MSFD Commission Decision 2017/848/EU).

7.2.3.3 Non-breeding abundance vs. breeding success/failure

Comparison between non-breeding abundance and breeding success was possible for five species each in Arctic Waters and in the Greater North Sea. Whereas in Arctic Waters four of the five species had the same result in both indicators, the Greater North Sea had only one such match. In all of these cases, also breeding abundance was assessed, i.e. species were represented in all indicator parameters. Only one species failed in all indicators (European Shag in Arctic Waters) and one species passed in all indicators (Great Cormorant in the Greater North Sea).

7.3 Reasons for declines and increases of marine bird populations found in OSPAR and HELCOM seabird indicators

Seabird populations are influenced by a large variety of impact factors. Some factors are natural and would cause fluctuations in abundance and distribution without interference from humans. Others are strongly or completely owing to human activities and their related pressures (Mitchell *et al*. 2004, Mendel *et al*. 2008). Further, marine birds are not only migrating within the considered marine regions, but also leave them to spend the winter further south or to breed further northeast. In both cases additional pressures act on those birds assessed in the OSPAR and HELCOM regions (see review in ICES 2017a).

Of all the traits used to group species (see section 7.2 above), the functional groups (based on feeding behaviour) produced the only clear patterns in assessment results: pelagic feeding species tended to do better than other functional groups in all regions except in Arctic waters, were all groups had failed to meet targets for each indicator. This would suggest that food availability is one of the main drivers affecting the status of species across the NE Atlantic and Baltic Sea.

Breeding indicator assessments resulted in striking differences between functional groups of surface feeders and pelagic feeders in most of the regions assessed (Table 7.3). In particular in the Greater North Sea population sizes of seabird species feeding on small fish at or close to the surface showed strong declines, whereas those of species that forage in deeper layers of the water column were stable or increasing (OSPAR 2017c). In addition a higher proportion of surface feeders sustained breeding failure in the Greater North Sea and Celtic Seas. These findings point to a substantially decreased availability of small forage fish species at the surface (e.g. sandeels, clupeids, young gadoids) that are typical prey for various surface feeding species (e.g. Black-legged Kittiwake). Since water column feeders like Common Guillemot fare well while feeding on the same prey species and sizes, it seems likely that the reduced availability of fish is not caused solely by decreases in stock size, but also by changes in vertical distribution of small pelagic fish. To investigate this hypothesis, JWGBIRD contacted various fish biologists to inquire about available data and information sources on trends in the availability of small pelagic fish at the sea surface with special focus on the period covered by OSPAR/HELCOM indicator work (1990 onwards). A respective request was also sent to ICES Working Group of Small Pelagic Fishes, their Ecosystems and Climate Impact (WGSPEC).

Response to these inquiries clearly stated that lack of data makes it impossible to assess the availability of small pelagic fish to surface-feeding predators, currently or in the past. Abundance data of small pelagic fish is lacking vertical resolution and moreover not available as long-term datasets and at the needed spatial scale (ICES 2017b, A. Dänhardt, G. Engelhard, J. Floeter, J. Gröger, R. Froese, H.M. Winkler, pers. comm.). Acoustic surveys such as the HERSUR that have the potential to deliver data on vertical distribution of fish do not cover the upper layers of the water column up to 9 m depth (J. Floeter, pers. comm.). WGSPEC addressed the JWGBIRD request by checking for significant changes in the number of North Sea fish eggs and larvae collected by the Continuous Plankton Recorder (CPR) in spring and summer. Results showed a decline of fish eggs/larvae in spring throughout the North Sea that corresponds to a decrease in the sandeel stock (ICES 2017b). While CPR data offer the potential of investigating long-term patterns e.g. in clupeids and sandeel stocks by estimating changes in densities of eggs and larvae (Lynam *et al*. 2013), they will not reflect changes in the abundance of post-larval fish at the surface.

Though past and present data do not provide proof of changes in the availability of small pelagic fish for surface feeding seabirds, a decrease seems probable and calls for some reasoning regarding underlying causes. Surface feeding seabirds profit from prey fish being concentrated at the surface by diving predators such as other seabirds (Camphuysen & Webb 1999), marine mammals (Evans 1982) and large fish (Clua & Grosvalet 2001). Therefore, it is possible that the decreased availability of prey fish at the sea surface is caused by less incidents of fish being driven to the surface from lower numbers of diving predators. However, diving seabirds and marine mammals have been faring very well (OSPAR 2017c, Hammond *et al*. 2013) and recent years have shown particularly high abundances of mackerel in the south-eastern North Sea (J. Floeter, pers. comm.), which is one of the key drivers in multispecies feeding associations there.

It is likely to assume that the significant increases observed in sea surface temperatures in the North Sea over the last decades have direct and indirect effects on prey fish availability. Carroll *et al*. (2015) found that higher breeding success of kittiwakes was associated with weaker stratification before breeding and lower SSTs during the breeding season. Cold-water fish might increasingly avoid warmer surface layers. But small increases in temperature are unlikely to reduce the physiological condition of fish and force them to avoid surface layers (J. Floeter, pers. comm.). It is more probable that fish are responding to changes in the abundance, composition and vertical distribution of their prey. Sea surface temperature rise is correlated with pronounced changes in the phenology, composition and trophodynamics of marine communities (Corten 2001, Kirby *et al*. 2007, Wiltshire *et al*. 2010, Capuzzo *et al*. 2017). In addition, increases in temperature affect the physiology of fish and reduce the viscosity of water , which means the fish can swim faster to escape from predators (Hunt von Herbing 2002) and reduce the predation success of piscivorous seabirds (Cairns *et al.* 2008).

Another cause of the differences between surface feeders and pelagic feeders could be anthropogenic. For years, some seabirds, mostly surface-feeders that scavenge (e.g. Great Skua, Northern Fulmar, large gulls), have benefited from fisheries through food provided at sea by discharging offal and discarding undersize fish. As a result, the abundance of these species may have been elevated above levels that could be sustained by naturally occurring food sources. The necessary introduction of measures to conserve fish stocks has reduced the amount of discards, as has the decline of some commercial fisheries, which has also resulted in less offal being discharged. The reduction in food provided by the fishing industry may have contributed to the decline in population of Fulmars and other offshore surface-feeders since the mid-1990s (Mitchell *et al*. 2004). Another consequence of fewer discards is that Great Skuas have had to rely increasingly on other food sources, including the predation of other seabirds, which is having a negative impact on their prey populations (e.g. Arctic Skuas) (Votier *et al*. 2004). These impacts are set to continue through the Landing Obligation currently being phased in under the Common Fisheries Policy. JWGBIRD recently discussed possible impacts of the Landing Obligations and suggested how such impacts could be monitored, focusing on the species and biological aspects most likely to be affected (ICES 2016). It is expected that overall, the Landing Obligation will benefit the wider marine ecosystem and not seriously undermine seabird communities.

7.4 Conclusions

7.4.1 Functional groups

This preliminary analysis has shown that in both NE Atlantic and Baltic Sea, functional groups based on feeding behaviour are much more effective at describing ecological differences in assessment results between species than other single traits,. This supports previous recommendations by JWGBIRD (ICES 2016) and the adoption of these groups in the revised Commission Decision on MSFD (2017/848/EU).

7.4.2 Food availability

Species of pelagic feeding seabirds had more favourable assessments of breeding abundance and breeding success/failure than surface feeders in the North Sea and Celtic Seas. This suggests availability of prey fish close to the surface is a stronger driver than absolute abundance of fish. Changes in the vertical distribution of fish in the water column are poorly understood due to lack of direct data. But the warming of surface waters and increased stratification due to climate change are thought to be reducing availability of prey fish near the surface.

7.4.3 Within-species assessments

Very few species were assessed with all three indicators – non-breeding abundance, breeding abundance and breeding success/failure. Breeding success was assessed only in the OSPAR Maritime Area and not in the Baltic.

Assessments of breeding abundance and breeding success/failure of the same species were more likely to be the same than different. There were more instances of species passing both assessments than failing both.

There was a low level of agreement in species-specific assessments of breeding abundance and non-breeding abundance. This is probably because different populations of the same species are included in the assessments of breeding and non-breeding abundance. These differ in a variety of life-history traits and are thus subject to disparate drivers and pressures.

The observed relationships in these within-species assessments will be an important consideration when deciding how to integrate assessments of one more indicators to assess the status of a single species (as required under the MSFD Commission Decision 2017/848/EU).

7.5 Further work

7.5.1 Determine factors affecting the status of marine bird populations

There are likely to be factors other than food availability that are affecting the status of marine birds. This chapter represents the first preliminary and simplistic analysis of results. Additional more complex analysis of species-specific trends is each indicator will be conducted by JWGBIRD to identify these additional drivers. These analyses will include trait-based models using multiple traits (see Table 7.4) as explanatory variables of interspecific differences in the trends of each indicator.

7.5.2 Achieve better comparability between OSPAR & HELCOM assessments

OSPAR and HELCOM assessments included indicators of breeding abundance and non-breeding abundance. The assessments used the same metrics and assessment thresholds, but differed in one respect: the OSPAR assessments compared the most recent annual value of abundance against the threshold value, but HELCOM used the most recent five-year mean value of abundance. The latter approach is more robust to interannual fluctuations in the accuracy of abundance estimates. It is proposed that the OSPAR assessment methods are changed to be in line with those of HELCOM.

7.5.3 Achieve more balanced coverage of species within indicators

The species composition in each indicator was biased towards particular functional groups or taxonomic groups. Species were included in the indicators based on data availability alone – not other selection criteria were applied. Achieving a more balanced species composition would involve either removing species from some groups or adding species to other groups. Adding more species may involve expanding existing monitoring, which would probably require additional resources that are not available. Even if monitoring can be expanded to some species, it will be several years before these data can be incorporated into the indicators. Removing species would need careful consideration to avoid introducing further bias and subjectivity. Reducing the number of species in a group may reduce the interpretive power afforded by that group. On the other hand explanatory power might also be increased when focusing exclusively on species with a particularly strong link to the regional marine ecosystem. Removing species from the assessment may however make less sense in the context of the new MSFD Commission Decision (2017/848/EU) that focuses on species-specific assessments.

7.5.4 Determine how best to integrate indicator assessments within species

The revised MSFD Commission Decision requires the status of each species to be assessed using specified criteria (e.g. population size, distribution, breeding success). As shown above the bird assessments in OSPAR and HELCOM used indicators of breeding abundance and non-breeding abundance and OSPAR also used breeding success/failure. Each of these indicators could not be assessed in all species. Therefore, future assessments of species status will be based on variable numbers of indicators depending on the species. This presents a problem, particularly if a simple conditional rule is applied within a species. For instance, if a 'one out all out' rule were applied, the species is considered to be in poor status if one or more indicators has not achieved the required thresholds. Through chance events, the likelihood of a species not achieving good status increases the more indicators are assessed. Hence, well studied species may be more likely to be assessed as in poor status, than species assessed by a single indicator. It is therefore, imperative that appropriate integration methods are applied within species otherwise bias will be introduced into the assessments. Such methods will be investigated by an ICES workshop WKDIVAGG in May 2018. Members of JWGBIRD will participate in this workshop and the wider group can review the workshops recommendations.

7.5.5 Use more objective baselines

Most OSPAR contracting Parties did not provide baselines for inclusion in the IA2017. As an alternative, relative abundance was calculated using a baseline equal to the abundance at the start of the time-series. A similar approach was used for the HELCOM abundance indicators. ICES (2015) recommended that it is preferable to set baselines objectively, using one of the methods (a) or (b), below. But such baselines are not so easy to identify from existing data time-series.

a) 'Historical reference': where abundance is known at a point in the past long before the time-series began, but where the reasons for subsequent change are unknown. Historical population estimates should be used as baselines if they were recorded: before known human impacts; and/or before other major declines in population; or at known plateaus in population trends, following increases and peaks in population size.

b) Reference level': the population size that could be expected if human impacts were negligible (this can be derived from known population sizes either historically or from within available time-series). Use of 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 events). Use of recent population estimates (e.g. previous five-year mean) when a species has been colonising.

The setting of more objective baselines would mean that we are not continually expecting populations to remain stable or increase over time. We might expect some populations to decline as a result of better management of the marine environment in an attempt to return to more natural conditions. For example efforts to reduce eutrophication and to eliminate fisheries discards will reduce the food sources of some marine bird species. Furthermore, the recovery of some fish stocks (e.g. haddock, whiting in the North Sea) and of whales will mean that seabirds feeding on small shoaling fish will have more natural competitors.

7.5.6 Develop new indicators to strengthen explanatory power

The indicators used in both the OSPAR and HELCOM assessments of marine birds were unable to distinguish human impacts from the effects of prevailing environmental conditions. The indicators on abundance and breeding success/failure used in the assessments are affected by both human pressures and natural processes. One way to improve detection of human impacts on the abundance indicators would be to use more objective baselines as mentioned above. Another way would be to expand the assessments to include other indicators. There are currently OSPAR and/or HELCOM candidate indicators on marine bird distribution, kittiwake breeding success, invasive predatory mammal presence on seabird islands and seabird bycatch. There have been national assessments on the first three of these in 2018, which JWGBIRD will review and recommend future action on these indicators. Seabird bycatch is now a primary criteria for assessments of birds under MSFD Descriptor 1. It is likely that data on seabird bycatch will be collected more systematically in the future, which could lead to an operational indicator on seabird bycatch. This also applies to HELCOM, where a core indicator dealing with seabird bycatch is not operational due to a considerable lack of data on both seabird bycatch and fishing effort.

7.6 References

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8 Provide seabird information for the ICES Ecosystem Overviews

In 2017, JWGBIRD was asked to revise the text provided in 2016 for the Baltic Sea Ecosystem Overview, and if possible add a suitable figure.

8.1 Revised text drafted by JWGBIRD for the Baltic Sea

At least 26 species of seabird breed along the coasts of the Baltic Sea, including large numbers of razorbills *Alca torda*, herring gulls *Larus argentatus*, common gulls *Larus canus* and great cormorants *Phalacrocorax carbo*. Different species have shown different trends in breeding numbers: 12 species have declined, 7 have increased, 6 were stable and the trend was uncertain in one species. The greatest declines in breeding numbers were observed in common eider *Somateria molllissima* and great black-backed gull *Larus marinus*.

At least 17 species of seabirds spend the winter in the Baltic Sea, which is an important wintering area for the globally threatened long-tailed duck *Clangula hyemalis*, velvet scoter *Melanitta fusca* and Steller's eider *Polysticta stelleri*. All three species have been declining in number during the last 25 years, as have many other benthic-feeding species. Numbers of several fish-eating species increased during the 1990s, but have since then declined back to the previous levels.

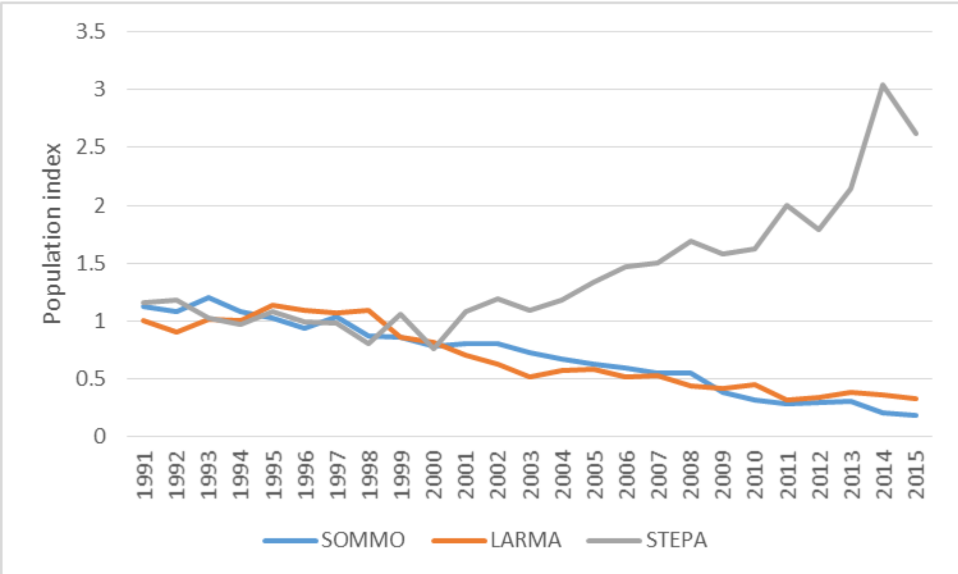

Figure 8.1. Development in the breeding populations of common eider (SOMMO), greater black-backed gull (LARMA) and Arctic tern *Sterna paradisaea* (STEPA) in the Baltic Sea in the period 1991–2015.

9 Can we use citizen science more extensively in the study of marine bird ecology?

9.1 Introduction

Several recent reviews have highlighted the contribution made by citizen science in terms of tackling a wide range of questions in ecology, particularly as advancements in technology have been made over recent decades (e.g. Kobori *et al*. 2016). A major strength of using citizen science is the potential to collect data over larger spatial scales and longer time spans than would be possible using solely professional effort (e.g. Silvertown 2009). Similarly, the value of citizen science in terms of meeting both research needs and augmenting public engagement with science has been flagged up as an important aspect of using volunteers (Pocock *et al.* 2017). There have, however, been a number of criticisms of the use of citizen science, mainly in relation to the quality of data collected (Gollan *et al.* 2012; Aceves-Bueno *et al*. 2017).

The main aims of this Term of Reference were therefore to:

a) Identify the range of citizen science projects used to monitor marine bird populations (seabirds, swans, ducks, geese and waders) in a range of countries covered by ICES and OSPAR and HELCOM conventions.

b) Understand how these citizen projects feed into reporting requirements and therefore highlight the importance of the use of volunteers.

During the 2017 JWGBIRD meeting held in Riga, delegates from Belgium, Denmark, Estonia, Germany, Latvia, Lithuania, the Netherlands, Norway, Poland, Sweden, and the UK responded to five key questions, which form the basis of the structure of this chapter. The contributors included representatives from non-government organisations, universities and government agencies. Responses were then collated to show the range of issues raised and are therefore not reported by country.

Participants were also asked to fill out a spreadsheet which provided more specific detail on the key organisations, taxonomic groups of interest, time of annual cycle covered, relative frequency, spatial scale, funding mechanisms, incentives for volunteers, parameters obtained and the reporting requirements met by the surveys or schemes. This information was provided for all countries with the exception of Denmark. These spreadsheets were then converted into a set of tables, which are referred to in the text where appropriate. A wide range of surveys were taken into consideration in terms of: taxonomic groupings, habitat type and scale (Table 1), and also with respect to the time of year covered and frequency (Table 2), as discussed later. Due to time constraints, this chapter should be viewed as a preliminary survey of the role of citizen science in marine bird monitoring and should form the basis for identifying further work needed in the future. In addition, further work is likely to required in order to standardize definitions and terminology, when making comparisons between countries and types of schemes based on the tables.

9.2 . What is citizen science?

The term citizen science has been extensively described in the peer-reviewed literature (e.g. Silvertown 2009). Within JWGBIRD, there was broad agreement with these published definitions, with citizen science taken to mean the use of volunteers to collect data in a standardized way, but with the support of paid professionals to analyse and report information. In terms of the use of the word 'standardized', there was a distinction between on one hand systematic surveys or schemes, and on the other hand unstructured data collection such as online databases for 'birders' which give some indication of the presence of species, although effort or records of absence are not always captured. The former were characterized by having prescribed protocols for data collection and were regarded as being of much higher value (Table 3 shows specific examples, see also Kamp *et al*. 2016).

Financial remuneration to observers can be offered in the form of formal payment schemes for either petrol/mileage, boat costs or accommodation (Table 4). Incentives may also be offered for the most dedicated volunteers, such as free publications resulting from the surveys or prizes for achieving the highest level of effort. In addition, costs for equipment can also be met, e.g. ringing equipment. Throughout Europe, there are countries that run a social voluntary service (e.g. the Voluntary Ecological Year and Federal Voluntary Service schemes which operate in Germany); volunteers in such schemes are given a minimum stipend to live on, but these were thought not to be true examples of citizen science. However, the bird monitoring carried out as part of these voluntary service schemes share a number of similarities with citizen science projects.

Across the different citizen science projects, there was a great deal of variation in the ratio of volunteers to professionals who were involved in data collection. Some surveys are entirely volunteer based (e.g. a number of the regional based Beached Bird Surveys), whereas others are mainly dependent on professional field effort for data collection and volunteers provide a useful top-up in coverage. There are also a number of examples of monitoring schemes, which are organised by one organisation while fieldwork is coordinated by other organisations, which included both paid and voluntary effort (e.g. The Seabird Monitoring Programme in the UK and Ireland).

Motivations underlying why people are willing to provide their time for free have been extensively reviewed (e.g. Roy *et al*. 2012, Geoghegan *et al*. 2016). Similar issues were flagged up by JWGBIRD members, who stated that volunteers enjoyed the sense of making a discovery for themselves. Many of these volunteers were also thought to be interested in conservation issues and want to help reverse declines of the species considered to be in trouble. Another motivation mentioned for taking part in citizen science was the recognition that their contribution made a real difference e.g. understanding causes of decline. Similarly, it was also thought to be important to have a sense of how their data fit into the bigger picture by being part of a community. Nevertheless, there was a perception that there might be more interest from a volunteer in understanding the regional or even national context rather than contributing to reporting at larger scales than individual countries (e.g. OSPAR, HELCOM).

Understanding the types of volunteers was also thought to be important when it came to tapping into their particular skill sets. Volunteers can collectively encompass a wide range of tasks (e.g. systematic surveys involving fieldwork, handling birds for ringing, classifying material, manual data entry, data processing). Related to this was the need for understanding the personality types who are attracted to citizen science, e.g. 'birders' (who regularly record all the birds they see) or 'twitchers' (who put specific effort into seeing and recording rarities, sometimes travelling great distances). More recently, people who can be loosely classified as 'gamers' have been identified as able to help with data collection by looking at and classifying images/videos online (e.g. the recently launched global based Seabird Watch programme https://www.zooniverse.org/projects/penguintom79/seabirdwatch).

The use of traditional media (e.g. television and radio) along with social media (e.g. Twitter, Facebook) was reported to be extremely useful in terms of increasing numbers of volunteers, with social media having the extra added value of providing a community and means of interacting with other volunteers and organisers.

In some countries, the pool of highly skilled volunteers was reported as increasing in age, with no obvious cohort to replace them in future years. There was at least one country however (the UK), where there is growing movement of 'young birders' which is supported by non-government organisations through funded training schemes and a vibrant social media community. It was broadly agreed that, where possible, a range of abilities should be catered for which should incorporate not only the highly skilled and experienced, but also right down to the beginner level (e.g. school children have been used to survey white storks in Latvia since the 1930s). Whilst this may not be possible for all individual citizen science projects, organisations could try to think strategically about how to help volunteers transition from basic entry level to more advanced surveys or schemes.

The vast majority of citizen science projects mentioned were at the scale of the individual country concerned, but some were regional or even single-site initiatives (Table 1). All parts of the annual cycle were covered (breeding, wintering and migration), and many were carried out annually, but there were some surveys carried out periodically or even on a one-off basis (Table 2). The citizen science projects considered here collected data on up to eleven parameters (Table 5), with breeding and wintering abundance counts being the most common.

9.3 How do we improve the quality of data collected using citizen science?

A number of papers have addressed issues relating to the quality of data collected using citizen science (e.g. Garbarino and Mason 2016). Many of the issues addressed below are not restricted to the use of volunteers, but can also be argued to be symptomatic of data collection over a large geographic scale and involving large number of people.

When using volunteers to collect data, particularly when dealing in large numbers of participants, it was suggested that methods should be relatively easy to follow, thus increasing the likelihood that they are repeatable. This in part reflects that some volunteers might be limited in terms of the time they can commit, or may be less skilled than others. Another aspect raised was that volunteers might interpret methods slightly differently, and that better guidance should be developed to deal with this, e.g. when to use telescopes in preference to binocular for counts of birds – since the results are likely to differ substantially. There may be instances where the methodologies might be more complex (e.g. where the vast majority of data collection is being carried out by professionals), and in such instances only the most experienced /skilled volunteers should be used. In some cases, these can be combined in a tiered approach, with 'citizens' providing larger-scale, or contextual, data, with more dedicated observers, or paid staff, providing more detailed information from a limited number of sites.

There was also recognition that training of volunteers is very valuable. This can range from bird identification courses to participating in actual data collection, e.g. surveys. Training can be offered remotely online using photographs and short videos or by face to face training, ideally targeted at venues relatively local to where the volunteers are likely to be working. Another more targeted form of training is the use of mentors, who work with volunteers over a period of time developing their skills and confidence. Related to training is the potential for offering an examination or accreditation, process, which can be very appealing to volunteers. As an example, Nord University in Norway has a web page designed to help train and test volunteers in bird identification skills, which has been translated into over twenty-eight languages (https://www.birdid.no/bird/training.php). It was also thought that even some long-term volunteers might benefit from retraining to help reiterate the methodologies and prevent method drift (where methods become adapted over time as surveyors no longer refer to the written methods). It was also raised that there needs to be clear messaging over the need for data to be comparable across sites.

Surveys which operate at a large-scale (e.g at a country level) were reported to be extremely difficult to organise from a centralised location, and the value of a network of regional organisers to help volunteers on the ground was highlighted. Such regional co-ordinators in turn can also be volunteers, e.g. in the UK the BTO has a regional representative network who coordinate volunteers to carry out a whole range of surveys within their region.

Informative feedback to volunteers was consistently highlighted as being critical to running successful citizen science projects. This includes initial timely acknowledgement that their data have been received (if not entered online where responses can be automated), and ideally in the form of a thank you. It is also important that organisers of citizen science projects explain how volunteers' contribution have made a difference. There are a wide range of options for doing so, ranging from personalised responses (letters) to newsletters (sent in the post or increasingly via e-mail) and even the use of social media (e.g. Twitter, Facebook). In terms of relaying key messages, a number of participants were of the opinion that volunteers were more likely to care about issues more local to them when discussing the impact of their work. There was also one instance where it was possible to take the volunteers out for an annual meal as a means of thanking them for their time, but this was an example of a very localised and small group (Beached Bird Surveys in Belgium). Targeted events (e.g. with lectures) are also highly valued by volunteers and can also help build a sense of community.

Maintaining long-term involvement is very useful in terms of a volunteer getting to really know a site (e.g. agreeing access with landowners, knowledge of best places/routes to carry out counts from), and also improves consistency. Another aspect which was raised was the need to understand, in some areas, who the local birders/birdwatchers are in order to minimise 'turf wars'. Birders can regard their local birding area or 'patch' as being theirs. It was suggested that it is good practice to assign sites according to the volunteers' own knowledge and level of personal experience of that particular site.

The method of data capture is also an important determinant of data quality, and currently used methods are shown in Table 3. Whilst there might be valid reasons for retaining paper forms as a means of submitting data (e.g. when volunteers simply provide their survey form, as filled out in the field), typographic errors can easily arise which may not be easily picked up when entered by a different person. Even the use of spreadsheets and offline databases was said to be problematic when volunteers do not enter predefined/standardized responses and instead use free style text. The use of online data submission systems was universally recognised as being the best means of collating data, but such systems require significant resources not only for development but also for future maintenance as technology advances. Online systems can also help with site allocation and can help organisers easily ascertain the level of coverage achieved. In addition, the ability to draw polygons or otherwise delineate the site on a digital map is very useful for site definition and ensuring consistency in area surveyed from one period to the next.

Related to online systems is the use of more instantaneous methods of data recording via the development of software allowing data to be entered directly onto tablets or laptops in the field. This eliminates the need for paper recording forms and also ensures that data are provided in a timely fashion, but at the same time raises issues of ensuring that regular backup copies are made of the data, and that there is adequate battery power whilst out in the field. Mobile phone apps are also becoming increasingly popular, but can be also affected by limited battery operating time. It was highlighted however, that whilst the increase in uptake of entering data into online systems has been invaluable in reducing time associated with data entry, there is a risk that the personal touch is lost in that volunteers no longer need to contact organisers to hand over their data. Engagement at a local level is extremely important in terms of not only recruiting new volunteers, but also to maintain long-term effort from existing volunteers.

Data validation is extremely important for checking the quality of data, and this can be achieved by regional/local organisers checking all records submitted within their designated regions. Similarly, such checks can be programmed into online database systems, which then pick up on unusual records in terms of species identified or the numbers counted at the time of data entry.

Whilst there was consensus that citizen science participants, if offered sufficient training and support, could make an important contribution, there were a number of instances where their use was argued to be limited. This included when data collection was required at unsocial times of day or under challenging conditions (e.g. where sites are hard to access or accommodation is restricted). Similarly, there are occasions where volunteers may have a vested interest in the findings of the work and their objectivity could be called into question (e.g. the use of fishermen to record bycatch for fish and birds, which has been shown to differ to more impartial recording as cited by one participant of the meeting). Another specific example given was when the results of the work might result indirectly in an outcome which the volunteers might not agree with (e.g. in the Netherlands, where some volunteers are not keen to assist with counts of geese as the results may be used to set numbers to be culled as part of goose management).

There was also an argument for managing expectations for the type of data that can be collected using volunteers. In some cases, it may be more realistic to propose the use of indices as opposed to absolute numbers as the primary objective. Whilst some monitoring parameters such as wintering abundance counts are relatively straightforward to collect, other parameters need a greater intensity of effort. One example concerns breeding success, where the number and timing of visits can have a profound influence on the recorded numbers fledged per breeding attempt, or where more time-consuming methods (e.g. nest enclosures) or legislative issues (e.g. need of permits) are involved.

9.4 Funding obligations/opportunities for citizen science

Although citizen science projects, including long-term monitoring programmes, can be extremely cost-effective in terms of how much money is spent for the amount of data collected, these schemes do require sufficient resources for not only the staff time involved but the associated infrastructure as well (e.g. online reporting systems). Many of the representatives stated that much of the funding for long-term monitoring came via contracts from governments (Table 4), but there seemed to be variation in the extent to which the contracted organisations within individual countries had this financial support (this was not quantified, however, as part of this exercise).

Special initiatives such as atlases or periodic censuses or even website redevelopment usually required additional sources of funding, e.g. from charitable trusts, individual donors or industry including renewables, oil and gas. Whilst many organisations were comfortable accepting money from a broad range of sources, a few raised concerns about being able to retain their independence if the money came with vested interests. There were also instances where the professional staff involved provided their own time in a voluntary capacity in order to help launch certain initiatives.

In the UK, there may also be reduced funding opportunities in the coming years because organisations will no longer be eligible to lead proposals for European funding schemes once Brexit is enacted. It remains to be seen if such funding will be provided by alternative sources.

9.5 How has citizen science contributed to reporting requirements at the N-E Atlantic scale (marine only)?

Results from bird monitoring schemes are reported at several levels and through many mechanisms, including national level, Birds Directive, ICES, AEWA/IWC, OSPAR, HELCOM, CAFF, Living Planet and others (Table 6). Whilst many of these citizen science projects do not contribute to formal reporting, they may have the potential to do so at a later date, but this was not covered within the scope of this ToR.

OSPAR and HELCOM bird abundance indicators strongly rely on data collected by volunteers. For example, non-breeding abundance indicators are generated from data from International Waterbird Census (IWC), a framework scheme for those counts carried out in participating countries. The numbers of breeding birds are also mostly recorded by volunteers in most Contracting Parties of OSPAR and HELCOM and thus contribute to the respective abundance indicators. In the OSPAR indicator of breeding success/failure, the proportion of data collected by professionals is larger, though volunteers are still involved.

The same data (IWC and national breeding bird surveys) are usually also important for reporting under the Birds Directive (Article 12 reporting). In addition, other citizen science projects contribute to Birds Directive reporting. For example, the national breeding bird atlas project in Germany, for which data were almost exclusively collected by volunteers, contributed to the reporting of trends in distribution and population size of breeding birds.

9.6 How do we improve the level of reporting at the N-E Atlantic Scale?

There was little appetite to change methods for the different countries, especially for the long-term monitoring schemes. In general, it was thought to be possible to work around a lack of standardisation of methods/analyses, but references were made to schemes that were more readily comparable (e.g. those national schemes contributing to the International Waterbird Census - IWC). If there was sufficient justification to make amendments however, it was proposed that it would be necessary to run two schemes in parallel to allow calibration (e.g. in the UK for terrestrial monitoring there was a change from the Common Bird Census (CBC) to the Breeding Bird Survey (BBS) which involved seven years of both methods being carried out concurrently before the former was dropped, Freeman *et al.* 2007). There were, however, suggestions that further thought into the timing and frequency of surveys would be needed for successful integration. There also was some discussion as to whether raw data from each country should be provided or whether data processed and analysed at a country level would be sufficient for the purpose of reporting. The latter option was thought to be more pragmatic however. The outputs from each country should preferentially be standardized and thereby more easily combined and compared. It is worth noting perhaps, for more terrestrial based species, that increasing effort is being spent to ensure data are compatible between countries, such as the EuroBirdPortal (www.eurobirdportal.org), which combines many of the invidual online bird listing sites, and the exchange code used by all European ringing schemes (Euring 2010).

9.7 Recommendations for consideration by future JWGBIRD meetings

It was not possible to cover all relevant aspects of the use of citizen science in monitoring of marine birds at the JWGBIRD 2017 meeting. It would be useful to discuss the following issues at future meetings:

- Which surveys / demographic rates could be formally reported (e.g. should survival rates as derived from national ringing schemes be included)?

- Which surveys/schemes could be extended spatially (e.g. should countries with limited coastline covered by Beached Bird Surveys be encouraged to increase their extent)?
- Which surveys/schemes should be increased in frequency (e.g. could one-off/periodic surveys become annual events)?
- Consideration of future funding models to ensure longevity of data schemes.

9.8 Tables

Table 1. Types of marine bird citizen science schemes operating and organised by countries in the OSPAR and HELCOM region. Use of parentheses under scale indicates partial coverage

Country	Name of Citizen Science project	Main organisers	Taxonomic Grouping			Habitat				Scale		
			Seabirds	Ducks, Swans and Geese	Waders	Inshore/offshore	Estuaries	Coast	Inland	Country	Region	Siteonly
UK + IE	Seabird Monitoring Programme (SMP)	JNCC (via 19 partners)	x					x	x	x		
UK + IE	Seabird Census	JNCC (via 19 partners)	x					x	x	x		
UK + IE	Wetland Bird Survey (WeBs/I-WeBS)	BTO, BWI	x	x	x		x	x	x	x		
UK + IE	Non-Estuarine Waterbird Survey (NEWS)	BTO, BWI	x	x	x			x		x		
UK + IE	Nest Record Scheme	BTO	x	x	x		x	x	x	x		
UK + IE	Ringing scheme	BTO	x	x	x		x	x	x	x		
UK + IE	Ringing Adult for Survival (RAS)	BTO	x	x	x			x	x	x		
UK + IE	Winter Gull Roost Survey (WinGS)	BTO	x					x	x	x		
UK + IE	BirdTrack	BTO, RSPB, SOC, WOS, BWI	x	x	x	x	x	x	x	x		
UK + IE	Bird Atlases	BTO, SOC, BWI	x	x	x		x	x	x	x		
UK + IE	Waterways Breeding Bird Surveys (WBBS)	BTO		x	x				x	x		
UK + IE	Breeding Bird Survey	BTO	x	x	x				x	x		
UK + IE	Goose and Swan Monitoring Programme	WWT		x			x		x	x		
UK + IE	Resightings of colour-marked geese /swans	WWT		x					x	x		
UK + IE	Beached Bird Surveys (multiple schemes)	RSPB/ SOTEAG/ NHSC	x					x		(x)		
UK + IE	Seabird Watch*	UCC/OU	x					x			x	
UK + IE	Roof-nesting Gull Survey (Dublin City Gull)	DCC/ BWI	x						x			x

Country	Name of Citizen Science project	Main organisers	Taxonomic Grouping			Habitat				Scale		
			Seabirds	Ducks, Swans and Geese	Waders	Inshore/offshore	Estuaries	Coast	Inland	Country	Region	Siteonly
UK + IE	Seawatch surveys (multiple schemes)	BO, RW**	x	x		x						x
UK + IE	Mapping winter distribution of seabirds	CEH	x	x				x			x	
UK + IE	Ferry Survey Programme	ML	x	x		x					x	
UK+ IE	Project Puffin	RSPB	x					x		x		
UK+ IE	Calmap ferry project	JNCC	x			x					x	
BE	Beached Bird Surveys	INBO						x		x		
BE	Seabirds at Sea	INBO				x				x		
BE	Seaduck counts	INBO	x	x		x				x		
BE	Colour-ringed gulls	INBO	x					x	x	x		
BE	Wintering waterbirds	INBO	x	x	x	x		x	x	x		
BE	Breeding bird atlas	INBO	x	x	x			x	x	x		
BE	International Waterbird Census	INBO	x	x			x	x	x	x		
NL	Broedvogelmeetnet [1]	Sovon	x	x	x	x	x	x	x		x	
NL	Meetnet Reproductie Waddenzee [2]	Sovon	x	x	x		x	x		x		
NL	Meetnet Nestkaarten [3]	Sovon	x	x	x		x	x	x	x		
NL	Watervogelmeetnet [4]	Sovon	x	x	x	x	x	x	x	x		
NL	Punt Transect Tellingen (PTT) [5]	Sovon	x	x	x		x	x	x	x		
NL	Trektellen.org*	GT*	x	x	x		x	x	x	x		
NL	Ringing scheme	Vogeltrekstation		x	x	x	x	x	x		x	
NL	Oog voor het Wad[6]	MOCO	x			x	x	x			x	
NL	Monitoring Seabirds-at-Sea	DPM & BW				x				x		

Country	Name of Citizen Science project	Main organisers	Taxonomic Grouping			Habitat				Scale		
			Seabirds	Ducks, Swans and Geese	Waders	Inshore/offshore	Estuaries	Coast	Inland	Country	Region	Siteonly
NL	Wadertrack (Oystercatcher)	Sovon	x		x	x	x	x	x	x		
NL	waarneming.nl	Stichting Natuurinformatie	x	x	x	x	x	x	x		x	
NL	Beached Bird Surveys	NIOZ		x	x			x		x		
NL	Surveillance of bird health	Sovon, DHWC	x	x	x			x	x		x	
DE	Monitoring colonial birds and rare spp (breeding)	NPA	x	x	x		x	x		x		
DE	Monitoring common breeding birds Wadden Sea	NPA	x	x	x		x	x	x	x		
DE	National monitoring common breeding birds	DDA		x	x			x	x	x		
DE	Monitoring (wintering) waterbirds, goose/swans	NPA	x	x	x	x	x	x	x	x	x	
DE	Beached Bird Surveys	NPV, NLWKN	x	x	x		x	x		(x)		
DE	Monitoring breeding success	NPA	x	x	x		x	x	x	x		
DE	ornitho.de (~BirdTrack)	DDA	x	x	x	x	x	x	x	x		
DE	Ringing schemes	Vogelwarte	x	x	x		x	x	x		x	
DE	no name (breeding bird surveys Baltic Sea coast)	various		x	x			x	x	x		
NO	Winter counts of marine birds	NINA	x	x	x			x		x		
NO	City gulls	NINA	x					x	x			x
NO	Beached Bird Surveys	NINA	x	x				x		x		
NO	Artsobservasjoner (The species gateway)	NBIC	x	x	x	x	x	x	x	x		
SE	September counts	Lund University	x	x			x	x	x	x		
SE	International Waterbird Census	Lund University	x	x	x		x	x	x	x		
SE	Monitoring of breeding coastal birds	Lund University	x	x	x	x		x		x		
PL	Monitoring Pospolitych Ptaków Lęgowych[7]	GIOŚ / OTOP	x						x	x		

Country	Name of Citizen Science project	Main organisers	Taxonomic Grouping			Habitat				Scale		
			Seabirds	Ducks, Swans and Geese	Waders	Inshore/offshore	Estuaries	Coast	Inland	Country	Region	Siteonly
PL	Monitoring Zimujących Ptaków Wodnych [8]	GIOŚ / OTOP	x	x	x	x	x	x	x	x		
PL	ornitho.pl	OTOP	x	x	x	x	x	x	x	x		
LT	Spring migration (first arrival) phenology	LOD	x	x	x	x	x	x	x	x		
LT	Breeding bird atlas	LOD	x	x	x		x	x	x	x		
LT	Mid-winter counts	LOD	x	x			x	x	x	x		
LT	Observations of rare birds	LOD	x	x	x	x	x	x	x	x		
LV	dabasdati.lv	LDF, LOB	x	x	x		x	x	x	x		
LV	Beached birds	LOB	x	x	x			x		x		
LV	Breeding bird atlas	LOB		x	x		x	x	x	x		
LV	Arrival of spring migrants	LOB		x	x		x	x	x			x
LV	International Waterbird Census	LOB		x	x		x	x	x	x		
EE	International Waterbird Census	EOS		x	x	x	x	x	x	x		
EE	Breeding Bird Atlas	EOS	x	x	x		x	x	x	x		
EE	Phenology Project	EOS		x	x		x	x	x	x		
EE	Bird of the year (swans)	EOS		x			x	x	x			x
EE	Swan and Geese Monitoring	University of Life Sciences	x	x			x	x	x	x		
EE	Estonian Ringing Scheme	NCA	x	x	x		x	x	x			

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[1] Trilateral Monitoring and Assessment Programme for NL, D and DK (TMAP) breeding birds; [2] TMAP breeding success, [3]Nest Record Scheme, [4] TMAP migratory birds, [5] Point-transect counts terrestrial wintering birds; [6] monitoring of disturbance in the Wadden Sea; [7]Common Bird Survey ; [8]Wintering Waterbird Survey

*** schemes which operate outside the country of origin,** = individual organisers**

ORGANISATION (listed alphabetically, bold indicates official acronyms) BTO= British Trust for Ornithology; BW = Bureau Waardenburg, BWI = Bird Watch Ireland , CEH = Centre of Ecology and Hydrology, DCC = Dublin City Council, DDA = Dachverband Deutscher Avifaunisten, DHWC =Dutch Wildlife Health Centre) DPM =, GIOS = Główny Inspektorat Ochrony Środowiska (Chief Inspectorate for Environmental Protection), GT = Gerard Troost , EOS = Estonian Ornithological Society, INBO = Research Institute for Nature and Forest , JNCC = Joint Nature Conservation Committee, LDF = Latvian Fund for Nature , LOB = Latvian Ornithological society, LOD = Lithuanian Ornithological Society, MOCO = a consortium operating to monitor marine traffic in the Wadden Sea, ML = Marine Life, NBIC =Norwegian Biodiversity Information Centre, NIOZ =Royal Netherlands Institute of Sea Research; NHSC = Natural History Society of Cumbria, NCA = Nature Conservation Agency, NLWKN = Niedersächsische Landesbetrieb für Wasserwirtschaft NPA =National Park Authority (Niedersachsen / Schleswig-Holstein); NPV = Nationalparkverwaltung, OTOP = Ogólnopolskie Towarzystwo Ochrony Ptaków (Polish Society for the Protection of Birds), OU = Oxford University, RSPB = Royal Society for the Protection of Birds, SOTEAG = Shetland Oil Terminal Environmental Advisory Group, Sovon = the Dutch Centre for Field Ornithology, UCC=University College Cork , WWT = Wildfowl and Wetland Trust,

NPV = Nationalparkverwaltung, in Lower Saxony/Germany (i.e. National Park Park administration, like NPA in Schleswig-Holstein)

NLWKN is also operating in Lower Saxony: Niedersächsische Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz. So governmental agency for water and nature management and coastal protection.

Table 2. Timing of life cycle covered and frequency of project covered by marine bird citizen science schemes operating in the OSPAR and HELCOM region.

Country	Name of Citizen Science project	Time of year			Frequency		
		Breeding	Wintering	Passage/migration	Annual	Periodic	One off/Just started
UK + IE	Seabird Monitoring Programme (SMP)	x			x		
UK + IE	Seabird Census	x				x	
UK + IE	Wetland Bird Survey (WeBs/I-WeBS)	x	x	x	x		
UK + IE	Non-Estuarine Waterbird Survey (NEWS)		x			x	
UK + IE	Nest Record Scheme	x			x		
UK + IE	Ringing scheme	x	x	x	x		
UK + IE	Ringing Adult for Survival (RAS)	x			x		
UK + IE	Winter Gull Roost Survey (WinGS)		x			x	
UK + IE	BirdTrack	x	x	x	x		
UK + IE	Bird Atlases	x	x			x	
UK + IE	Waterways Breeding Bird Surveys (WBBS)	x			x		
UK + IE	Breeding Bird Survey	x			x		
UK + IE	Goose and Swan Monitoring Programme		x	x	x	x	
UK + IE	Resightings of colour-marked geese /swans		x		x		
UK + IE	Beached Bird Surveys (multiple schemes)		x		x		
UK + IE	Seabird Watch*	x			x		
UK + IE	Roof-nesting Gull Survey (Dublin City Gull)	x			x		
UK + IE	Seawatch surveys (multiple schemes)			x	x		
UK + IE	Mapping winter distribution of seabirds		x		x		
UK + IE	Ferry Survey Programme	x			x		
UK+ IE	Project Puffin	x					x

Country	Name of Citizen Science project	Time of year			Frequency		
		Breeding	Wintering	Passage/migration	Annual	Periodic	One off/Just started
UK+ IE	Calmap ferry project	x			x		
BE	Beached Bird Surveys		x		x		
BE	Seabirds at Sea	x	x	x	x		
BE	Seaduck counts		x		x		
BE	Colour-ringed gulls				x		
BE	Wintering waterbirds				x		
BE	Breeding bird atlas					x	
BE	International Waterbird Census		x		x		
NL	Broedvogelmeetnet [1]	x			x		
NL	Meetnet Reproductie Waddenzee [2]	x			x		
NL	Meetnet Nestkaarten [3]	x			x		
NL	Watervogelmeetnet [4]		x	x	x		
NL	Punt Transect Tellingen (PTT) [5]		x		x		
NL	Trektellen.org*			x	x		
NL	Ringing scheme	x	x	x	x		
NL	Oog voor het Wad[6]	x	x	x	x		
NL	Monitoring Seabirds-at-Sea		x	x	x		
NL	Wadertrack (Oystercatcher)	x			x		
NL	waarneming.nl	x	x	x	x		
NL	Beached Bird Surveys		x		x		
NL	Surveillance of bird health	x	x	x	x		
DE	Monitoring colonial birds and rare species	x			x		

Country	Name of Citizen Science project	Time of year			Frequency		
		Breeding	Wintering	Passage/migration	Annual	Periodic	One off/Just started
DE	Monitoring common breeding birds Wadden Sea	x			x		
DE	National monitoring common breeding birds	x			x		
DE	Monitoring (wintering) waterbirds, goose/swans		x	x	x		
DE	Beached Bird Surveys		x	x		x	
DE	Monitoring breeding success	x			x		
DE	ornitho.de (~BirdTrack)	x	x	x	x		
DE	Ringing schemes	x	x	x	x		
DE	no name (breeding bird surveys Baltic Sea coast)	x			x		
NO	Winter counts of marine birds		x		x		
NO	City gulls	x					x
NO	Beached Bird Surveys		x		x		
NO	Artsobservasjoner (The species gateway)	x	x	x	x		
SE	September counts			x	x		
SE	International Waterbirds Census		x		x		
SE	Monitoring of breeding coastal birds	x			x		
PL	Monitoring Pospolitych Ptaków Lęgowych[7]	x			x		
PL	Monitoring Zimujących Ptaków Wodnych[8]		x		x		
PL	ornitho.pl	x	x	x	x		
LT	Spring migration (first arrival) phenology			x	x		
LT	Breeding bird atlas	x				x	
LT	Mid-winter counts		x		x		
LT	Observations of rare birds	x	x	x	x		

Country	Name of Citizen Science project	Time of year			Frequency		
		Breeding	Wintering	Passage/migration	Annual	Periodic	One off/Just started
LV	dabasdati.lv	x	x	x	x		
LV	Beached birds	x	x	x	x		
LV	Breeding bird atlas	x	x	x		x	
LV	Arrival of spring migrants			x	x		
LV	International Waterbird Census		x		x		
EE	International Waterbird Census		x		x		
EE	Breeding Bird Atlas	x					x
EE	Phenology Project			x	x		
EE	Bird of the year (swans)	x	x	x			x
EE	Swan and Geese Monitoring			x		x	
EE	Estonian Ringing Scheme	x	x	x	x		

[1] TMAP breeding birds; [2] TMAP breeding success, [3]Nest Record Scheme, [4] TMAP migratory birds, [5] Point-transect counts terrestrial wintering birds; [6] monitoring of disturbance in the Wadden Sea; [7]Common Bird Survey ; [8]Wintering Waterbird Survey

*** schemes which operate outside the country of origin**

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Table 3. Data collection methods covered by marine bird citizen science schemes operating in the OSPAR and HELCOM region.

Country	Name of Citizen Science project	Data type		Data Entry Method				
		Systematic (defined methods/effort)	Unstructured	Online database	App	Offline database	Paper	Other (e.g. photos, records of colour rings)
UK + IE	Seabird Monitoring Programme (SMP)	x		x			x	
UK + IE	Seabird Census	x		x			x	
UK + IE	Wetland Bird Survey (WeBs/I-WeBS)	x		x			x	
UK + IE	Non-Estuarine Waterbird Survey (NEWS)	x		x			x	
UK + IE	Nest Record Scheme		x	x		x	x	
UK + IE	Ringing scheme	x	x	x		x	x	
UK + IE	Ringing Adult for Survival (RAS)	x		x		x		
UK + IE	Winter Gull Roost Survey (WinGS)	x		x			x	
UK + IE	BirdTrack		x	x	x			
UK + IE	Bird Atlases	x	x	x			x	
UK + IE	Waterways Breeding Bird Surveys (WBBS)	x		x			x	
UK + IE	Breeding Bird Survey	x		x			x	
UK + IE	Goose and Swan Monitoring Programme	x		x		x	x	x
UK + IE	Resightings of colour-marked geese /swans	x				x		x
UK + IE	Beached Bird Surveys (multiple schemes)	x				x	x	
UK + IE	Seabird Watch*	X		x				
UK + IE	Roof-nesting Gull Survey (Dublin City Gull)		x			x		
UK + IE	Seawatch surveys (multiple schemes)	x	x			x	x	
UK + IE	Mapping winter distribution of seabirds		x					x
UK + IE	Ferry Survey Programme	x					x	

Country	Name of Citizen Science project	Data type		Data Entry Method				
		Systematic (defined methods/effort)	Unstructured	Online database	App	Offline database	Paper	Other (e.g. photos, records of colour rings)
UK+ IE	Project Puffin		x					x
UK+ IE	Calmap ferry project	x					x	
BE	Beached Bird Surveys	x			x	x	x	x
BE	Seabirds at Sea	x				x	x	
BE	Seaduck counts	x				x	x	
BE	Colour-ringed gulls			x		x		
BE	Wintering waterbirds	x		x				
BE	Breeding bird atlas	x				x	x	
BE	International Waterbird Census	x		x	x	x	x	
NL	Broedvogelmeetnet [1]	x		x	x			
NL	Meetnet Reproductie Waddenzee [2]	x		x		x		
NL	Meetnet Nestkaarten [3]	x		x			x	
NL	Watervogelmeetnet [4]	x		x	x			
NL	Punt Transect Tellingen (PTT) [5]	x		x	x			
NL	Trektellen.org*		x	x	x			
NL	Ringing scheme	x	x	x		x	x	
NL	Oog voor het Wad[6]	x		x	x			
NL	Monitoring Seabirds-at-Sea	x				x		
NL	Wadertrack (Oystercatcher)	x		x		x		
NL	waarneming.nl		x	x	x			
NL	Beached Bird Surveys	x					x	
NL	Surveillance of bird health		x	x				

Country	Name of Citizen Science project	Data type		Data Entry Method				
		Systematic (defined methods/effort)	Unstructured	Online database	App	Offline database	Paper	Other (e.g. photos, records of colour rings)
DE	Monitoring colonial birds and rare species	x				x	x	
DE	Monitoring common breeding birds Wadden Sea	x				x	x	
DE	National monitoring common breeding birds	x					x	
DE	Monitoring (wintering) waterbirds, goose/swans	x				x	x	
DE	Beached Bird Surveys	x			x	x	x	
DE	Monitoring breeding success	x				x	x	
DE	ornitho.de (~BirdTrack)		x	x	x			
DE	Ringing schemes	x				x		x
DE	no name (breeding bird surveys Baltic Sea coast)	x				x	x	
NO	Winter counts of marine birds	x				x	x	
NO	City gulls	x		x				
NO	Beached Bird Surveys	x				x	x	
NO	Artsobservasjoner (The species gateway)	x		x	x			
SE	September counts	x				x		
SE	International Waterbird Census	x				x		
SE	Monitoring of breeding coastal birds	x				x		
PL	Monitoring Pospolitych Ptaków Lęgowych [7]	x		x	x			
PL	Monitoring Zimujących Ptaków Wodnych [8]	x		x	x			
PL	ornitho.pl		x	x	x			
LT	Spring migration (first arrival) phenology		x				x	
LT	Breeding bird atlas	x		x	x			
LT	Mid-winter counts	x					x	

Country	Name of Citizen Science project	Data type		Data Entry Method				
		Systematic (defined methods/effort)	Unstructured	Online database	App	Offline database	Paper	Other (e.g. photos, records of colour rings)
LT	Observations of rare birds		x	x				
LV	dabasdati.lv		x	x	x			x
LV	Beached birds	x					x	
LV	Breeding bird atlas	x		x	x			
LV	Arrival of spring migrants	x				?	?	
LV	International Waterbird Census	x		x	x	x		
EE	International Waterbird Census	x		x			x	
EE	Breeding Bird Atlas		x			x	x	
EE	Phenology Project	x		x		x	x	
EE	Bird of the year (swans)		x	x		x	x	
EE	Swan and Geese Monitoring	x		x		x	x	
EE	Estonian Ringing Scheme		x			x		

[1] TMAP breeding birds; [2] TMAP breeding success, [3]Nest Record Scheme, [4] TMAP migratory birds, [5] Point-transect counts terrestrial wintering birds; [6] monitoring of disturbance in the Wadden Sea; [7]Common Bird Survey ; [8]Wintering Waterbird Survey

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Table 4. Financial support for volunteers and sources of funding for citizen science projects for marine bird citizen science schemes operating in the OSPAR and HELCOM region. Use of parenthesis under incentives indicates restricted funding in that not all participants will quality.

Country	Name of Citizen Science project	Incentives			Who funds scheme (operational costs)				Staff time (operation/logistics)		
		Mileage	Boat /ferries	Other incentives	Government	Nature Conservation Agencies	Non Government Organisations	Other	Nature Conservation Agencies	Non Government Organisations	Other
UK + IE	Seabird Monitoring Programme (SMP)	(x)	(x)		x	x			x	x	
UK + IE	Seabird Census				x	x	x	x	x	x	
UK + IE	Wetland Bird Survey (WeBs/I-WeBS)				x		x		x	x	
UK + IE	Non-Estuarine Waterbird Survey (NEWS)				x	x	x			x	
UK + IE	Nest Record Scheme				x	x	x			x	
UK + IE	Ringing scheme				x	x	x			x	
UK + IE	Ringing Adult for Survival (RAS)				x	x	x			x	
UK + IE	Winter Gull Roost Survey (WinGS)				x	x	x			x	
UK + IE	BirdTrack						x	x		x	
UK + IE	Bird Atlases						x	x	x	x	
UK + IE	Waterways Breeding Bird Surveys (WBBS)				x	x	x		x	x	
UK + IE	Breeding Bird Survey				x	x	x		x	x	
UK + IE	Goose and Swan Monitoring Programme				x	x	x		x	x	
UK + IE	Resightings of colour-marked geese /swans						x			x	
UK + IE	Beached Bird Surveys (multiple schemes)	x					x			x	

Country	Name of Citizen Science project	Incentives			Who funds scheme (operational costs)				Staff time (operation/logistics)		
		Mileage	Boat /ferries	Other incentives	Government	Nature Conservation Agencies	Non Government Organisations	Other	Nature Conservation Agencies	Non Government Organisations	Other
UK + IE	Seabird Watch*							x			x
UK + IE	Roof-nesting Gull Survey (Dublin City Gull)							x		x	x
UK + IE	Seawatch surveys (multiple schemes)							x		x	x
UK + IE	Mapping winter distribution of seabirds				x				x		
UK + IE	Ferry Survey Programme						x				x
UK+ IE	Project Puffin						x			x	
UK+ IE	Calmap ferry project				x				x	x	
BE	Beached Bird Surveys			x	x						x
BE	Seabirds at Sea			x	x						x
BE	Seaduck counts				x						x
BE	Colour-ringed gulls			x	x						x
BE	Wintering waterbirds				x				x		x
BE	Breeding bird atlas			x	x	x			x	x	x
BE	International Waterbird Census	x		x		x	x		x		
NL	Broedvogelmeetnet [1]		(x)		x				x	x	
NL	Meetnet Reproductie Waddenzee [2]				x				x	x	x
NL	Meetnet Nestkaarten [3]				x					x	

Country	Name of Citizen Science project	Incentives			Who funds scheme (operational costs)				Staff time (operation/logistics)		
		Mileage	Boat /ferries	Other incentives	Government	Nature Conservation Agencies	Non Government Organisations	Other	Nature Conservation Agencies	Non Government Organisations	Other
NL	Watervogelmeetnet [4]	(x)	(x)		x				x	x	
NL	Punt Transect Tellingen (PTT) [5]						x				
NL	Trektellen.org*						x			x	
NL	Ringing scheme				x			x			x
NL	Oog voor het Wad[6]					x			x	x	
NL	Monitoring Seabirds-at-Sea				x						x
NL	Wadertrack (Oystercatcher)							x		x	x
NL	waarneming.nl				x			x			
NL	Beached Bird Surveys				x						x
NL	Surveillance of bird health				x					x	
DE	Monitoring colonial birds and rare species					x			x	x	
DE	Monitoring common breeding birds Wadden Sea					x			x	x	
DE	National monitoring common breeding birds	x			x					x	
DE	Monitoring (wintering) waterbirds, goose/swans				x				x	x	
DE	Beached Bird Surveys			x	x	x	x		x	x	
DE	Monitoring breeding success					x			x	x	
DE	ornitho.de (~BirdTrack)						x			x	

Country	Name of Citizen Science project	Incentives			Who funds scheme (operational costs)				Staff time (operation/logistics)		
		Mileage	Boat /ferries	Other incentives	Government	Nature Conservation Agencies	Non Government Organisations	Other	Nature Conservation Agencies	Non Government Organisations	Other
DE	Ringing schemes				x						x
DE	no name (breeding bird surveys Baltic Sea coast)				x	x			x		x
NO	Winter counts of marine birds	x		x	x					x	
NO	City gulls				x					x	
NO	Beached Bird Surveys	x		x	x					x	
NO	Artsobservasjoner (The species gateway)				x				x		
SE	September counts										
SE	International Waterbird Census	(x)			x						x
SE	Monitoring of breeding coastal birds	x	x		x						x
PL	Monitoring Pospolitych Ptaków Lęgowych [7]	x			x					x	
PL	Monitoring Zimujących Ptaków Wodnych [8]	x			x					x	
PL	ornitho.pl						x			x	
LT	Spring migration (first arrival) phenology									x	
LT	Breeding bird atlas			x			x			x	
LT	Mid-winter counts									x	
LT	Observations of rare birds										
LV	dabasdati.lv						x			x	

Country	Name of Citizen Science project	Incentives			Who funds scheme (operational costs)				Staff time (operation/logistics)		
		Mileage	Boat /ferries	Other incentives	Government	Nature Conservation Agencies	Non Government Organisations	Other	Nature Conservation Agencies	Non Government Organisations	Other
LV	Beached birds										
LV	Breeding bird atlas	x		x		x	x		x		
LV	Arrival of spring migrants										
LV	International Waterbird Census	x				x				x	
EE	International Waterbird Census	x				x				x	
EE	Breeding Bird Atlas					x				x	
EE	Phenology Project					x				x	
EE	Bird of the year (swans)					x				x	
EE	Swan and Geese Monitoring					x					x
EE	Estonian Ringing Scheme					x			x		

[1] TMAP breeding birds; [2] TMAP breeding success, [3]Nest Record Scheme, [4] TMAP migratory birds, [5] Point-transect counts terrestrial wintering birds; [6] monitoring of disturbance in the Wadden Sea; [7]Common Bird Survey ; [8]Wintering Waterbird Survey

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Table 5. Parameters collected by marine bird citizen science schemes operating in the OSPAR and HELCOM region

Country	Name of citizen science project	Parameters collected										
		Abundance (breeding)	Abundance (wintering)	Abundance (birds at sea)	Abundance (dead birds)	Abundance (passage)	Productivity	Survival	Movement	Diet	Phenology	Distribution
UK + IE	Seabird Monitoring Programme (SMP)	x					x					
UK + IE	Seabird Census	x										x
UK + IE	Wetland Bird Survey (WeBs/I-WeBS)	x	x			x						
UK + IE	Non-Estuarine Waterbird Survey (NEWS)		x									
UK + IE	Nest Record Scheme						x				x	
UK + IE	Ringing scheme							x	x			
UK + IE	Ringing Adult for Survival (RAS)							x				
UK + IE	Winter Gull Roost Survey (WinGS)		x									
UK + IE	BirdTrack	x	x	x	x	x					x	
UK + IE	Bird Atlases	x	x									
UK + IE	Waterways Breeding Bird Surveys (WBBS)	x										
UK + IE	Breeding Bird Survey	x										
UK + IE	Goose and Swan Monitoring Programme		x				x				x	x
UK + IE	Resightings of colour-marked geese /swans							x	x			
UK + IE	Beached Bird Surveys (multiple schemes)				x							
UK + IE	Seabird Watch*						x				x	
UK + IE	Roof-nesting Gull Survey (Dublin City Gull)	x										
UK + IE	Seawatch surveys (multiple schemes)			x		x						
UK + IE	Mapping winter distribution of seabirds			x		x						
UK + IE	Ferry Survey Programme									x		
UK+ IE	Project Puffin			x								
BE	Beached Bird Surveys				x					x		

Country	Name of citizen science project	Parameters collected										
		Abundance (breeding)	Abundance (wintering)	Abundance (birds at sea)	Abundance (dead birds)	Abundance (passage)	Productivity	Survival	Movement	Diet	Phenology	Distribution
BE	Seabirds at Sea			x								x
BE	Seaduck counts											
BE	Colour-ringed gulls						x	x	x		x	
BE	Wintering waterbirds		x								x	x
BE	Breeding bird atlas	x										x
BE	International Waterbird Census		x									
NL	Broedvogelmeetnet [1]	x										x
NL	Meetnet Reproductie Waddenzee [2]						x	x				
NL	Meetnet Nestkaarten [3]						x					
NL	Watervogelmeetnet [4]		x			x	x				x	x
NL	Punt Transect Tellingen (PTT) [5]		x									x
NL	Trektellen.org*					x					x	
NL	Ringing scheme							x	x			
NL	Oog voor het Wad[6]											
NL	Monitoring Seabirds-at-Sea			x								x
NL	Wadertrack (Oystercatcher)						x	x	x			
NL	waarneming.nl	x	x			x					x	
NL	Beached Bird Surveys				x					x		
NL	Surveillance of bird health				x							
DE	Monitoring colonial birds and rare species	x										
DE	Monitoring common breeding birds Wadden Sea	x										
DE	National monitoring common breeding birds	x										
DE	Monitoring (wintering) waterbirds, goose/swans		x			x						

Country	Name of citizen science project	Parameters collected										
		Abundance (breeding)	Abundance (wintering)	Abundance (birds at sea)	Abundance (dead birds)	Abundance (passage)	Productivity	Survival	Movement	Diet	Phenology	Distribution
DE	Beached Bird Surveys				x							
DE	Monitoring breeding success						x					
DE	ornitho.de (~BirdTrack)	x	x			x	x				x	
DE	Ringing schemes				x		x	x	x			
DE	no name (breeding bird surveys Baltic Sea coast)	x										
NO	Winter counts of marine birds		x									x
NO	City gulls	x					x					
NO	Beached Bird Surveys				x							
NO	Artsobservasjoner (The species gateway)	x	x			x					x	x
SE	September counts					x						x
SE	International Waterbird Census		x									x
SE	Monitoring of breeding coastal birds	x										
PL	Monitoring Pospolitych Ptaków Lęgowych [7]	x										
PL	Monitoring Zimujących Ptaków Wodnych [8]		x	x								
PL	ornitho.pl	x	x	x		x					x	
LT	Spring migration (first arrival) phenology										x	
LT	Breeding bird atlas	x										
LT	Mid-winter counts		x									
LT	Observations of rare birds	x	x	x		x						
LV	dabasdati.lv	x	x		x	x						x
LV	Beached birds				x							
LV	Breeding bird atlas	x										x
LV	Arrival of spring migrants										x	

Country	Name of citizen science project	Parameters collected										
		Abundance (breeding)	Abundance (wintering)	Abundance (birds at sea)	Abundance (dead birds)	Abundance (passage)	Productivity	Survival	Movement	Diet	Phenology	Distribution
LV	International Waterbird Census		X									
EE	International Waterbird Census		x									
EE	Breeding Bird Atlas	x										
EE	Phenology Project										x	
EE	Bird of the year (swans)	x	x			x			x		x	
EE	Swan and Geese Monitoring	x	x			x			x		x	
EE	Estonian Ringing Scheme											

[1] TMAP breeding birds; [2] TMAP breeding success, [3]Nest Record Scheme, [4] TMAP migratory birds, [5] Point-transect counts terrestrial wintering birds; [6] monitoring of disturbance in the Wadden Sea; [7]Common Bird Survey ; [8]Wintering Waterbird Survey

*** schemes which operate outside the country of origin**

COUNTRY (listed from west to east) UK = United Kingdom, IE = Ireland, BE = Belgium, NL = the Netherlands, DE= Germany, NO=Norway, SE = Sweden, PL= Poland, LT = Lithuania, LV= Latvia, EE = Estonia

Table 6. How the different marine bird citizen science schemes operating in the OSPAR and HELCOM region feed into reporting

Country	Name of Citizen Science project	Reporting								
		Birds Directive– Article 12	Red listing (e.g. BOCC)	MSFD	AEWA	ICES	OSPAR	Helcom	CAFF	Living Planet
UK + IE	Seabird Monitoring Programme (SMP)	x	x	x		x	x			
UK + IE	Seabird Census	x	x	x		x	x			
UK + IE	Wetland Bird Survey (WeBs/I-WeBS)	x	x	x						
UK + IE	Non-Estuarine Waterbird Survey (NEWS)	x	x	x						
UK + IE	Nest Record Scheme									
UK + IE	Ringing scheme									
UK + IE	Ringing Adult for Survival (RAS)									
UK + IE	Winter Gull Roost Survey (WinGS)									
UK + IE	BirdTrack									
UK + IE	Bird Atlases	x	x			x?	x?			
UK + IE	Waterways Breeding Bird Surveys (WBBS)	x	x							
UK + IE	Breeding Bird Survey	x	x							
UK + IE	Goose and Swan Monitoring Programme	x	x		x					
UK + IE	Resightings of colour-marked geese /swans									
UK + IE	Beached Bird Surveys (multiple schemes)									
UK + IE	Seabird Watch*									
UK + IE	Roof-nesting Gull Survey (Dublin City Gull)									
UK + IE	Seawatch surveys (multiple schemes)									
UK + IE	Mapping winter distribution of seabirds						x?			
UK + IE	Ferry Survey Programme									
UK+ IE	Project Puffin									
UK+ IE	Calmap ferry project									

Country	Name of Citizen Science project	Reporting								
		Birds Directive– Article 12	Red listing (e.g. BOCC)	MSFD	AEWA	ICES	OSPAR	Helcom	CAFF	Living Planet
BE	Beached Bird Surveys			x			x			
BE	Seabirds at Sea	x		x						
BE	Seaduck counts	x		x	x					
BE	Colour-ringed gulls									
BE	Wintering waterbirds	x			x		x			
BE	Breeding bird atlas	x	x							
BE	International Waterbird Census	x		x		x		x	x	
NL	Broedvogelmeetnet [1]	x	x	x		x				x
NL	Meetnet Reproductie Waddenzee [2]			x		x				
NL	Meetnet Nestkaarten [3]			x		x				
NL	Watervogelmeetnet [4]	x	x	x	x	x		x	x	x
NL	Punt Transect Tellingen (PTT) [5]	x	x							
NL	Trektellen.org*	x								
NL	Ringing scheme									
NL	Oog voor het Wad[6]									
NL	Monitoring Seabirds-at-Sea									
NL	Wadertrack (Oystercatcher)									
NL	waarneming.nl									
NL	Beached Bird Surveys					x?				
NL	Surveillance of bird health									
DE	Monitoring colonial birds and rare species	x	x	x	x					
DE	Monitoring common breeding birds Wadden Sea	x	x	x	x					
DE	National monitoring common breeding birds	x	x							
DE	Monitoring (wintering) waterbirds, goose/swans	x	x	x	x					

Country	Name of Citizen Science project	Reporting								
		Birds Directive–Article 12	Red listing (e.g. BOCC)	MSFD	AEWA	ICES	OSPAR	Helcom	CAFF	Living Planet
DE	Beached Bird Surveys				x					
DE	Monitoring breeding success									
DE	ornitho.de (~BirdTrack)									
DE	Ringing schemes									
DE	no name (breeding bird surveys Baltic Sea coast)	x	x	x		x	x			
NO	Winter counts of marine birds						x		x	
NO	City gulls									
NO	Beached Bird Surveys						x			
NO	Artsobservasjoner (The species gateway)									
SE	September counts				x					
SE	International Waterbirds Census			x	x		x	x		
SE	Monitoring of breeding coastal birds			x			x	x		
PL	Monitoring Pospolitych Ptaków Lęgowych [7]	x								
PL	Monitoring Zimujących Ptaków Wodnych [8]	x		x						
PL	ornitho.pl									
LT	Spring migration (first arrival) phenology									
LT	Breeding bird atlas	x								
LT	Mid-winter counts	x			x					
LT	Observations of rare birds	x								
LV	dabasdati.lv									
LV	Beached birds									
LV	Breeding bird atlas	x								
LV	Arrival of spring migrants									
LV	International Waterbird Census	x		x	x			x		

Country	Name of Citizen Science project	Reporting								
		Birds Directive– Article 12	Red listing (e.g. BOCC)	MSFD	AEWA	ICES	OSPAR	Helcom	CAFF	Living Planet
EE	International Waterbird Census			x	x		x			
EE	Breeding Bird Atlas			x						
EE	Phenology Project									
EE	Bird of the year (swans)				x					
EE	Swan and Geese Monitoring				x					
EE	Estonian Ringing Scheme									

[1] TMAP breeding birds; [2] TMAP breeding success, [3]Nest Record Scheme, [4] TMAP migratory birds, [5] Point-transect counts terrestrial wintering birds; [6] monitoring of disturbance in the Wadden Sea; [7]Common Bird Survey ; [8]Wintering Waterbird Survey

*** schemes which operate outside the country of origin**

COUNTRY (listed from west to east) UK = United Kingdom, IE = Ireland, BE = Belgium, NL = the Netherlands, DE= Germany, NO=Norway, SE = Sweden, PL= Poland, LT = Lithuania, LV= Latvia, EE = Estonia

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10 Ad hoc advice – Link between OSPAR Bird indicators and the revised MSFD Commission Decision (2017)

10.1 Background

This Term of Reference was added during JWGBIRD's annual meeting in order to respond to an ad hoc request for advice from OSPAR's Intersessional Correspondence Group on the Marine Strategy Framework Directive (ICG-MSFD). ICG-MSFD has posed some questions to ICG-COBAM (Coordination of Biodiversity Assessment and Monitoring) on how to develop the OSPAR work on regionally coherent and coordinated determinations of Good Environmental Status (GES) (ICG-MSFD(2) 17/8/1, Annex 5). These questions are in response to a paper present by ICG-COBAM to ICG-MSFD (ICG-MSFD (2) 17/5/1). The paper looked at the correspondence between the OSPAR indicators and the new GES Criteria in the revised Commission Decision on GES (2017/848) under the Marine Strategy Framework Directive (MSFD) (see Table 1 for a summary).

At the request of the OSPAR co-chair of JWGBIRD, the group agreed to provide answers to questions posed by ICG-MSFD that are relevant to marine bird assessments. The responses below will be presented to a joint meeting of ICG-COBAM and ICG-MSFD to be held on 7-8th December 2017.

Table 1: Comparison between GES Criteria in the 2010 Commission Decision and the revised Commission Decision in 2017 (2017/848) and the corresponding OSPAR indicators

2010 Criteria	Revised Criteria – 2017	Corresponding OSPAR indicators
	*D1C1 Incidental bycatch rates (Primary)	B5 – Marine bird bycatch (candidate)
1.2 Population size	*D1C2 Population abundance (Primary)	B1 – Marine bird abundance (common indicator)
1.3 Population Condition	D1C3 Population demographics (secondary)	B3 – Breeding success status of marine birds (common indicator) B2 Breeding success of kittiwake (candidate)
1.1 Species Distribution	D1C4 Species distributional range and pattern (secondary)	B6 – Marine bird distribution (candidate)
	D1C5 Habitat for the species (secondary)	B4 – Non-native/invasive mammal presence on island seabird colonies (candidate)

10.2 Summary response to questions from ICG-MSFD

Below we have listed the questions posed by ICG-MSFD and have provided a summary response, with a more detailed justification in the subsequent section.

1) ICG-COBAM is invited to elaborate which MSFD secondary criteria it sees as most important and why.

D1C3 Population demographics, specifically indicators of marine bird breeding success, as used in the IA2017. This is because breeding success or productivity can be a valuable indicator of population health and can provide an early warning of changes in the environment.

2) ICG-COBAM is invited to provide options for addressing the main gaps and mismatches it has identified between OSPAR work and the regional requirements of Commission Decision on GES (2017/848/EU) and to set out the resources (e.g. funding, expertise, time-scales) and arrangements for each of the options, to the extent possible.

There are two main gaps:

a) Assessments of marine bird bycatch under the primary criterion **DC1C1** - incidental bycatch rates, are currently not possible in the OSPAR Area. A candidate indicator on seabird bycatch has been proposed because mortality from bycatch is likely to be problem for many bird species. However, it has not been possible to develop the indicator further because there are insufficient data on seabird bycatch. Data on seabird bycatch are lacking because there is no systematic monitoring of seabird bycatch in the OSPAR Area.

b) The revised Commission Decision requires species-specific assessments to be carried out based on each GES criterion. Methods for integrating the results of each criterion for each species need to be developed. This is not straightforward, because not all species are assessed using the same criteria. Integration will be possible but careful consideration needs to be given to the methods used in order to avoid any bias in species status assessments.

3) ICG-COBAM is invited to consider risk from anthropogenic pressures (to species, species groups and habitats) and which species are particularly endangered in order to help prioritise what further work is needed in relation to the different criteria

In order to develop assessments under criteria **D1C1** – bycatch and **D1C4** – distribution, JWGBIRD will apply a risk-based approach to identify those species that should be assessed under each criterion.

4) ICG-COBAM is invited to consider how to use the assessment methods from the Birds Directives for birds and mammals in MSFD assessments.

The Birds Directive does not require Member States to assess the status of individual species or to assess population size or distribution against baselines, targets or thresholds. Hence, there are no Birds Directive assessment methods as such that could be used to assess equivalent GES criteria under MSFD (i.e. **D1C2** population size and **D1C4** distribution). The EC performs a post hoc analysis of Birds Directive national reports to assess progress toward EU targets under the Convention on Biodiversity.

The Birds Directive reporting and the MSFD bird assessments can certainly make use of the same data on population size and distribution, collected by the same monitoring schemes.

10.3 Detailed response to questions from ICG-MSFD

10.3.1 Secondary Criteria

ICG-COBAM is invited to elaborate which MSFD secondary criteria it sees as most important and why.

JWGBIRD considers the most important secondary criteria in the assessment of birds to be **D1C3** Population demographics. **D1C3** was assessed in the OSPAR Intermediate Assessment 2017 using an indicator of marine bird breeding success/failure. The indicator currently describes changes in breeding failure rates in seabird colonies throughout the North-East Atlantic. Breeding failure is the extreme event of almost no chicks being produced by a seabird colony in a single breeding season. In its 2017 report, JWGBIRD proposes an alternative method for assessing levels of productivity (i.e. number of fledged young per nesting pair) that are required to sustain or support growth in the population.

As long-lived species with delayed maturity, changes in the productivity of seabirds and waterbirds are expected to reflect changes in environmental conditions long before these are evident as changes in population size. Breeding success or failure in marine birds can be a valuable indicator of population health, especially in areas where commercial fisheries and seabirds target the same prey. Therefore, results of assessments of **D1C3** should be viewed as an early warning of changes in the environment.

There is also a candidate indicator of **D1C3** – kittiwake breeding success, which has been adopted only by the UK in the Greater North Sea, but not by other CPs because of lack of data elsewhere in the North Sea. The kittiwake indicator takes into account prevailing climatic conditions and aims to indicate negative impacts from factors other than climate. The UK's preliminary assessment of kittiwake breeding success has demonstrated impacts of sandeel fishing in the past and has indicated that closures to sandeel fishing in UK waters appear to have been successful.

JWGBIRD are uncertain about whether the assessment of **D1C4** on distributional range and pattern will add value to existing assessments of **D1C2 and D1C3**. The group plans, in the future to review assessments of marine bird distribution on land that have been carried out by the UK as part of MSFD Art. 8 reporting in 2018, and at sea, which was developed by HELCOM (2012) and tested by Germany in the course of MSFD reporting. Indicators of marine bird distribution are only suitable for certain species of marine and coastal birds, for which changes in distributional pattern can be accurately measured and are likely to provide an indication of anthropogenic impacts. For example, changes in the distribution of overwintering or migrating waders and waterfowl that rely on intertidal areas for foraging, could reflect impacts of habitat loss caused by coastal developments and flood defences. Likewise, changes in the coastal breeding distribution of waders, waterfowl, terns, gulls and cormorants may also reflect impacts of habitat loss or of the introduction of non-native and native predatory mammals to bird colonies on islands. Changes in the distribution of inshore and offshore aggregations of seaducks, divers, alcids and possibly grebes could reflect impacts from renewable energy developments, dredging and shipping. However, measuring the at-sea distribution of birds is dependent on effective monitoring programmes and these are currently restricted to certain parts of North Sea only (see JWGBIRD Report 2016 for more details).

Conversely, criterion **D1C4** is unlikely to be appropriate for assessing cliff-nesting species of seabird (e.g. guillemot, razorbill, kittiwake, fulmar), because changes in the distribution of large cliff-nesting seabird colonies do not provide useful indicators of anthropogenic impacts. This is because the distribution of these colonies is largely determined by the distribution of suitable sea cliffs. Impacts on seabirds at large cliff-colonies, for example from fishing on the birds' food supply, are more likely to be detected by abundance indicators long before any changes in distribution would become evident.

JWGBIRD consider it unlikely that assessments of **D1C5** - Habitat for the species will add any value to the assessments of marine birds. It is likely that changes in species abundance (**D1C2**) and in species distribution (**D1C4**) will reflect impacts on the extent of habitat available. Furthermore, measuring the extent of habitats available for marine birds will be extremely difficult because they are wide-ranging, use a wide range of habitats, and some species migrate outside Europe's seas. Also, habitat quality is very important and this includes features such as food abundance and availability and nest site availability. However, an existing OSPAR candidate indicator B4 – Non-native/invasive mammal presence on island seabird colonies, could be used to highlight the impact of invasive predatory mammals on the availability of safe, predator-free nesting habitat for ground-nesting species. Indicator B4 has not been developed much by JWGBIRD, but a version of it is currently being assessed by the UK as part of their national reporting under Art 8 of the MSFD in 2018. The UK are using the indicator to assess the effectiveness of existing biosecurity measures in minimising the risk from invasive predatory mammals on seabirds breeding on islands in Special Protection Areas.

10.3.2 Gaps

ICG-COBAM is invited to provide options for addressing the main gaps and mismatches it has identified between OSPAR work and the regional requirements of Commission Decision on GES (2017/848/EU) and to set out the resources (e.g. funding, expertise, time-scales) and arrangements for each of the options, to the extent possible.

The main gap in the current OSPAR marine bird assessments is on bycatch under **D1C1**. Previous reviews by JWGBIRD and its predecessors (e.g. ICES 2017) have identified that bycatch mortality is an ongoing problem for many seabird species that are at risk of being caught in fishing gear, particularly in gillnets and on longlines. An OSPAR candidate indicator on seabird bycatch does exist but no development of this indicator has been possible because there are insufficient data available with which to construct the indicator. Data on seabird bycatch are lacking because there is no systematic monitoring of seabird bycatch in the OSPAR area. Some ad hoc records of seabird bycatch are reported, for example as part of monitoring cetacean bycatch under EU regulations. These ad hoc records are collated by the ICES Working Group on Bycatch of Protected Species WGBYC (e.g. ICES 2016). However, these data are insufficient to allow estimation of mortality rates due to bycatch across geographical areas and/or fishing fleets.

To reduce the number of seabirds incidentally caught, the European Union adopted an 'Action Plan for reducing incidental catches of seabirds in fishing gears' (COM(2012)665final) in 2012. Recently, JWGBIRD reviewed the implementation of this Action Plan in the EU Member States, including additional information from non-EU countries (ICES 2017). JWGBIRD recommended that systematic monitoring of bycatch (including Remote Electronic Monitoring) and fishing effort (e.g. adapting VMS-tracking technology to small vessels) are first needed to provide the data necessary for assessing **D1C1**. JWGBIRD has established a collaboration with the ICES Working Group on Bycatch of Protected Species, in order to provide advice on seabird bycatch monitoring and assessment in the future.

The revised MSFD Commission Decision states that *"The status of each species shall be assessed individually, on the basis of the criteria selected for use"*. In the IA2017, the number of indicators that were assessed per species was 1–3, including non-breeding abundance, breeding abundance and breeding success/failure. In the North Sea, only five species were assessed on all three indicators, 24 species by two indicators – and 42 species has only one indicator (either non-breeding abundance or breeding abundance). This presents a problem when assessing the status of each species, particularly if a simple conditional rule is applied within a species. For instance, if a 'one out-all out' rule were applied, the species is considered to be in poor status if one or more indicators has not achieved the required thresholds. The laws of probability entail that the likelihood of a species not achieving good status will increase as more indicators are assessed. Hence, well-studied species are more likely to be assessed as in poor status than species assessed by a single indicator, all else being equal. It is therefore imperative that appropriate integration methods are applied within species, otherwise bias will be introduced into the assessments.

10.3.3 Species at risk and assessment priorities

ICG-COBAM is invited to consider risk from anthropogenic pressures (to species, species groups and habitats) and which species are particularly endangered, in order to help prioritise what further work is needed in relation to the different criteria

JWGBIRD has previously recommended (ICES 2017) that seabird bycatch monitoring could be based on risk assessments that identify areas of over-lap of high fishing effort and high densities of vulnerable seabirds. Such an exercise has just been completed for UK waters (Defra, in press) and is available for the German section of the Baltic Sea (Sonntag *et al*. 2012).

As mentioned above, risk of impacts from breeding habitat loss should be used to prioritise which species could be assessed under criterion **D1C4** – distributional range and pattern.

10.3.4 Relationship between the Birds Directive requirements and MSFD

ICG-COBAM is invited to consider how to use the assessment methods from the Habitats and Birds Directives for birds and mammals in MSFD assessments.

There is no requirement under the Birds Directive for member states to assess if favourable conservation status (FCS) has been achieved for individual species, as is required under the Habitats Directive. There is also no requirement under the Birds Directive for any formal "assessment" against targets or thresholds. However, a post hoc analysis of Member States' 2012 Birds Directive Article 12 reports was conducted by the European Environment Agency (EEA), on behalf of the Commission to measure progress towards the EU's 2020 target for birds under the Convention on Biodiversity: *"By 2020, 50% more species assessed under the Birds Directive show a secure or improved status.,"* (compared to 52% of species in 2004) (See https://bd.eionet.europa.eu/article12/). A similar assessment will be conducted after Member States have submitted their next national reports in 2019.

The revised MSFD Commission Decision states: "Wherever possible, the assessments under [Birds] Directive 92/43/EEC, and [Habitats] Directive 2009/147/EC shall be used for the purposes of this Decision." The Commission Decision also requires that "The status of each [bird] species shall be assessed individually, on the basis of the criteria selected for use". As mentioned above, the Birds Directive does not require member states to assess the status of individual species. However, the post hoc analysis conducted by EEA (see https://bd.eionet.europa.eu/article12/) did assess the status of each species across the EU to determine the number of species that were considered 'secure' or 'improving'. The assessment of 'secure' was based on IUCN Red List status and on declines in population size or range of 20% or more. It is not clear if the 'secure' assessments equate to a 'favourable' assessment for the equivalent criteria under MSFD.

Given that Member states are not required to conduct species status assessments under the Birds Directive, this presents a further question: can the information reported under that Directive be used to assess species status and Good Environmental Status (GES) in marine birds under MSFD?

Currently, under Article 12 of the Birds Directive, Member States are required to report every six years *"on the implementation of national provisions taken under this Directive."* The current reporting round is 2013-18. In essence, the Art 12 report consists of a "general report" on the implementation of the Directive, plus an annex containing "species status and trends" for migratory species and species listed in Annex 1 of the Directive. The vast majority of marine bird species included in the OSPAR IA2017 assessments are included in the Birds Directive reporting. The reports on 'species status and trends' contain information on 'population size' and 'breeding distribution map and range size', which could potentially be used in assessments under MSFD criteria **D1C2 and D1C4.** The Commission Decisions states: *"for birds, criteria* ***D1C2 and D1C4*** *equate to the 'population size' and 'breeding distribution map and range size' criteria of [the Birds] Directive 2009/147/EC.*" This suggests that the reports of species submitted under the Birds Directive could also be used to assess each species against criteria **D1C2 and DC14** under the MSFD. However, as shown in Table 2, the species-specific reports of population size and trends and distribution map and range size do not go far enough to assess the relevant GES criteria under MSFD.

The trends in population size in the Birds Directive reports are expressed as percentage changes over time (see guidance in http://cdr.eionet.europa.eu/help/birds_art12/). However, in order to meet the requirements of MSFD, and the criterion **D1C2**, some context to the trends is required to assess if the species is being impacted by anthropogenic pressures, or is responding to changing climatic conditions. In the OSPAR Common Indicator assessment of marine bird abundance, annual abundance estimates are compared against a baseline. The baseline for each species, should be set at a population size that is considered desirable for each individual species within each geographical area. Ideally a baseline should be set at a '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).

Likewise, Birds Directive reporting of the current breeding distribution (as map) and on percentage changes in distributional range need to undergo an assessment against baselines or targets to be used under MSFD. Few data on changes in distribution were reported by Member States in 2012 under Art 12 of the Birds Directive. This is probably because changes in distribution are not straightforward to measure or detect.

Table 2: Comparison between GES assessment criteria for birds (Commission Decision 2017/848) and the reporting requirements under the Birds Directive (source Birds Directive reporting guidance http://cdr.eionet.europa.eu/help/birds_art12/).

GES Criterion	Birds Directive species report	Comparison
D1C2 — Primary: The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.	Population size – the most recent estimate within the Member State. Short-term trend (last 12 years) and Long-term trend (since c. 1980) – magnitude and direction of change in population size during 2007–2018 and during 1980–2018 or periods as close as possible to those.	Birds Directive single population size estimate can provide an indication of rarity; but on its own provides no indication of state, impact or long-term viability Birds Directive short and long-term declines in population size can be indicative of anthropogenic impacts, and of long-term viability. However, in order to assess D1C2, some context to the trends is required, through the use of baselines and thresholds. Scale mismatch: Birds Directive reporting is at a national scale and does not distinguish between marine and terrestrial; MSFD assessments are at a subregional or regional scale and include marine and coastal habitats only. Birds Directive reporting on species population size does not equate to an assessment of D1C2.
D1C4 —The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.	Breeding distribution map and size – presented as map with distribution marked on a 10x10km grid; plus total surface area of the breeding distribution in km^2 Short-term trend (last 12 years) and Long-term trend (since c. 1980) – magnitude and direction of change in breeding distribution surface area during 2007–2018 and during 1980–2018 or periods as close as possible to those.	Birds Directive reporting can provide a current snapshot of breeding distribution and could be overlain with pressure information to assess vulnerability. Trends in distribution may be indicative of a species' status. For instance, an overall shrinkage in range could be an indicator of large-scale human impacts or simply reflect changing climatic conditions. Further modelling of the species' 'ideal' range and distribution based on climate and habitat requirements would be required to fully assess this criterion. Birds Directive reporting does not include non-breeding distribution, which could be impacted by pressures and may affect the status of migratory species that don't breed in a particular region. Scale mismatch: see population size. Birds Directive reporting on species breeding distribution map and size does not equate to an assessment of D1C4.

Furthermore, an additional step would be required under MSFD D1C4 to assess if a species' distributional range or pattern is in line with prevailing physiographic, geographic and climatic conditions. To carry out such an assessment, one would need to know the 'ideal' range and distribution of species, which would need to be derived from modelling of the species' climate and habitat requirements.

There are additional barriers to using Birds Directive reports on marine bird species in MSFD assessments. The first is scale: MSFD assessments are conducted at biogeographic scales that are not always compatible with national scale reporting under the Birds Directive. Secondly, the Birds Directive reports for marine bird species include their entire range across both marine and terrestrial habitats, whereas MSFD assessments are restricted to marine and coastal areas.

In conclusion, the Birds Directive reporting of population size and breeding distribution map and range size, do not equate with the MSFD assessments of **D1C2 and D2C4**. However, the Birds Directive reporting and the MSFD bird assessments can certainly make use of the same data on population size and distribution, collected by the same monitoring schemes. Furthermore, the Birds Directive reporting of threats and pressures operating on species could be used in MSFD reporting under Article 8 – Assessments and Article 13 – Programmes of Measures. Birds Directive reporting on conservation measures is also highly relevant to MSFD Article 13 reports.

10.4 References

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Annex 1: List of participants

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Annex 2: JWGBIRD Tasks for 2018

Date & Venue of annual meeting: Ostende, Belgium, 1–5 October 2018

Chairs: Morten Frederiksen, Denmark, Ian Mitchell, UK, and Volker Dierschke, Germany,

Meeting Tasks:

a) Construct an indicator of breeding productivity and conduct a trial assessment using the target setting approach developed by the JWGBIRD in 2017.

b) Continue analyses of trends from OSPAR and HELCOM assessments to identify variables and processes that may explain key outcomes. (This task will be progressed intersessionally before presenting results at 2018 meeting)

c) Review of techniques for measuring and communicating confidence in assessments.

d) Review of the analysis of the abundance and distribution of birds from the combined 2016 midwinter offshore (at-sea) surveys of the Baltic.

e) GES integration rules for birds – test various methods for integrating within species of assessments of multiple criteria (as per revised MSFD Commission Decision 2017); taking into account the outputs from WKDIVAGG in May 2018.

f) Review national MSFD assessments relating to OSPAR Candidate indicators on birds and recommend future action on these indicators.

Intersessional tasks:

a) OSPAR: Respond to requests for advice on Threatened and Declining bird species from ICG-POSH.

b) HELCOM: Provide information according to specific requests from HELCOM about ecology, status and conservation of seabird populations breeding in, migrating through and wintering in the Baltic Sea in order to allow HELCOM to meet requirements relating to environmental policies of the regional sea convention, of its Contracting Parties and the European Union (intersessional, recurring when required).

c) Work with leads from SE, DE, FI, to produce reports for the HELCOM core indicators in order to contribute to the Holistic Assessment of the Baltic Sea (HOLAS II) due April 2018.

d) Provide seabird information for the ICES Ecosystem Overviews as required.

Justification and background to 2018 Tasks

Meeting Task a)

This task is a continuation of work initiated and described in Chapter 2 of the JWGBIRD 2017 report (ICES 2018).

Meeting Task b)

This task is a continuation of work initiated and described in Chapter 7 of the JWGBIRD 2017 report (ICES 2018).

Meeting Task c)

During the production of the OSPAR and HELCOM assessments, it became apparent that there are multiple ways of assessing confidence. This task will review these methods and propose the most appropriate to use in future assessments of marine birds.

Meeting Task d)

Meeting Task e)

This task was identified in Chapter 10 of the JWGBIRD 2017 report (ICES 2018). The revised MSFD Commission Decision (EC 2017/878) requires species-specific assessments to be carried out based on each GES criterion. Methods for integrating the results of each criterion for each species need to be developed. This is not straightforward, because not all species are assessed using the same criteria. Integration will be possible but careful consideration needs to be given to the methods used in order to avoid any bias in species status assessments. These methods will enable species-specific assessments to be made using OSPAR Common Indicators and HELCOM Core Indicators respectively. In May 2018 an ICES workshop WKDIVAGG will investigate ways of integrating assessments within species of marine birds, mammals, reptiles and fish. JWGBIRD 2018 will consider the outputs from WKDIVAGG in proposing integration methods for use in future OSPAR and HELCOM assessments.

Meeting Task f)

This task was also identified in Chapter 10 of the JWGBIRD 2017 report (ICES 2018). There are four existing OSPAR candidate indicators that were not included in OSPAR IA2017. However, EU member states in the Region will in 2018 submit assessments of similar indicators under Article 8 of the MSFD (see Table below). All the candidate indicators appear relevant under the new GES criteria recently agreed in the revised MSFD Commission Decision (EC 2017/878). This is an opportunity for JWGBIRD to review the indicator assessments and to assess whether further development of the candidate indicators is worthwhile.

Revised Criteria - 2017	Corresponding OSPAR candidate indicators	Member state MSFD Art 8 assessment 2018
D1C1 Incidental bycatch rates (Primary)	B5 – Marine bird bycatch (candidate)	None
D1C3 Population demographics (secondary)	B2 Breeding success of kittiwake (candidate)	UK
D1C4 Species distributional range and pattern (secondary)	B6 – Marine bird distribution (candidate)	UK, DE
D1C5 Habitat for the species (secondary)	B4 – Non-native/invasive mammal presence on island seabird colonies (candidate)	UK

Intersessional Task a)

The OSPAR Intersessional Correspondence Group on the Protection of Species and Habitats (ICG-POSH) has developed a series of collective actions across contracting parties, that are designed to implement the OSPAR Recommendations on its list of Threatened and Declining Species. JWGBIRD is responsible through Action #36 for establishing collaboration with the leads of other actions on birds, regarding data collection, storage and analysis. This intersessional task will enable JWGBIRD to provide ad hoc information and advice when requested by ICG-POSH leads.

JWGBIRD will provide regular updates to ICG-POSH on their work strands concerning collective actions relevant to seabirds. Other outputs will depend on the requests for advice from ICG-POSH, ICG-COBAM and/or from the CPs leading on the periodic assessments for Threatened and Declining bird species.

Intersessional Task b)

JWGBIRD is a seabird expert group with delegates from nearly all HELCOM Contracting Parties. Its aggregated knowledge and expertise allows the group to discuss and answer questions related to seabird ecology, their status and conservation when needed to support the environmental work of HELCOM. Requests for comments or reports can occur with short notice, as they are not always directly related to HELCOM's own environmental programmes, but may arise e.g. in the frame of policies from the European Union. The annual meeting of the group is not necessarily the most appropriate forum in which to deal with such requests (e.g. due to mismatched deadlines), whereas correspondence between the relevant group members can give the required advice in time.

Annex 3: Recommendations

RECOMMENDATION	ADRESSED TO
1. JWGBIRD recommends that members are nominated from ICES Member Countries currently not represented in the group to ensure sufficient geographical coverage.	ACOM
2. JWGBIRD recommends that WGBYC coordinate with JWGBIRD on matters related to seabird bycatch in fishing gear. risk assessment (as it relates to OSPAR indicator B.1).	WGBYC

Annex 4: Brief report on JWGBIRD participation at WGBYC 2017 annual meeting

Following recommendations from WGBYC 2016 and JWGBIRD 2016, collaboration between the two working groups should be intensified in order to better understand and deal with seabird bycatch in fishing gear. JWGBIRD and its predecessors have worked on the bycatch issue during their meetings in 2008, 2009, 2010 and 2016. As a delegate of JWGBIRD, Volker Dierschke participated in the annual meeting of WGBYC, which was held from 12-15 June 2017 in the NOAA Fisheries – Northeast Fisheries Science Center in Woods Hole, MA, U.S. The meeting was chaired by Marjorie Lyssikatos (U.S.) and attended by 14 experts from Sweden, Denmark, Poland, Germany, the Netherlands, France, the United Kingdom, Iceland and Portugal.

The meeting focused on the compilation of bycatch data collected under EU Regulation 812/2004 in EU waters and discussed consequences of changes in monitoring requirements arising from the new regulation DC-MAP and the future regulation of technical measures. Further, discussion was held upon closer collaboration between WGBYC and WGCATCH.

A plenary on 13 June covered several projects and initiatives directly addressing the issue of seabird bycatch. Gina Shield presented the NEFOP seabird bycatch monitoring and the data collection thereunder. Josh Hatch continued with reporting estimates of seabird bycatch in fixed gears in NE U.S. Both presentations show that a considerable amount of data are available for the description of seabird bycatch since 1989. The great majority of bycaught seabirds were Greater Shearwaters. In contrast to the amount of information available for the NW Atlantic, Sven Koschinski and Volker Dierschke had to admit that no data are available to run the HELCOM core indicator on marine mammals and seabirds drowning in fishing gear, of which they explained the concept.

Another session was on mitigation measures, mainly related to marine mammals and especially Harbour Porpoises, but Adam Wozniczka introduced a project addressing mitigation of seabird bycatch from Poland/Lithuania/Portugal. He shortly mentioned the use of black-and-white net panels (see JWGBIRD 2016 report, chapter 3.4.4), but concentrated on the use of lights attached to gillnets during soak time. Data are still in evaluation.

On 14 June, the attendees visited the North East Fisheries Observer Program Facility in Falmouth, which is engaged in data handling and storage, necropsy of bycaught seabirds and training of at-sea observers. All the European attendants were much impressed of the professional way of undertaking observer programs, including technology applied.

Finally, on 15 June Volker Dierschke introduced JWGBIRD and its work, with special emphasis on ToRs dealing with bycatch issues. In addition, he named possible future possibilities for collaboration. Apart from advice to be given intersessionally, this included:

- recommendations for optimal monitoring of seabird bycatch (e.g. regarding the coverage of fishing métiers, vessel sizes, fishing effort and species, methods used for recording seabird bycatch and units of fishing effort);
- development of appropriate methods to assess the impact of bycatch losses on population size (needed for HELCOM core indicator);
- conducting bycatch risk assessments for the entire Baltic (based on results of seabird surveys in February 2016);
- reviewing effects of alternative fishing gear on seabirds (e.g. risk for seabirds if longlines are replacing gillnets);

- exploring mitigation measures applying to more than one ecosystem component (e.g. supporting both seabirds and marine mammals, whereas for instance pingers are useful only for Harbour Porpoises and not for birds).

Some of these aspects may serve as ToRs in future meetings of JWGBIRD or WGBYC, others may be just subject to giving mutual expertise. Altogether, it was very clear that both working groups can learn and take profit from each other, so that future collaboration appears to be promising