Anthropogenic pressures on marine birds in the OSPAR Maritime Area

Owing to the large number of marine bird species, which use various kinds of marine habitat and belong to five different feeding guilds (species groups), it is not straightforward to identify the most important anthropogenic pressures acting on this ecosystem component. In order to investigate these pressures in the OSPAR Maritime Area, various sources of reporting were reviewed. As the way of reporting is not consistent among Contracting Parties and EU Member States, respectively, and because different terminology was used for the categories of pressures, it is challenging to aggregate information about pressures across countries and conventions on the same level. Here, all information was translated into the pressure categories used in the MSFD.

General methods

In order to identify the main pressures impacting marine birds in the Northeast Atlantic, the following reporting sources were investigated:

- OSPAR MPA database
- MSFD Art 8 reporting
- MSFD Art 16 reporting
- Birds Directive Reporting Art 12

After extracting information about pressures from the available sources with the highest spatial and temporal resolution possible, the relative importance of the individual pressures was investigated. First, for each source it was quantified how often the individual pressures were mentioned or occurring per species group and per OSPAR Region. Considering that the type of information extracted by each reporting source is different (e.g. number of reports for MSFD Art 8, number of species exposed to pressure for the OSPAR MPA database), a scoring system was developed to rank the relative importance of individual pressures and make results comparable across reporting sources. For each reporting source, the value of the highest score was divided into three thirds, and each of these thirds was allocated to a level of importance:

Importance Rank	Description
high	scores falling into upper third
medium	scores falling into the central third
low	scores falling into the lowest third

For example, if the highest score is 54, counts of 0-18 reflect low importance, counts of 19-36 stand for medium importance and counts of 37-54 indicate high importance. This was also applied to scores aggregated for Regions (across species groups) and to scores aggregated for all marine birds (across species groups and Regions).

In order to allow comparison between sources the terminology for pressures used in the individual sources was translated into MSFD terminology for the results overview (which is used in the Thematic Assessment section P).

OSPAR MPA Database

Source: OSPAR MPA Database https://www.ospar.org/work-areas/bdc/marine-protected-areas/mpa-webtool

The OSPAR MPA database holds spatial and non-spatial data on MPAs that have been nominated to the OSPAR MPA network and can be accessed through the OSPAR MPA database webtool.

The OSPAR MPA database uses the terminology of the OSPAR Joint Assessment and Monitoring Programme (JAMP) 2014–2023 (OSPAR Agreement 2014-02). It includes information on human activities and species occurring within individual Marine Protected Areas (MPAs). All information available in the OSPAR MPA Database can be clearly assigned to a specific area (i.e. an OSPAR Region). Importantly, pressures are not linked to bird species but only presented for an MPA in general.

In total, the database includes 537 MPAs (duplicated MPAs excluded). For 206 MPAs the presence of birds is mentioned but for most of them no information on occurring human activities (and therefore pressure) was reported. Only for 58 MPAs (10.8% of all MPAs listed in the OSPAR database) it was possible to source information on both pressures and birds occurring.

The system applies to all OSPAR Contracting Parties, but regarding birds data are available only for:

- Region I: NO (no data: DK, IS)
- Region II: NO, SE, DK, DE, BE, FR, UK (no data: NL)
- Region III: UK, FR (no data: IE)
- Region IV: FR, ES, PT
- Region V: PT, UK

Methods

Human activities reported within each MPA were linked to pressures, following the methodology described in Robson et al. (2018)

For each pressure, a risk profile score was assigned following Robson et al (2018):

- score 0 = absent,
- score 1 = low risk (this pressure generally does not occur at a level of concern and should not require consideration as part of an assessment),
- score 2 = high/medium risk (pressure is commonly induced by activity at a level that needs to be considered further as part of an assessment).

Species entries within each MPA were weighted by risk profile of pressure:

- High/medium risk = 2*(number of species entries),
- Low risk = number of species entries

Scores were summed up per pressure for each OSPAR Region. Due to the overall scarcity of information on birds, no distinction was made between species groups; instead, all species were considered together. Then, for each pressure the scores of all MPAs were summed up to for the entire OSPAR Maritime Area.

Results

Table 1 shows the scores per OSPAR Region and for the entire OSPAR Maritime Area for each pressure. With some variation among Regions, the overall picture indicates physical loss and damage

of the seabed, organic enrichment, underwater noise and several biological pressures as being of high importance in MPAs where birds are mentioned.

Table 1: *Pressures extracted from the OSPAR MPA Database sorted by the three main categories (green – biological, brown – substances, litter, energy, blue – physical). Numbers refer to totals of species entries (weighted by importance of pressure: 2 high, 1 low). As pressures in the database are not linked to birds, only those pressures also included in the MSFD Art. 8 reporting and MSFD Ar. 16 assessments are included here. Dark blue – high importance, medium blue – medium importance, light blue – low importance.*

	Region I	Region II	Region III	Region IV	Region V	Region I-V
n	4 MPA	16 MPA	6 MPA	29 MPA	3 MPA	**58 MPA**
Physical loss (to land or freshwater)	32	61	113	520	0	726
Physical loss (to another seabed type)	38	314	165	1135	18	1670
Water flow changes	32	99	99	621	6	857
Penetration of seabed surface	32	321	190	1117	30	1690
Underwater noise changes	35	193	148	904	18	1298
Litter	16	172	97	570	18	873
Nutrient enrichment	35	144	99	595	12	885
Organic enrichment	32	158	172	710	18	1090
Synthetic compound contamination	35	173	113	633	18	972
Hydrocarbon and PAH contamination	19	172	97	570	18	876
Introduction of light	24	172	97	696	18	1007
Introduction of other substances	30	180	106	606	0	922
Visual disturbance	35	220	190	965	18	1428
Input of genetically modified species and translocation of native species	35	8	158	630	0	831
Introduction of microbial pathogens	32	56	158	500	0	746
Introduction or spread of non-indigenous species	35	173	176	814	18	1216
Removal of non-target species	32	256	186	1110	36	1620
Removal of target species	35	253	186	1112	36	1622
Death or injury by collision	30	173	117	570	18	908

Confidence

There is altogether **low confidence**, because i) in each individual MPA there is no direct link between bird species and pressure, ii) for only a low proportion of MPAs bird occurrence and pressures are reported and iii) coverage of the marine area of the Regions is low (extremely low in Regions I and V).

MSFD Art. 8 reporting

Source: WISE Marine https://water.europa.eu/marine/data-maps-and-tools/msfd-reporting-information-products/msfd-reporting-data-explorer/assessments

The Marine Strategy Framework Directive (MSFD, 2008/56/EU) requires assessment of the current environmental status of Member States' marine waters and of the predominant pressures and impacts upon them (Article 8 MSFD).

The database uses the terminology from the guidance for Reporting on the 2018 update of articles 8, 9 & 10 for the Marine Strategy Framework Directive (MSFD Guidance Document 14). Pressures are reported for marine birds in general for a country's marine area. Though in general there are entries per country and species group, differentiation between species groups is almost lacking. The system applies to all EU Member States, but regarding birds data are only available for:

- Region I: – (no data: DK, IS, NO)
- Region II: SE, DK, DE, BE, UK (no data: NO, FR)
- Region III: IE (no data: UK, FR)
- Region IV: ES, PT (no data: FR)

- Region V: PT

Methods

From WISE Marine the following information was extracted:

- Total of entries per pressure for each species group in each OSPAR Region.
- Total of entries per pressure for each OSPAR Region across species groups.
- Total of entries per pressure across OSPAR Regions and species groups.

Aggregated pressures (e.g., "all biological pressures") were extracted and are shown in Table 2, but were not considered in the results overview.

Results

The summary of reports suggests disturbance of species due to human presence as by far the most important pressure acting on marine birds in Regions II to V (Table 2). Medium importance is indicated for the extraction of species (i.e. by-catch in fishing gear, hunting) and the input of litter and other substances.

Table 2: *Pressures extracted from Article 8 MSFD reporting (reports for each EU Member State), sorted by the three main categories. Numbers give the numbers of entries in the national reports. Dark blue – high importance, medium blue – medium importance, light blue – low importance.*

OSPAR Pressure	Region I	Region II	Region III	Region IV	Region V	Region II-V
Number of EU Member States	0 MS	5 MS	1 MS	2 MS	1 MS	8 MS
All biological pressures		0	0	2	0	2
Loss of/change to natural biological communities due to cultivation of animal/plant species		0	1	0	0	1
Disturbance of species due to human presence		24	1	4	1	30
Extraction of or mortality/injury to wild species (by fishing and other activities)		15	1	3	0	19
Input or spread of non-indigenous species		2	0	2	2	6
All pressures related to inputs of substances, litter and energy		5	0	0	0	5
Input of other substances		10	1	0	0	11
Input of litter		10	1	0	2	13
Input of nutrients		0	1	0	0	1
Input of organic matter		0	1	0	0	1
Input of other forms of energy		5	0	0	2	7
Input of anthropogenic sound		5	1	0	0	6
Physical disturbance to seabed		0	1	0	0	1
Changes to hydrological conditions		4	0	0	0	4

Confidence

There is altogether **low confidence**, because i) incomplete coverage of OSPAR Regions (no information from Region I, incomplete information from Regions II-IV), ii) some reports of individual countries do not allocate their reporting to OSPAR Regions or even Sea (for example, the reporting for Spain combines information for OSPAR Region IV and the Mediterranean Sea).

MSFD Art. 16 reporting

Source: Article 16 Technical Assessment of the MSFD 2015 reporting on Programme of Measures, technical assessments of countries available at https://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/implementation/reports_en.htm (Step 5: technical reports per country).

Under Article 16 MSFD, the programmes of measures (Article 13 MSFD) are assessed. The respective technical assessment reports for each EU Member State provide a good review of measures implemented or planned, but also communicating the pressures against which the measures are taken.

The respective Article 16 technical assessments not only provide a good review of measures implemented or planned, but they also include a section *Assessment against pressures* for each ecosystem component (including birds).

Methods

Pressures addressed in this section were extracted from table content in the technical assessments for all EU Member States in the OSPAR Maritime Area. For many measures, the entry for relevant pressures is "Various". This kind of entry often refers to measures addressing spatial protection and directives related to conservation. Therefore, the extracted results (Table 3) are biased and do not necessarily reflect the relative importance of individual pressure types. Further, the programmes of measures of the Member States vary considerably regarding the degree of specification and the overall number of measures.

The measures listed and the associated pressures are usually not specified spatially and therefore cannot be allocated to OSPAR Regions. Thus, the reported pressures are summed up from all EU Member States in the OSPAR Maritime Area together.

Results

The by far most Article 13 MSFD measures are directed against the pressure "Extraction of, or mortality/injury to, wild species" (Table 3), which mostly refers to hunting and by-catch in fishing gear. The only pressure of medium importance is "physical disturbance to seabed".

Table 3: Pressures extracted from Article 16 MSFD assessments (reports for each EU Member State), sorted by the three main categories. Note restrictions addressed in the text and that the number of measures per country given here varies significantly. No EU Member State falls into Region I. Dark blue – high importance, medium blue – medium importance, light blue – low importance.

Pressure	Region II-V
Physical loss	1
Physical disturbance to seabed	**17**
Changes to hydrological conditions	1
Input of other forms of energy	4
Input of litter	**11**
Input of nutrients	1
Input of other substances	3
Disturbance of species	**9**
Introduction of microbial pathogens	1
Input or spread of non-indigenous species	5
Extraction of, or mortality/injury to, wild species	**37**

Confidence

There is an overall **low confidence**, because i) incomplete coverage of OSPAR Regions (no information from Region I), ii) no differentiation between Regions if one country covers more than one OSPAR Region, iii) unequal distribution of measures over OSPAR Regions (e.g. only four measures in Region V), iv) many measures are kept general (not allowing to assign them to pressures); v) very few relationships to species groups or species given.

Birds Directive Art. 12 reporting

Source: European Environment Agency https://www.eea.europa.eu/data-and-maps/data/article-12-database-birds-directive-2009-147-ec-1.

Under Article 12 Member States must forward to the Commission a report on the implementation of the measures taken under the Birds Directive (BD) and the main impacts of these measures. Reporting includes information concerning the status and trends of wild bird species protected by the Directive, the threats and pressures on them, the conservation measures taken for them and the contribution of the network of Special Protection Areas to the objectives laid out in Article 2 of this Directive.

Birds Directive (BD) pressure categories are a mix of activities and pressures. BD provides a crosswalk for the BD and MSFD pressures, with up to 9 MSFD pressure categories assigned to one BD pressure/activity category. All MSFD pressures per BD pressure/activity were used in the analysis.

Methods

BD pressures/activities reported for marine bird species were summed up per species group and Region, but considerable difficulties were faced regarding allocation to Regions (some EU Member States are covering more than one OSPAR Region or even marine waters outside OSPAR). Further, BD reporting is not restricted to marine habitats only, but also refers to the occurrence of species inland (at least in part of the year). BD pressures/activities which clearly refer to terrestrial and freshwater pressures were rejected.

Results

Keeping in mind constraints mentioned above, highly important pressures for marine birds in the OSPAR Regions II-V are disturbance, anthropogenic mortality, disturbance of the seabed and input of noise (Table 4).

Table 4: *Pressures extracted from Article 12 Birds Directive reporting (reports for each EU Member State), translated from BD to MSFD terminology and sorted by the three main categories. Numbers represent entries per species, summed up for OSPAR Regions. No EU Member State falls into Region Note restrictions and very low confidence addressed in the text. Dark blue – high importance, medium blue – medium importance, light blue – low importance.*

MSFD Pressure	Region II	Region III	Region IV	Region V	Region II-V
Physical loss	17	14	18	2	51
Physical disturbance to seabed	24	21	27	4	76
Changes to hydrological conditions	19	15	15	2	51
Input of anthropogenic sound	21	17	22	5	65
Input of other forms of energy	5	2	7	1	15
Input of litter	15	14	22		51
Input of nutrients	10	9	14	1	34
Input of organic matter	4	4	6		14
Input of other substances	11	9	16	1	37
Input of water					

Input of genetically modified species and translocation of native species					
Input of microbial pathogens					
Input or spread of non-indigenous species	10	7	7	2	26
Selective extraction of species, including non-target catches					
Loss of, or change to, natural biological communities due to cultivation of animal or plant species	4	5	5	1	15
Disturbance of species	26	22	27	5	80
Extraction of, or mortality/injury to, wild species	27	22	31	2	82

Confidence

There is a general **very low confidence**, because of (often severe) uncertainties regarding pressure categories, geographical assignment (marine vs. terrestrial; OSPAR Regions), also poor coverage of species (selection for Annex I species) and a lack of information for OSPAR Region I.

Overall assessment

Methods

From each section above, the general result for marine birds across all species groups and OSPAR Regions was aggregated in Table 5. An overall assessment for each pressure was done by converting the importance ranks obtained from the different reporting sources into numerical values (considering also no entries) and using the average of the values with no decimal positions as the overall assessment score

Importance ranks were converted as follow for each pressure reported in a Region:

- No importance (i.e. no entry) = 0
- Low = 1
- Medium =2
- High = 3

In the example of the pressure Physical loss, the average of ranks is 1.5, rounded to a score of 2 which corresponds to an overall assessment of "medium importance"

	Overall Assessment	**Birds Directive Art. 12 Reporting**	**MSFD Art. 8 Reporting**	**MSFD Art. 16 Assessments**	**OSPAR MPA database**
Physical loss	**medium**	medium		low	high
Numerical rank	**1.5**	2	0	1	3

All pressures categories are given in MSFD terminology, because this is used in the DAPSIR approach of the Marine Birds Thematic Assessment for QSR 2023.

Results

Overall, highest importance was found in the pressure categories “disturbance of species” and “Extraction of, or mortality/injury to, wild species” (Table 5).

It should be noted information on the pressure " Selective extraction of species, including non-target catches " could be sourced only from the analysis of the OSPAR MPA database using the importance scores obtained for the pressures "Removal of non-target species" and "Removal of target species".

The variable terminology used by other reporting sources prevented to clearly assess the level of importance of this pressure, as for instance bycatch - which is often reported in various sources - can be placed in different pressure categories. For this reason, the category “Selective extraction of species” was not included in the overall assessment.

Table 5: *Overall assessment of importance of pressures on marine birds in the entire OPSAR Region, derived from Tables 1-4). Dark blue – high importance, medium blue – medium importance, light blue – low importance.* ***Take into account the significant limitations behind the informative power of the individual sources due to the difficulty of assigning reports to the OSPAR Regions or even the marine area in general.*** * Note that due to the different terminologies bycatch can be placed in different pressure categories and therefore the category “Selective extraction of species” is not included in the overall assessment.

	Overall Assessment	Birds Directive Art. 12 Reporting	MSFD Art. 8 Reporting	MSFD Art. 16 Assessments	OSPAR MPA database
Physical loss	**medium**	medium		low	high
Physical disturbance to seabed	**medium**	high	low	medium	high
Changes to hydrological conditions	**medium**	medium	low	low	medium
Input of anthropogenic sound	**medium**	high	low		high
Input of other forms of energy	**low**	low	low	low	medium
Input of litter	**medium**	medium	medium	low	medium
Input of nutrients	**medium**	medium	low	low	medium
Input of organic matter	**low**	low	low		medium
Input of other substances	**medium**	medium	medium	low	medium
Input of water	**no importance**				
Input of genetically modified species and translocation of native species	**low**				medium
Input of microbial pathogens	**low**			low	medium
Input or spread of non-indigenous species	**medium**	medium	low	low	high
Selective extraction of species, including non-target catches	*				high
Loss of, or change to, natural biological communities due to cultivation of animal or plant species	**low**	low	low		
Disturbance of species	**high**	high	high	low	high
Extraction of, or mortality/injury to, wild species	**high**	high	medium	high	high

Confidence

Given the low or very low confidence found in the four analysed sources, the overall confidence is low.

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