

Pilot Assessment of Marine Mammal By-catch in Arctic Waters



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OSPAR Convention

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Convention OSPAR

La Convention pour la protection du milieu marin de l’Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d’Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. Les Parties contractantes sont l’Allemagne, la Belgique, le Danemark, l’Espagne, la Finlande, la France, l’Irlande, l’Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume- Uni de Grande Bretagne et d’Irlande du Nord, la Suède, la Suisse et l’Union européenne

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Key Message

Marine mammal by-catch is a significant pressure affecting populations in the North-East Atlantic. In Arctic Waters (Region I), a Pilot Assessment was possible for two species (harbour porpoise and grey seal) in the Iceland Assessment Unit (AU) based on the US conservation objective (PBR), resulting in grey seal exceeding and harbour porpoise not exceeding the threshold value.

Background (brief)

The primary human-induced cause of mortality of marine mammals in the OSPAR Maritime Area is incidental capture and entanglement in fishing gears, commonly known as by-catch. Assessing the impact of this pressure in relation to population abundance is paramount.

This indicator assessment has been further developed since the Intermediate Assessment 2017 (IA 2017) and now includes common dolphin and grey seal, as well as harbour porpoise <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/marine-mammal-bycatch/>. This set of species comprises some of the most abundant marine mammal species in the OSPAR Maritime Area.

The AUs applied in the IA 2017 for harbour porpoise have been updated, taking account of the current best ecological evidence. AUs have also been defined for grey seal. Since the IA2017, this indicator has also proposed for a candidate assessment in OSPAR Region I but was restricted to a single AU within that region around Iceland due to data availability.

Background (extended)

The primary human-induced cause of mortality of marine mammals in the OSPAR Maritime Area is incidental capture and entanglement in fishing gears, widely known as by-catch (Dolman *et al.*, 2016). There are existing legal requirements to monitor by-catch of marine mammals and to apply relevant measures to ensure it does not have a significant negative impact on marine mammal populations (ICES, 2021b).

Species

This candidate indicator assesses by-catch of harbour porpoise *Phocoena phocoena* and grey seal *Halichoerus grypus*, extending the common indicator assessment into Region I for species where data is sufficient.

Assessment Units

In order to define a spatial scale within which to conduct an assessment, appropriate Assessment Units within the OSPAR range of each species have been agreed (**Figure a**).

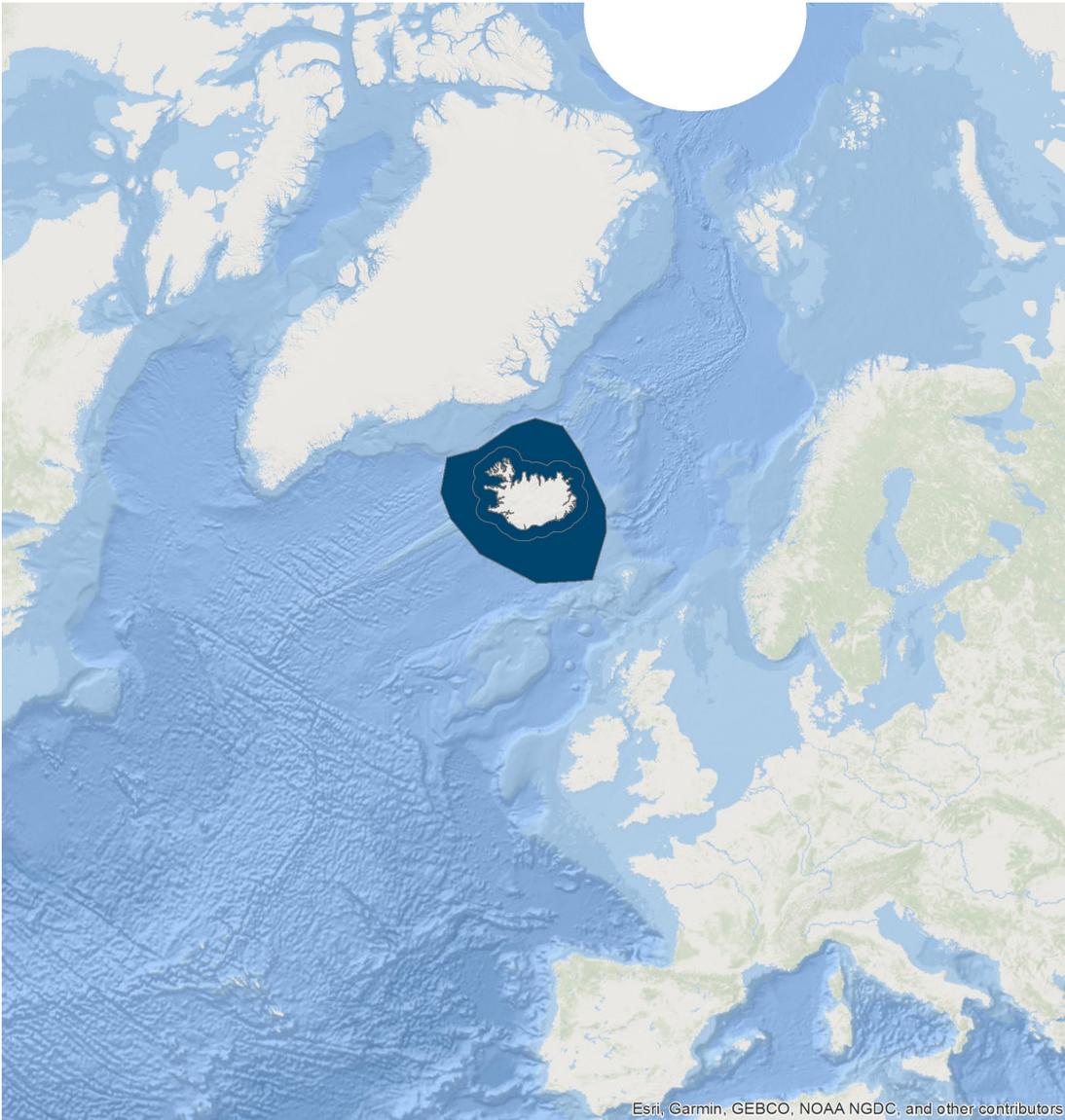


Figure a: Assessment units for the Pilot Assessment of by-catch of harbour porpoises and grey seals

Data

ICES (2021a) issued a specific data call to estimate by-catch (ICES 2021a) in addition to the annual data call issued via the ICES Working Group on Bycatch (WGBYC) in order to collate data at a higher resolution for the assessment: the full description is provided in <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/marine-mammal-bycatch/> and <https://www.ospar.org/documents?v=48551>.

Candidate Assessment

Within Region I, a candidate assessment was only possible for the Iceland AU: by-catch estimates and thresholds were both available for harbour porpoise and grey seal.

Assessment Method

In order to assess by-catch impact, we need to know the estimated population abundance within an AU; the estimated level of by-catch; and then compare this against the calculated threshold value.

Thresholds in the context of by-catch of protected species such as marine mammals are understood to represent an upper limit to anthropogenic removals; that is a limit beyond which the risk of failing to achieve the conservation objectives set by policy makers is unacceptable. Threshold setting methods rely

on a management strategy evaluation framework that uses computer simulations to compare and assess the outcomes of different decisions/actions in light of (simulated) data. Of primary importance are the conservation objectives that the management framework should achieve (<https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/marine-mammal-bycatch/>).

Abundance estimates

Harbour porpoise abundance estimation

Icelandic waters were partially surveyed via aerial methods in 2007, resulting in an estimate of 43 179 individuals (CV = 0,45) for the Iceland AU (Gilles *et al.*, 2020). The threshold for the Iceland AU was based on a model integrating this one abundance estimate from 2007 and two relative abundance estimates based on genetic close-kin analysis (NAMMCO/IMR, 2019). The conclusion of the modelling was that model-based extrapolation was reasonable in this AU, and that harbour porpoises in the Iceland AU seem to be recovering since 2005 (NAMMCO/IMR, 2019).

Grey seal abundance estimation

Data for grey seal estimates were completed from the data call for the M3 / M5 seal indicators using data from 201 to 2020 in line with the ICES data call for bycatch data. <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/seal-abundance-and-distribution> and <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/grey-seal-pup-production>. Estimates were derived from grey seal counts conducted during surveys of harbour seals in their summer moult period (August), counts of grey seal pups made at breeding colonies in the autumn / winter, and counts during the grey seal moult period which follows the breeding season in early spring.

An estimate of minimum abundance (Nmin) was produced following the same methodology as used for the common indicator M6 <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/marine-mammal-bycatch/>:

Iceland AU: 5 881 (Nmin)

Threshold setting method

To ensure long-term viability in the face of anthropogenic impacts, PBR was developed in the U.S. for the purposes of implementing the 1994 Marine Mammal Protection Act (MMPA) (Wade, 1998; Moore *et al.*, 2013). The PBR is an upper limit to the level of anthropogenic mortality that would allow a population to achieve abundance equal to or greater than the Maximum Net Productivity Level (MNPL; <cross-link to CEMP guidelines>). A population that is at/at/above the MNPL is referred to as being at “optimum sustainable population”. The conservation objective of the MMPA is: a population will remain at, or recover to, its maximum net productivity level MNPL (typically 50% of the population’s carrying capacity), with 0,95 probability, within a 100 year period. Thresholds were thus set according to the US MMPA conservation objective which differs from the ASCOBANS interim conservation objective that used in the common indicator assessment (<https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/marine-mammal-bycatch/>) .

Threshold values

Harbour porpoise by-catch

The threshold value is 3 500 animals using PBR (NAMMCO/IMR 2019).

Grey seal by-catch

The threshold value is 353 animals using PBR.

Bycatch and mortality estimates

ICES issued an official data call in 2021 to 18 of the 20 ICES countries with fisheries operating in the OSPAR Maritime Area, to collect data describing total by-catch monitoring/sampling effort and grey seal, harbour

porpoise and common dolphin by-catch events from the years 2005 until 2020 (ICES, 2021a). Observations of by-caught animals were collated over several years, primarily via bycatch observer schemes but also via Remote Electronic Monitoring (REM). The number of observed dead animals is modelled, taking into account the number of days that fishing activity was observed, in order to produce a ‘by-catch rate’. The by-catch rate is then multiplied by the number of days at sea (DaS) by vessels in a specific area during the entire year, in order to produce an estimate of the total number of by-catch events (by-catch estimate) for that section of the fleet. This number is further multiplied by the number of animals involved in a by-catch event (‘by-catch intensity’), to obtain mortality estimates resulting in the total number of by-caught animals. The methodology used to estimate bycatch levels was that of the ICES Workshop on Estimation of Mortality of Marine Mammals (WKMOMA; ICES, 2021a) which was convened at the request of OSPAR and is described in full in the common indicator assessment <https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/marine-mammal-bycatch/>. The most recent complete year of fishing effort data is 2020 and is therefore the timeframe used for the by-catch estimates (ICES, 2021a). WKMOMA also provided 2019 estimates given the potential impact of Covid-19 on fishing and recording effort, leading to a potential underestimate in the 2020 values. Both estimates are evidenced in the ICES (ICES, 2021a) report. Although 2019 estimates are generally higher, the difference is relatively small therefore the assessment is based on the newest available data, which is 2020. The assessment does not change whether 2019 or 2020 estimates are used.

Harbour porpoise by-catch

The 2020 by-catch estimate for harbour porpoises in the Iceland AU was 1 713 (95% CI 1 274 - 2 276).

Grey seal by-catch

The 2020 by-catch estimate for grey seals in the Iceland AU was 760 individuals (95% CI 333 - 1 715).

Candidate Assessment

The by-catch estimate outputs from ICES (ICES 2021a) were assessed against thresholds for harbour porpoise and grey seal in the Iceland AU (**Table a**).

Table a: Overview of threshold values and estimated by-catch per AU. Abundance estimates are rounded. Approximate 95% Confidence intervals were computed assuming a log-normal distribution (https://en.wikipedia.org/wiki/Log-normal_distribution).

OSPAR Region	AU	Threshold setting approach	Abundance estimates	Threshold values (anthropogenic removal via bycatch)	Bycatch estimates (2020) Red = threshold exceeded
Harbour porpoise					
I	Iceland*	PBR **	N(2007)*** = 43 200 CV = 0,45 (16 900 - 91 400)	3500	1713
Grey seal					
I	Iceland*	PBR	Nmin = 5 881	353	760

* Pilot assessment, ** threshold set by NAMMCO/IMR (2019) from outputs of a model run on Icelandic harbour porpoises

*** partial coverage of the AU (Gilles *et al.*, 2020)

Results (brief)

Candidate assessments of harbour porpoises and grey seals in their respective Iceland AUs have been possible. For the harbour porpoise, threshold was achieved with by-catch estimates remaining below PBR. For the grey seal, threshold was not achieved with by-catch estimates exceeding PBR.

Results (extended)

Harbour porpoise

WKMOMA (ICES, 2021a) estimated harbour porpoise by-catch for both 2019 and 2020. The Candidate Assessment did not change whether the by-catch estimates for 2019 or 2020 were applied: the threshold was not exceeded.

The threshold setting method for the Iceland AU was set by NAMMCO/IMR (2019) and based on modelling results which indicated that the Icelandic population of harbour porpoises is recovering. Based on the model run outputs, the PBR is around 3 500 porpoises. The threshold was set based on model outputs, with the most recent absolute estimate of abundance dating from 2007, and covering only coastal waters. This aerial survey was not optimised for harbour porpoises and was conducted 15 years ago. The threshold was not exceeded but PBR should be updated with more up to date information on the abundance of harbour porpoise in Icelandic waters.

Grey Seal

By-catch of grey seal was assessed using PBR given the availability of data. By-catch estimates of grey seals in the Iceland AU exceeded the threshold value. The Candidate Assessment did not change whether the by-catch estimates for 2019 or 2020 were used.

Conclusion (brief)

Harbour porpoise and grey seal are among the most commonly by-caught marine mammal species in the OSPAR Maritime Area according to records from observer monitoring. In Region I, only the Iceland AU could be assessed from within this large Region. By-catch levels exceeded the threshold for grey seal but not for harbour porpoise.

By-catch data availability was poor due to large gaps in coverage of observer data. There was low to moderate consensus in methodology / maturity of methodology. Despite these caveats, it is clear that by-catch is occurring at high levels that do not align with the OSPAR strategy of tackling biodiversity loss minimising, and where possible eliminating, incidental by-catch.

Conclusion (extended)

In 2020, it was estimated that some 1 700 harbour porpoises died as a result of by-catch in the Iceland AU. Nevertheless by-catch levels did not exceed the threshold: this was due to several factors included the use of PBR to set the threshold and using outputs from a model for the abundance estimate. Approximately 760 grey seals were by-caught in 2020, and threshold was not achieved.

Results with respect to threshold exceedance differ between seals and cetaceans, but remain congruent on the overall conclusion that by-catch of marine mammals is a widespread and significant pressure in the OSPAR Maritime Area. This must be addressed to meet the aims of the OSPAR Strategy to minimise, and where possible eliminate, incidental by-catch of marine mammals so that it does not represent a threat to the protection and conservation of these species by 2025.

Confidence Statements

The assessment was undertaken using data on marine mammal abundance with a spatial coverage and temporal extent that is not sufficient for the area assessed: only the Icelandic AU could be assessed within Region I.

With respect to by-catch data, despite an unprecedented effort as testified by WKMOMA (ICES, 2021a), there remains substantial gaps in coverage resulting in a low data availability, mainly owing to the absence of a dedicated monitoring of marine mammal by-catch by onboard observers across the OSPAR Maritime Area.

There is moderate / low confidence in the methodology used in this assessment. There is consensus within the scientific community regarding this methodology. However, as the method has been developed specifically for this assessment and not been more widely used it is considered moderate / low.

Knowledge Gaps (brief)

Thresholds for cetaceans were determined using the PBR approach with a different conservation objective than the ASCOBANS conservation objective 'to allow populations to recover to and/or maintain 80% of carrying capacity in the long term' which has been used for harbour porpoises in the common indicator assessment. There is no recent robust abundance estimate of harbour porpoise in the Iceland AU. No candidate assessment in other AUs of Region I could be undertaken.

Knowledge Gaps (extended)

Abundance estimate for the Iceland AU was based on modelling (NAMMCO/IMR, 2019). The model integrated one abundance estimate from 2007 and two relative abundance estimates based on genetic close-kin analysis, together with by-catch estimates from two key fisheries (over 2013 to 2017) with extrapolation back to 1950 based on available fisheries data. The conclusion of the modelling was that harbour porpoises in the Iceland AU seem to be recovering since 2005. More recent information of abundance is required for the AU to obtain a robust abundance estimate (*i.e.* one not based on a model of past data; see Hammond *et al.*, 2021 for best practices). There is currently no guidance on a phase-out rule (<cross link to common indicator assessment M6> to adjust thresholds downwards when thresholds are computed on outdated abundance data.

Norway, the Faroes, and Russia did not submit by-catch monitoring and effort in response to the WKMOMA data call, and it was therefore not possible to estimate bycatch in these waters.

The conservation objective used to set threshold for cetaceans in this candidate assessment is that of the US MMPA which differs from the ASCOBANS interim objective "to restore and/or maintain stocks/populations to 80% or more of the carrying capacity". The ASCOBANS conservation objective is more ambitious and would have resulted in lower thresholds, all else being equal. The threshold is thus underpinned by a conservation objective, which needs to be consistent across the OSPAR Maritime Area (<https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/marine-mammal-bycatch/>) and may be adjusted to accommodate future evidence. In particular for harbour porpoises, the 26th Advisory Committee of ASCOBANS agreed to organize an 'Expert workshop to recommend small cetacean conservation objectives in relation to anthropogenic removals'. The aim of this two-part workshop is to decide an appropriate precautionary, yet practical, conservation objective for small cetacean species (ASCOBANS, 2021).

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Assessment Metadata

Field	Data Type	
Assessment type	List	Quality Status Report
Summary Results (template Addendum 1)	URL	Not applicable
SDG Indicator	List	14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
Thematic Activity	List	Biological Diversity and Ecosystems
Relevant OSPAR Documentation	Text	CEMP guideline for Common Indicator - By-catch of Marine Mammals
Linkage	URL	https://ices-library.figshare.com/articles/report/Workshop_on_estimation_of_Mortality_of_Marine_MAMmals_due_to_Bycatch/18621857

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Field	Data Type	
		https://www.frontiersin.org/articles/10.3389/fmars.2021.795953/full https://gitlab.univ-lr.fr/pelaverse/rla_paper
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Conditions applying to access and use	URL	https://oap.ospar.org/en/data-policy/



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Our vision is a clean, healthy and biologically diverse North-East Atlantic Ocean, which is productive, used sustainably and resilient to climate change and ocean acidification.

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