Agenda Item 6	Marine Strategy Framework Directive
Document 6	**Report of the Joint ACCOBAMS/ASCOBANS Working Group on the Marine Strategy Framework Directive (MSFD)**
Action Requested	• Take note • Give guidance
Submitted by	MSFD Working Group

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Report from the Joint ACCOBAMS/ASCOBANS Working Group on the

Marine Strategy Framework Directive (MSFD)

Report to the 22nd ASCOBANS Advisory Committee Meeting

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This WG operates via correspondence, and it coordinates and cooperates closely with other relevant scientific bodies and working groups within both Agreements, in particular the sub-regional working groups. The WG liaises with relevant working groups established by other international bodies, i.e. OSPAR and ICES as well as national processes.

The overall aim of this WG is to ensure that cetacean conservation issues are adequately taken account of in the framework of ongoing work related to the MFSD. Therefore the joint ACCOBAMS/ASCOBANS working group on the MSFD will:

1) Collect information on how the implementation of the MSFD is furthered in the various relevant regional fora with regard to (small) cetaceans (e.g. OSPAR, ICES, …)

2) In close cooperation with other scientific bodies and working groups within both Agreements, ensure consistency and identify gaps in the implementation of the MSFD with regard to (small) cetaceans in these regional fora

3) Liaise with scientific bodies and working groups within ACCOBAMS/ASCOBANS that work on matters relevant to the implementation of the MSFD

4) Report back on the conclusions of its work to the relevant working groups of ACCOBAMS/ASCOBANS, and to its relevant scientific and technical bodies

5) Ensure that the conclusions of its work are brought to the attention of the relevant groups working on the implementation of the MSFD

6) Prepare draft ToR for work within ACCOBAMS/ASCOBANS related to the further implementation of the MSFD after 2014

CMS Instrument:

ACCOBAMS

ASCOBANS

1) **Collect information on how the implementation of the MSFD is furthered in the various relevant regional fora with regard to (small) cetaceans (e.g. OSPAR, ICES)**

In 2013, three common mammal biodiversity (Descriptor 1) indicators were proposed by OSPAR ICG-COBAM (Coordination of Biodiversity Assessment and Monitoring).

Code	Previous code	Indicator	Category
M-2	32&34	Distributional range and pattern of cetaceans species regularly present	Core
M-4	36	Abundance at the relevant temporal scale of cetacean species regularly present	Core
M-6	38&39	Numbers of individuals within species being bycaught in relation to population	Core

These were reviewed by ICES (2014) and it was recommended that as these indicators were compound indicators (e.g. indicators that cover more than one species) and do not include specific rules defining how the indicator should operate, they should be broken down to species level, before setting rules for their use (ASCOBANS 2014). ICES further recommended subsuming Indicator M-2 within M-4. The OSPAR indicator technical specification sheet for the revised common indicator M-4 (abundance and distribution of cetaceans) can be found in Annex A. Originally indicator M-4 was developed for OSPAR region II, the greater North Sea, but the geographic scope of this indicator has been extended to include OSPAR's Regions III, Celtic Seas, and IV, Bay of Biscay and Iberian coast.

As of 2015, OSPAR's mammal biodiversity indicator M-6 (bycatch indicator) is currently no longer a common indicator and its further development is on hold.

OSPAR's Biodiversity Committee (BDC) met in March 2015 and the summary record from that meeting is available on OSPAR's website (www.OSPAR.org). The discussions at BDC on biodiversity indicators were based on the results of the work of OSPAR ICG-COBAM, which meets around three times per year. During the course of the BDC meeting, Germany noted that the size and location of assessment units for harbour porpoise in the North Sea are currently being discussed in international forums. Germany wanted to flag that the number, size and location of said assessment units might need to be revised in the ICES request according to the outcomes of international discussions. Further during the course of the meeting, Contracting Parties noted with concern that the quality of the M4 common indicator is dependent on SCANS-III.

Draft assessments for OSPAR's common indicators were expected to be delivered during 2015. However for indicator M-4, the assessment will be undertaken by the ICES WGMME in spring 2016. Prior to ICES undertaking this task, all data will need to be collated and in a format ready for analysis.

For preparatory work for this assessment by the ICES WGMME, an OSPAR ICG-COBAM workshop, provisionally proposed for September or October 2015, will deal with the following proposed agenda:

1 CEMP (environmental monitoring) appendices: prepare second draft.
2 JAMP guidelines: prepare draft and send to national experts and other relevant persons (ICES MME participants, ASCOBANS MSFD WG,).
3 Prepare a request to national and other experts to deliver coastal bottlenose dolphin information for region II-III-IV or point to where such information can be found, and collate readily available information about distribution and abundance (in preparation of an assessment at ICES MME 2016).
4 Data mining: other new information available for reporting (more recent than SCANS II): e.g. SAMMS, DEPONS, PT survey, SP survey.
5 Collate minke whale information in OSPAR Regions II and III, in preparation of ICES MME 2016.
6 Review IA2017 reporting format and identify gaps to be filled. Enter preliminary information and prepare a presentation of this format for MME
7 Identify what can be expected from SCANS III

For the assessment, OSPAR has requested the following from ICES, using the latest versions of the indicator description/summaries (point 1-3 relate to seal indicators):

4. To collate estimates of coastal bottlenose dolphin abundance in the assessment units identified, over an appropriate time frame;
5. To assess trends in abundance (and where possible distribution within range) of coastal bottlenose dolphins in the assessment units identified, against targets proposed;
6. To present an overview of data on cetacean species other than coastal bottlenose dolphins that may be available to make a regional assessment in the frame of indicator M-4;
7. To collate and assess the data identified in (6) against the targets proposed."

This request will help to fulfill the need of OSPAR to report in 2016 on the outcome of the assessment of common indicators related to marine mammals, with a view to include information into the Intermediate Assessment in 2017. The assessments will also be used to meet the national requirements for reporting under Article 8 of the MSFD in 2018.

Table 1. Cetacean indicators proposed/used by Member States in the ASCOBANS region as of August 2015. This table will be continued to be populated when information on indicators and targets becomes available to the WG. *Information last updated September 2014.

Member States	Proposed Indicators	Target
Belgium	Bycatch rate of harbour porpoises vs average population size	
Denmark* **D1 (biodiversity)**	Monitoring of its distribution area Counts of the populations in the Danish territorial seas in the MSFD (Baltic Sea region and in the) North Sea/Skagerrak subregion	
France **D1 (biodiversity),** **D4 (food web),** **D8 (contaminants), D10 (marine litter), and probably D11 (noise)**	Distribution area and pattern of regularly occurring cetaceans	
	Abundance of regularly occurring cetaceans	
	Biodemographic parameters including mortality rates, by-catch rates	
	Diet & Litter in stomachs	
	Causes of death & pollutants	
Germany **D1 (biodiversity)**	Distribution area and pattern of regularly occurring cetaceans	
	Abundance of regularly occurring cetaceans	
	Bycatch of individuals in relation to the population of a species	

	Causes of mortality of cetaceans found dead	
Ireland **D1 (biodiversity) and D4 (food webs)**	Distributional range and distributional pattern within range, at the relevant temporal scale, of cetacean species regularly present (in consultation)	Maintain populations in a healthy state, with no decrease in population size with regard to the baseline (beyond natural variability) and restore populations, where deteriorated due to anthropogenic influences, to a healthy state.
	Abundance, at the relevant temporal scale, of cetacean species regularly present (in consultation)	Maintain populations in a healthy state, with no decrease in population size with regard to the baseline (beyond natural variability) and restore populations, where deteriorated due to anthropogenic influences, to a healthy state.
		Maintain populations in a healthy state, with no decrease in population size with regard to the baseline (beyond natural variability) and restore populations, where deteriorated due to anthropogenic influences, to a healthy state.
Portugal*		
The Netherlands **D1 (biodiversity)**	Population abundance	Not yet defined
	Bycatch mortality of porpoises	1.7% limit
Spain* **D1 (biodiversity)**	Distributional range and pattern	
	Population size	

	Demographic conditions (mortality rates, including by-catch)	
	Litter in stomachs (still to be decided)	
	Pollutants in cetaceans (still to be decided)	
Sweden **D1 (biodiversity)**	Distributional pattern of harbor porpoises[1]	
D1 (biodiversity)	Somatic growth of marine mammals[2]	
UK (Defra 2015) **D1 (biodiversity)**	Distributional pattern within range	At the scale of the MSFD subregions the distribution of cetaceans is not contracting as result of human activities: in all of the indicators monitored there is no statistically significant contraction in the distribution of marine mammals caused by human activities.
D1 (biodiversity)	Population abundance	At the scale of the MSFD subregions abundance of cetaceans is not decreasing as a result of human activity: in all of the indicators monitored, there should be no statistically significant decrease in abundance of marine mammals caused by human activities.

D1 (biodiversity)	Population condition pressure indicators based harbour porpoise bycatch and short-beaked common dolphin bycatch	At the scale of the MSFD subregions cetacean populations are in good condition: mortality of cetaceans due to fishing by-catch is sufficiently low so as not to inhibit conservation objectives being met
D4 (food webs)	Abundance trends of functionally important selected groups/species	At the scale of the MSFD subregions abundance of cetaceans is not decreasing as a result of human activity: in all of the indicators monitored, there should be no statistically significant decrease in abundance of marine mammals caused

[1]Management area: North Sea; Assessment area is not defined yet, indicator is planned to be operational during 2016; strongly coordinated with HELCOM indicator: "Harbour porpoise distribution and abundance" and OSPAR indicator M-2 "Distributional range and pattern of cetaceans species regularly present"

[2]Management area: North Sea (harbor porpoise, harbor seal) and Baltic Sea; Assessment area is not defined yet, indicator is planned to be operational during 2016

Defra (2015) Department for Environment, Food and Rural Affairs. Marine Strategy Framework Directive consultation Programme of Measures: 175 pages https://consult.defra.gov.uk/marine/msfd-programme-of-measures

Proposed mammal indicators for each country in the NE Atlantic

Table 1 outlines the indicators currently proposed/used by each Member State in the NE Atlantic, collated for the purposes of the joint MSFD WG. Although as noted in ASCOBANS (2014), countries boarding OSPAR Region II, the greater North Sea, agreed to participate in the development and usage of OSPAR's common indicators, not all Member States in this region are undertaking this task.

Mammal MSFD indicator development in the ACCOBAMS region

The University of La Rochelle is undertaking a survey that is collating information on the implementation of the MSFD in countries that are parties to ACCOBAMS and other EU non-ACCOBAMS countries. A report on this work will be submitted to the 10th meeting of the scientific committee in October 2015.

2) **In close cooperation with other scientific bodies and working groups within both Agreements, ensure consistency and identify gaps in the implementation of the MSFD with regard to (small) cetaceans in these regional fora**

The MSFD (2008) establishes a framework within which Member States shall take the necessary measures to achieve or maintain good environmental status in the marine environment by the year 2020 at the latest.

The Directive outlined that each Member State shall, in respect of each marine region or subregion concerned, develop a marine strategy for its marine waters. Member States sharing a marine region or subregion shall cooperate to ensure that, within each marine region or subregion, the measures required to achieve the objectives of this Directive are coherent and coordinated. By reason of the transboundary nature of the marine environment, Member States should cooperate to ensure the coordinated development of marine strategies with all Member States and third countries concerned. Where practical and appropriate, existing institutional structures established in marine regions or subregions, in particular Regional Sea Conventions, should be used to ensure such coordination.

In developing and implementing its marine strategy, each Member State shall following the same common approach:

(a) preparation:

(i) an initial assessment of the current environmental status of the waters concerned and the environmental impact of human activities thereon (July 2012);

(ii) determination of good environmental status for the waters concerned (July 2012);

(iii) establishment of a series of environmental targets and associated indicators (July 2012);

(iv) establishment and implementation, except where otherwise specified in the relevant Community legislation, of a monitoring programme for ongoing assessment and regular updating of targets (July 2014);

(b) programme of measures:

(i) development of a programme of measures designed to achieve or maintain good environmental status (by 2015)
(ii) implementation of the programme of measures (by 2016)

Article 19 of the Directive requires that each Member State organizes a public consultation procedure related to the implementation of this Directive. Member States have to ensure that all interested parties are given early and effective opportunities to participate, involving where possible, existing management bodies or structures. Information from Member States with regard to the public consultation process on both the programme of measures and monitoring programmes can be found at http://ec.europa.eu/environment/marine/public-consultation/index_en.htm. A few countries within the ASCOBANS area have not provided information on their public consultation process for their programme of measures and it is not known to the Joint MSFD WG at what stage of the process they are at.

Gaps in the implementation of the MSFD

In 2015, Member States have focused on their programme of measures even though, for the most part, their indicators and targets are not yet confirmed or further work is required for defining baselines and detecting significant trends.

As outlined in ASCOBANS (2014), proposed indicators are largely based on current monitoring requirements for other European legislation. Gaps in the implementation of the MSFD for cetaceans, marine top predators, largely pertain to the deficiency of indicators focusing on pressures and changes in population condition. Currently only one common mammal indicator is being assessed by OSPAR, “abundance and distribution of cetaceans” (indicator M-4). However, in order to understand the root cause of a significant decline in population abundance, additional indicators focusing on pressures (such as bycatch and pollutants) and changes in population condition are necessary for successfully managing that population and achieving GES (ASCOBANS 2014, Murphy et al. 2013). Although some Member States are proposing a bycatch indicator, specific targets have yet to be agreed upon and as outlined earlier, development of OSPAR’s common mammal biodiversity indicator M-6 (bycatch indicator) is currently on hold, predominantly due to a parallel process for developing monitoring in the CFP.

Two metrics for estimating changes in abundance and distribution have been proposed for OSPAR's common mammal indicator, these include "Abundance of the population of the cetacean species" and "Occupancy by the species of an area"; see Annex A. As SCANS-III has not yet been undertaken, a time series of abundance estimates are not currently available for common dolphin or striped dolphin assessment units (see Annex A; SCANS-II and CODA data were used as baselines), or for some harbour porpoise and bottlenose dolphin assessment units within the North-east Atlantic. Further, as outlined in ICES WGMME (2014) the decadal frequency of current surveys of cetaceans that range over wide areas mean that it is very difficult to detect, with any statistical certainty, any change in abundance on a reasonable time scale (a six-year time scale is implied in some EU legislation). This implies that survey frequency needs to be increased – the (societal) choice of statistical power has implications for survey frequency (ASCOBANS 2014).

Discussions are still ongoing over the delineation of assessment units for harbour porpoise and coastal bottlenose dolphins in the North-east Atlantic. For example, the inclusion of a Shannon Estuary resident bottlenose dolphin population assessment unit and division of the North Sea into multiple harbour porpoise assessment units.

3) **Liaise with scientific bodies and working groups within ACCOBAMS/ASCOBANS that work on matters relevant to the implementation of the MSFD**

Since the last Advisory Committee meeting, members of the Joint ACCOBAMS/ASCOBANS WG on MSFD were updated with any new developments on the creation of OSPAR's common mammal indicators.

4) **Report back on the conclusions of its work to the relevant working groups of ACCOBAMS/ASCOBANS, and to its relevant scientific and technical bodies**

A report from the joint working group was submitted to the 22nd Meeting of the Advisory Committee.

5) **Ensure that the conclusions of its work are brought to the attention of the relevant groups working on the implementation of the MSFD**

A copy of this report will be submitted to the forthcoming OSPAR MSFD M4 workshop on Cetacean Indicators. In early 2015, members of the Joint ACCOBAMS/ASCOBANS MSFD WG reviewed and provided input to the OSPAR common indicator technical specification for indicator M-4 (abundance and distribution of cetaceans).

6) **Prepare draft ToR for work within ACCOBAMS/ASCOBANS related to the further implementation of the MSFD after 2014**

Continued implementation of the ToRs agreed at the 20th Advisory Committee meeting.

Acknowledgements

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ANNEX A -

WORKING DOCUMENT

Common Indicator Technical Specification

M-4: Abundance and distribution of cetaceans

Content

A. General overview of the technical specifications

1. Indicator

Name**: Abundance and distribution of cetaceans**[1]

Code: **M-4**

OSPAR Threatened and Declining Species included in indicator: harbour porpoise, bottlenose dolphin

An indicator metric is defined for abundance.

Additionally, it is proposed to set a metric for "occupancy" as a metric for range. In many cases it will be easier to assess occupancy, or distribution within range, than to estimate abundance with precision, particularly in those regions where the species occur in low density. Range and distribution within range is particularly pertinent for those species that may respond to climate change (eg. striped dolphin, common dolphin, white-beaked dolphin), and for coastal bottlenose dolphins.

The focus of the indicator is on a selection of species which are sufficiently common for abundance trends to be realistically measured in the long term. Rarer (and more vulnerable) species (eg. beaked whales, killer whale, Risso's dolphin) might be treated better in the domain of the Habitats Directive than in the MSFD, and they might need alternative approaches for setting GES/FCS, as they might not constitute good indicators for GES. However, they will be recorded anyway by the conventional survey methods, and such data might be useful on smaller scales than envisaged by the MSFD, and in cases where it is clear the species considered is particularly sensitive to the consequences of a human activity.

2. Appropriateness of the indicator

Biodiversity component: Marine Mammals

MSFD criteria: 1.1 Species Distribution; 1.2 Population Size

MSFD indicator: 1.1.2 Distributional pattern within range; 1.2.1 Population abundance

Sensitivity to specific pressures	Relevance to management measures	Practicable	Applicable across region	Consensus among CPs
Low to high Non-specific – indicator of state that responds to multiple pressures	Low to high	Yes, but often within wide confidence margins	Depending on the species: Celtic Sea, Irish Sea, Greater North Sea, Bay of Biscay and Iberian coasts, shelf part of the Atlantic, and if relevant and feasible, oceanic part of the Atlantic	High

Marine mammals, including cetaceans, are top predators, and comprise an important part of biodiversity (Descriptor 1). As cetaceans are included in the Habitats Directive (Annex IV), their abundance (criterion 1.2.) comprises a key aspect for securing and achieving GES according to the MSFD. However, as it is not feasible to monitor all cetacean species, which include uncommon, widely-dispersed and oceanic species, the indicator is limited to the population size of a number of species for which reasonably robust abundance estimates could be obtained, and for which objectives were set or measures proposed in the framework of OSPAR, ASCOBANS, EC fishery regulations and

[1] This indicator is the result of a merger of two common indicators: M-2: cetacean distribution range and pattern and M-4: cetacean abundance. The two indicators were merged based on recommendations of ICES 2014 to BDC 2014 (ICES WGMME, 2014).

the Habitats Directive (Annex II). As existing and necessary monitoring might differ by species, the indicator is subdivided into harbour porpoise, wide ranging species other than the harbour porpoise (common dolphin, striped dolphin, offshore bottlenose dolphin, white-beaked dolphin, minke whale), and coastal bottlenose dolphin.

In many cases there is no straightforward link between the abundance of cetaceans and human activities. There are multiple pressures, and climate change is an additional factor influencing abundance and distribution. A number of human activities may, at least in part, be drivers of trends in abundance and changes in range and distribution within range, and some, like fishery by-catch and pollution, have the potential to cause population decline. As top predators are animals of general public concern, any changes in distribution and abundance should be assessed against changes in human activities as well as climate change to detect cause-effect relationships, where necessary followed by the appropriate measures. The indicator is closely linked to the indicator M-6 on bycatch, as bycatch may be one of the most important impacts on the population for particular cetacean species.

Number of CPs intending to use the indicator or something similar (OSPAR, 2013): 8; consensus among CPs on usefulness as part of a region wide set: 8.

3. Parameter/metric

"Abundance of the population of the cetacean species".

Abundance needs to be assessed at the relevant spatial and temporal scale (as defined below). The same monitoring used to assess changes in abundance can be used to assess changes in range and distribution within range (formerly indicator M-2). An assessment of abundance, including trends over time, is required as part of the Favourable Conservation Status (FSC) assessments for the Habitats Directive for a number of species.

"Occupancy by the species of an area".

Occupancy of an area over the range of the species (eg. number of cells with survey effort occupied or not), to be used for different purposes than abundance, could be easier to assess than to estimate abundance with precision. Changes in occupancy and distribution within range are particularly pertinent for those species that may respond to climate change and for coastal bottlenose dolphins. There might be problems in using occupancy as the only metric, due to the way different species behave. For example, as a population increases, the density might increase, rather than the range extending. Alternatively, changes in occupancy may reflect nothing more than natural movement patterns, so the entire range needs coverage or it will be impossible to say at what point the change noted is significant. Also, changes in distribution within range can be assessed, but it might be difficult to set targets against which those changes should be evaluated.

4. Baseline and reference level

Although the baseline for abundance should ideally derive from historical (i.e. pre-1900) data, these are not available. The historical abundance is unknown and cannot realistically be restored (where it is known to have declined) as today's marine environment is very different. Climatic changes may have important consequences. A modern baseline has to be utilized for abundance. For range and distribution within range, we have better reference data for a number of species.

As abundance estimates typically have wide confidence values, they may not have the power to detect even a quite substantial trend in a short period. Therefore, abundance data should always be considered together with any available data on distributional changes, trends in relative abundance and mortality, including causes of death in stranded animals and possible links with human activities. For a number of species, where possible, the baseline should be derived, for the relevant Assessment Unit (AU), from the two major cetacean surveys undertaken (SCANS and SCANS II). For coastal bottlenose dolphin populations, estimates from other monitoring programmes are available. Proposed baselines are given in Annex 1 (ICES, 2014a).

Regional surveys over smaller scales, but with a higher temporal resolution, can serve as additional information, and combining many small surveys can be useful for elucidating seasonal variability or trends over smaller areas. However, interpretation of such data should always consider the AU scale as context.

5. Target setting

While the original proposed target was: "Maintain populations in a healthy state, with no decrease in population size with regard to the baseline (beyond natural variability), and restore populations, where deteriorated due to anthropogenic influences, to a healthy state", there is no quantitative information on this. Therefore, ICES (2014) proposed an alternative target: "For each AU, maintain the cetacean population size at or above baseline levels, with no decrease of ≥30% over a three generation period". ICES (2014) indicated that for most species and populations it is not possible to set quantitative baselines prior to the relatively recent wide-area quantitative surveys (SCANS, SCANS II, CODA). Management policies should ensure that, should deterioration due to anthropogenic influences occur in the future, a quantitative 'recovery' target is set.

Maintaining a quantified time element in the target, rather than using "long-term", is important. ICES (2014b) provided general advice on the need to understand the statistical power of monitoring programmes before targets are set under MSFD in relation to that monitoring. It obviously is not advisable to set targets that demand a higher statistical precision than can be met within a feasible monitoring programme. The statistical power of a monitoring programme needs to be analysed prior to setting targets. Power analyses were conducted for a number of cetacean species based upon the results of two large-scale surveys (Annex 2). These analyses indicate that surveys every decade (as currently conducted) would have very low power to detect trends and certainly could not detect, e.g. a 1% annual decline over a six-year period as might be required by the EU Habitats Directive. ICES (2014a) considered that a more appropriate time interval to measure change would be a generational scale such as that used by IUCN. If wide-area surveys for cetacean species are increased in frequency to once every three years, it would be possible to detect changes of about 30% over three generations for most species. If practical or financial considerations mean that wide-area surveys cannot be conducted at three-year intervals, then an adjustment in the power to detect change is needed, with the consequential change in magnitude of decrease that could be reliably detected (Annex 2).

Although it seems not advisable to set targets that demand a higher statistical precision than can be met within a feasible monitoring programme, the reality is that it is unlikely that changes of ecological significance in cetacean abundance will be detected by current monitoring efforts. Only setting targets that can be detected with this type of monitoring effectively makes the targets meaningless. Therefore more practical targets need to be set, for instance using trends in relative abundance, also taking account of the fact that important changes in relative abundance, distribution within range and range (assessed using a standardised approach throughout a region) over a shorter period than three generations can trigger action. Also, Member States have to report on trends in abundance and distribution every 6 years, regardless of what can be achieved statistically. The time scale for taking action can therefore be much shorter than three generations.

The target should be assessed in each AU separately.

6. Spatial scope

Assessments need to be undertaken at an appropriate scale, taking some account of population structure, and a good understanding of natural variability and patterns of movement is required prior to any decline or increase in population size being detected and links made with anthropogenic activities. AUs for cetacean species, also to be used in indicator M-6 (bycatch) assessments, have been defined by ASCOBANS (Evans & Teilmann, 2009), were reviewed by ICES (2012), and were revised by ICES (2013, 2014a).

7. Monitoring requirements

The objective of the monitoring should be to detect trends, in particular negative ones, in the abundance of cetacean populations, due to human pressures. The abundance of cetaceans can be

monitored using a variety of techniques. Because of the scale required for assessments, a transboundary approach is recommended, and the collection, collation and analysis of data will be required. Also, strandings data can be useful as complementary information to identify possible anthropogenic impacts, and can contribute to the identification of possible underlying reasons for trends. The interpretation of continuous strandings data at wide spatial ranges can provide relevant information on the distribution of small cetaceans. Stranding correction by drift conditions and the modelling of their reverse drift can detect changes in cetacean distribution at sea (Peltier et al., 2013).

As cetacean monitoring is costly, the frequency at which data should be collected shall depend on the species monitored; it can be yearly and with a high resolution for species with a limited range (e.g. for coastal bottlenose dolphin) up to decadal and with a coarse resolution for wide ranging species. Monitoring is undertaken through a variety of approaches and involves many different organisations each using specific methods. There have been large scale international surveys such as SCANS, SCANS II and CODA, annual and seasonal surveys in the national waters of some Member States and, at a more localised scale, various surveys undertaken by the state, by academic institutions and/or non-governmental organisations. For the monitoring of this indicator, a coordinated combination of these types of survey will be required.

An indication of the surveys required (and the coordination needed) was provided by ICES (2014a). In general, while recognising that some are not feasible:

- Power analysis should be used to assess the effectiveness of the existing survey schemes. Schemes may need to be adjusted to meet the needs for statistical power.
- Replicate surveys increase the statistical power when analysing temporal trends.
- Annual surveys can more accurately detect smaller changes than less frequent surveys.
- The area surveyed should be consistent between years.
- The timing of surveys should be consistent.
- Covariates that affect detectability and those that affect distribution may need to be considered when designing surveys and should be recorded as they may be needed when evaluating results.
- The survey methodology should be standardised. Any revisions of survey methods and design should take care to ensure, as far as possible, comparability with earlier surveys.
- Coordination and compatibility between entities undertaking monitoring within AUs is essential.

Additionally, agreement should be sought on whether to choose between less intensive/more frequent surveys and more intensive/less frequent surveys. Also, if the aim is to estimate the abundance of the population, then the surveys need to cover as much of the population as possible. The distribution could be driven by other covariates than just location.

8. Reporting

Given that populations have a transboundary distribution (except for some coastal bottlenose dolphins), agreements have to be made on monitoring frequency. The monitoring frequency should follow the reporting, as the latter is fixed by the Directive, and the assessment for most species should be made at least every 6 years. In cases where data would be available at a higher temporal resolution (such as for coastal bottlenose dolphins), shorter time periods for the assessments may be appropriate.

9. Resources needed

Cetacean monitoring can range from fairly cheap (monitoring of an inshore population with a limited range) to very expensive (large-scale surveys, and monitoring of an offshore population distributed over a large area). Small-scale surveys with a relatively high frequency are in place in a number of countries, for instance in the frame of offshore marine renewable energy project impact assessment (but these cannot address the longer term monitoring needs within the MSFD) and for a number of species (such as coastal bottlenose dolphin populations). Part of the monitoring is in place (in a combination of indicator M-4 and M-6), while new resources are needed, e.g. for large scale surveys.

10. Further work

Further work and/or agreement is needed as follows:

1) A compilation of existing data on abundance;
2) An agreement on the delimitation of a number of AUs;
3) The development of, and agreement on a number of baselines;
4) An agreement on how much change needs to be detected within which timescale and frequency of surveys;
5) An agreement on temporal scales for monitoring, assessment and reporting by species and AU;
6) The agreement on a standardized monitoring methodology, or alternatively, a mechanism for standardizing data post collection, especially for local (national) surveys in between large-scale surveys (and an agreement to formally include local surveys as part of the monityoring methodology). Both effort-related monitoring of cetaceans and analytical procedures need further refinement and standardisation;
7) An agreement on the integration of national monitoring programmes;
8) The development of a data collection and storage framework, an assessment tool and an agreement on the body that makes the assessment.

B. Detailed technical specifications by species and species group

Harbour porpoise

1. Indicator
"Abundance and distribution of the harbour porpoise"

2. Appropriateness of the indicator
The harbour porpoise is listed in Annex II and IV of the Habitats Directive, and is implicitly referred to in the Indicative list of characteristics, as "species which are the subject of Community legislation". Indicators of harbour porpoise population status are a relevant aspect of defining GES and assessing progress towards GES under Descriptor 1 – Biological Diversity, of the MSFD. An assessment of the abundance of harbour porpoises is a prerequisite for the assessment of bycatch rate (indicator M-6).

3. Parameter/metric
"Abundance of the population of the harbour porpoise".

An assessment of abundance, including trends over time, is required as part of the Favourable Conservation Status (FSC) assessments for the Habitats Directive.

The assessment of abundance, needed for instance for bycatch assessment, will also deliver data on occupancy over time, while additional information for "occupancy by the harbour porpoise of an area" could be delivered through other, less quantified data, such as through strandings data or non-effort related sightings data.

4. Baseline and reference level
The baseline should be derived from the two major cetacean surveys undertaken (SCANS and SCANS II, 1994 and 2005 resp.). Proposed baselines are given in Annex 1 (ICES, 2014).

While often operated over a short temporal and spatial scale, and considereing that they are not specifically designed for MSFD purposes, regional surveys of harbour porpoises over smaller spatial scales, but with a higher temporal resolution (such as national monitoring programmes), can serve as additional sources of information, and can be useful for elucidating seasonal trends or trends in abundance over smaller areas.

5. Target setting
The target proposed by ICES (2014) is: "For each assessment unit, maintain the population size at or above baseline levels, with no decrease of ≥30% over a three generation period". For harbour porpoises, Taylor et al (2007) considered the maximum age of reproducing females to be between 24 and 27 years. In European waters, whilst a maximum life expectancy of 24 years has been recorded, a maximum age of 12 years is considered more normal, with the average age of a reproductive female considered to be 7.5 years (Pierce unpub. data). Power analysis from SCANS type surveys indicates this to be a feasible target (Annex 1). However, given that a three generation period spans decades, it is scarcely a practical time scale over which one can readily respond. Therefore, a more practical target can be:

"For each AU, the likelyhood that the population is at or above baseline levels is high".

6. Spatial scope
Harbour porpoises are widely distributed in the shelf seas of OSPAR regions II, III, and IV, with little interaction known with adjacent regions – though further investigation is needed of northwards interactions to Region 1 along the coast of Norway. In addition, the OSPAR boundary in the Kattegat runs across the population distribution in that area. Sweden and Denmark will need to work together,

with HELCOM involved, to set agreed targets and consequent monitoring and assessment schemes in this AU.

The proposed AUs for harbour porpoise are given in figure 1. They originate from ICES advice, and can be reviewed as more evidence becomes available. They can be described as:

a) North Sea: ICES Subarea IV, Division VIId, and part of Division IIIa (Skagerrak);
b) Kattegat and Belt Seas: Part of ICES Division IIIa (Kattegat) and Baltic Areas 22 and 23;
c) Western Scotland and Northern Ireland: ICES Division VIa and Subdivision VIb2;
d) Celtic Sea and Irish Sea: ICES Subarea VII with the exception of Division VIId (note that there are very few harbour porpoises in the deeper parts of OSPAR regions III and IV);
e) Iberian Peninsula: ICES Divisions VIIIc and IXa.

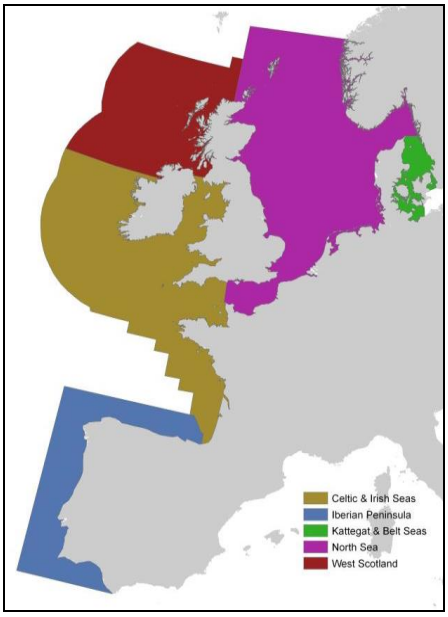

Figure 1. Recommended harbour porpoise AUs for OSPAR MSFD indicator assessments (ICES, 2014)

7. Monitoring requirements

Aerial- and ship-based surveys; large-scale surveys every 6 years, complemented by more frequent surveys at a smaller spatial scale that yield information at a higher spatial and temporal resolution; long time-series of strandings.

White-beaked dolphin

1. Indicator
"Abundance and distribution of the white-beaked dolphin"

2. Appropriateness of the indicator
The white-beaked dolphin occurs over a large part of the northern European continental shelf, including OSPAR regions II and III. While it might be vulnerable to a number of human activities, such as those resulting in pollution, climate change and prey availability, not much is known of this. The population within OSPAR region II and III is much smaller than the one of the harbour porpoise.

3. Parameter/metric
"Abundance of the population of the white-beaked dolphin".

4. Baseline and reference level
The baseline should be derived from the two major cetacean surveys undertaken (SCANS and SCANS II). Proposed baselines are given in Annex 1 (ICES, 2014a).

No information exists on the past state or on a state with negligible impacts. The 95% confidence intervals for the baseline proposed in Annex 1, only covering the areas covered by SCANS II and CODA, are 9107 and 27 743 around a best estimate of approximately 16 000 animals.

5. Target setting
A suitable target for the white-beaked dolphin population in OSPAR areas II and III could be (ICES, 2014): "Maintain the white-beaked dolphin population size at or above the baseline levels, with no decrease of ≥30% over a three-generation period (54 years)". Annex 1 details the power to detect change for wide-area surveys with different frequencies. Even with surveys with a relatively high frequency, the power to detect change is low. Given that a three generation period spans decades, it is scarcely a practical time scale over which one can readily respond. Therefore, a more practical target can be:

"The likelyhood that the population is at or above baseline levels is high".

6. Spatial scope
ICES currently advises a single AU for OSPAR regions II and III for white-beaked dolphin. Given recent genetic studies, this AU might need revision in the near future. The species occurs only occasionally in Region IV.

7. Monitoring requirements
Aerial- and ship-based surveys; large-scale surveys every 6 years, complemented by more frequent surveys at a smaller spatial scale that yield information at a higher spatial and temporal resolution; additional information provided by long time-series of strandings.

Offshore bottlenose dolphin

1. Indicator
"Abundance and distribution of the offshore bottlenose dolphin"

2. Appropriateness of the indicator
Next to bottlenose dolphins occurring close inshore, there is a much larger population that occurs in the offshore parts of OSPAR regions I, III, IV and V.

3. Parameter/metric
"Abundance of the population of the offshore bottlenose dolphin".

4. Baseline and reference level
The baseline level for bottlenose dolphins in the Northeast Atlantic has yet to be calculated.

5. Target setting
The target proposed by ICES (2014a) is: "For each assessment unit, maintain the population size at or above baseline levels, with no decrease of ≥30% over a three generation period".

The population extends over a much wider area than regions III and IV, and ICES advises not setting a target for a subset of this wider distribution. If it would be required to set a target for this wider distribution by including (parts of) Region I and V, a suitable target might be: "Maintain the offshore NE Atlantic bottlenose dolphin population size at or above the baseline level, with no decrease of ≥30% over a three-generation period (63 years)". This target would require monitoring over a relatively large area (including deeper Atlantic waters) at more regular intervals (three to five years) than the decadal survey intervals used previously.

Given that a three generation period spans decades, it is scarcely a practical time scale over which one can readily respond. Therefore, a more practical target can be:

"The likelyhood that the population is at or above baseline levels is high".

6. Spatial scope
The bottlenose dolphins in offshore parts of OSPAR regions III and IV are likely to be part of a population with a much wider distribution that extends into Region I and V.

7. Monitoring requirements
Aerial- and ship-based surveys; large-scale surveys every 6 years, such as SCANS and CODA.

Coastal (inshore) bottlenose dolphin

1. Indicator

"Abundance and distribution of the coastal bottlenose dolphin"

2. Appropriateness of the indicator

Resident populations of bottlenose dolphins occur in inshore parts of OSPAR regions II, III, and IV. There are interactions between some of the suggested AUs, and also between these AUs and populations further offshore. Although it is not believed that these interactions are large scale, further research is needed to ensure this understanding is correct. A number of inshore areas, in particular estuaries, are known to have held bottlenose dolphin populations in the (recent) past.

3. Parameter/metric

"Abundance of the populations of the coastal bottlenose dolphin".

"Occupancy of an area by inshore bottlenose dolphins".

Some of the groups of coastal/resident populations are monitored photographically every year and it would be relatively easy to detect range changes on the basis of occupancy of these groups. The length of coastline occupied could be used as an additional metric, encompassing both distribution and range.

4. Baseline and reference level

The baseline for abundance would need to be set using current data as no quantitative information exists on the past state or on a state with negligible impacts. Baseline levels for abundance for each AU are proposed in Annex 1.

The current percentage of the length of coastline occupied occasionally and regularly, with a quantification of occupancy rate, could be used as a baseline for distribution and range. However, given that a number of inshore areas are known to have held bottlenose dolphin populations in the (recent) past, these data can be used to estimate a historic baseline for occupancy/range. Issues might exist in teasing natural changes apart from human-induced ones.

5. Target setting

A suitable target might be (ICES, 2014): "For each AU, maintain inshore bottlenose dolphin population sizes at or above baseline levels, with no decrease of ≥30% over any ten-year period". However, as many populations have declined severely, and some have even become rare visitors in areas in which populations used to occur (such as in the southern North Sea), a restoration target may be appropriate on the long term. As important changes may occur over shorter time frames, a more practical target can be:

"The likelyhood that the population is at or above baseline levels is high".

A percentage growth or shrinkage of the length of coastline occupied could be used in a target for distribution and range. Considerable and consistent monitoring effort would be required at the edges of the coastal range to detect change reliably. If a baseline for occupancy is used that describes a historic situation, including areas where populations of the species occurred in a recent past (eg. mid-20th century), the target will inevitably include a restoration of the former occupancy.

6. Spatial scope

The proposed AUs for the inshore populations of bottlenose dolphin (figure 2) essentially encompass the relatively discrete range of each resident group. Using the currently available information, they can be described as:

a) West coast of Scotland;
b) East coast of Scotland;
c) West and North Wales;

d) West coast of Ireland, excluding the Shannon Estuary;
e) Shannon Estuary
f) Southwest England;
g) Normandy/Brittany;
h) North coast of Spain;
i) Southern Galician Rias (Spain);
j) Coast of Portugal;
k) Gulf of Cadiz.

This is not a comprehensive list of coastal groups as there are further groups of coastal bottlenose dolphins; however, their relationships with other groups are at present uncertain. Should further research reveal either changes in boundaries to the above units or additions to them, OSPAR could amend the list of AUs at a later date. Bottlenose dolphins also occur in offshore waters, but their distribution overlaps with OSPAR Region V (and to a lesser extent, I). Should OSPAR choose to include these regions in the implementation of the part of MSFD, AUs could be added to cover these dolphins.

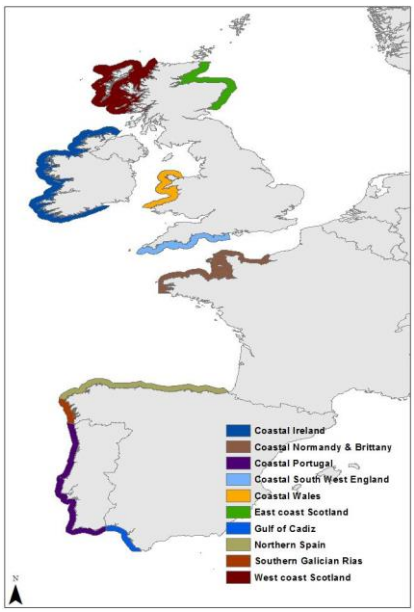

Figure 2. Recommended coastal bottlenose dolphin assessment units for OSPAR MSFD indicator assessments (ICES, 2014).

7. Monitoring requirements

Photo-ID is the main method, but ship- and landbased surveys can be appropriate; frequency can range from annually to every six years.

Short-beaked common dolphin

1. Indicator

"Abundance and distribution of the short-beaked common dolphin"

2. Appropriateness of the indicator

The common dolphins in OSPAR regions II, III, and IV are part of a wider Northeast Atlantic AU. Bycatch is a known problem for the species.

3. Parameter/metric

"Abundance of the populations of the short-beaked common dolphin".

"Occupancy of an area by common dolphins".

4. Baseline and reference level

A target for abundance would require monitoring over a relatively large area (including deeper Atlantic waters) at more regular intervals (three to five years) than the decadal survey intervals used previously. If surveys cannot occur at this spatial scale, OSPAR may then wish to consider not setting a target. The baseline level for abundance of the common dolphins in the Northeast Atlantic has yet to be calculated.

5. Target setting

As the common dolphins in OSPAR regions II, III and IV are part of a wider AU, including Region V, ICES advises not setting an abundance target for a subset of this unit. If a target would be needed, it should include parts of Region V, and it could be: "Maintain the Northeast Atlantic common dolphin population size at or above the baseline level, with no decrease of ≥30% over a three-generation period (44 years)".

Given that the three generation period spans decades, it is scarcely a practical time scale over which one can readily respond. Therefore, a more practical target can be:

"The likelyhood that the population is at or above baseline levels is high".

6. Spatial scope

A single AU for OSPAR regions II, III, and IV is proposed, on the basis that the species widely ranges in the waters of the Northeast Atlantic, from Scotland to Portugal (ICES, 2014). It is possible that separate offshore and shelf ecotypes exist but further study is required to elucidate this.

7. Monitoring requirements

Aerial- and ship-based surveys; large-scale surveys every 6 years (driven by the reporting frequency and the nature of the surveys), such as SCANS and CODA; long time-series of strandings.

Striped dolphin

1. Indicator
"Abundance and distribution of the striped dolphin"

2. Appropriateness of the indicator
Within European Atlantic waters, striped dolphins occur mainly OSPAR Regions IV and V. It is an abundant species in OSPAR Region IV, and is the main species experiencing bycatch in that region. It appears to be responding to climate change, extending its range northwards.

3. Parameter/metric
"Abundance of the populations of the striped dolphin".

"Occupancy of an area by striped dolphins".

4. Baseline and reference level
A baseline for abundance, with a very wide CV, is proposed in Annex I.

Information exists about the current occupancy/range, including information where the species occurs regularly and occasionally; this information could be used as a baseline for occupancy/range.

5. Target setting
Should one wish to set an abundance target, it would need to include parts of OSPAR Region V, and could be: "Maintain the striped dolphin population size at or above the baseline level, with no decrease of ≥30% over a three-generation period".

Given that the three generation period spans decades, it is scarcely a practical time scale over which one can readily respond. Therefore, a more practical target can be:

"The likelyhood that the population is at or above baseline levels is high".

6. Spatial scope
Within European Atlantic waters, striped dolphins occur mainly in OSPAR Regions IV and V.

7. Monitoring requirements
Setting an abundance target would require monitoring over a relatively large area (including deeper Atlantic waters) at more regular intervals (three to five years) than the decadal survey intervals used previously. If surveys cannot occur at this spatial scale, it might not be useful to set a target. The monitoring should consist of aerial- and ship-based surveys; large-scale surveys every 6 years, such as SCANS and CODA.

Smaller scale surveys could yield information about relative abundance and occupancy, as well as long time-series of strandings.

Minke whale

1. Indicator
"Abundance and distribution of the minke whale"

2. Appropriateness of the indicator
The minke whale population in OSPAR regions II and III appears to be relatively discrete (although some further investigation would be advisable).

3. Parameter/metric
"Abundance of the populations of the minke whale".

"Occupancy of an area by minke whales".

4. Baseline and reference level
Minke whales have been hunted in OSPAR Region III in the past and are still hunted in adjacent waters to the EU, but it is not known whether the current population size is depleted or not. Little information exists on the past state or on a state with negligible impacts. The 95% confidence intervals for the abundance baseline are 13 772–38 958 around a best estimate of approximately 23 200 animals (Annex 1).

5. Target setting
A suitable abundance target for this population might be (ICES, 2014): "Maintain the minke whale population size at or above the baseline levels, with no decrease of ≥30% over a three-generation period (66 years)". Given that a three generation period spans decades, it is scarcely a practical time scale over which one can readily respond. Therefore, a more practical target can be:

"The likelyhood that the population is at or above baseline levels is high".

6. Spatial scope
A single AU for minke whale is advised for OSPAR Regions II, III, and IV (ICES, 2014). The species also occurs in OSPAR Region I.

7. Monitoring requirements
Regular surveys undertaken by TNASS and Norwegian surveys, with additional information from other large-scale surveys (SCANS, CODA). Regional surveys of minke whales over smaller spatial scales, but with a higher temporal resolution, can serve as additional sources of information, such as for elucidating seasonal trends or trends in abundance over smaller areas.

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Annex 1. Baselines proposed for cetacean species regularly present

Species	Assessment units	Year	Abundance estimate	CV	SE	95% CI
Harbour porpoise	Kattegat and Belt seas	1994	27 923	0.46		11 831–65 901
	North Sea	1994	273 918	0.15		204 478–366 939
	West Scotland and Northern Ireland	2005	21 4621	0.42		9 740–47 289
	Celtic Sea and Western Ireland	2005	106 382	0.32		57 689–196 176
	Iberian Peninsula	2005	4 398	0.92		948–20 410
Bottlenose dolphin	East coast of Scotland	1990–1993	129		± 15	110–174
	West coast of Scotland	2006–2007	45	33–66		
	Cardigan Bay	2001–2007	397	0.23		362–414
	West Coast Ireland	2014	ca. 190			
	SW England	2009–2013	ca. 140			
	Brittany and Normandy[1]	2000	ca. 160			
	Northern Spain[2]	2003–2011	10 687	0.26		4 094–18 132
	Southern Galician Rias (NW Spain)	2000–2010	> 255			
	Coastal Portugal	2010	3 051	0.78		294–31 666
	Gulf of Cadiz	2009–2010	397	0.17		300–562
	Offshore[3]	2005/2007	11 923	0.21		7 935–17 915
White-beaked dolphin	Britain and Ireland	2005	15 895	0.29		9 107–27 743
Minke whale	European North Atlantic	2005/2007	23 163	0.27		13 772–38 958
Short-beaked common dolphin	European North Atlantic	2005/2007	174 485	0.26		105 694–288 048
Striped dolphin	European North Atlantic	2007	61 364	0.93		12 323–305 568

[1] This estimate is a combination of that for individuals in the archipelago of Molene (Brittany) and those in the Normandy region (western part of the Cotentin peninsula).

[2] Estimate for the Northern Spain AU includes animals from the Bay of Biscay.

[3] Estimate currently excludes animals from the Bay of Biscay.

Annex 2. Precision (CV) of estimates of abundance and power (%) to detect a 30% decline in three generations, obtained from existing large-scale, decadal distance-sampling surveys using ships and aircraft. Power is shown for the two significance levels of 0.05 and 0.2. The generation time was based on Taylor et al. (2007) for all species, and an additional calculation for a European harbour porpoise generation time of 7.5 years. Taylor et al (2007) considered the maximum age of reproducing females to be between 24 and 27 years. In European waters, whilst a maximum life expectancy of 24 years has been recorded, a maximum age of 12 years is considered more normal, with the average age of a reproductive females considered to be 7.5 years (Pierce unpub. data).

Monitoring activity	Species (generation time in years)	CV of measured estimate of abundance	Power (%) to detect trends in abundance, survey every 10 years		Power (%) to detect trends in abundance, survey every 5 years		Power (%) to detect trends in abundance, survey every 3 years	
			$\alpha = 0.05$	$\alpha = 0.2$	$\alpha = 0.05$	$\alpha = 0.2$	$\alpha = 0.05$	$\alpha = 0.2$
SCANS (ships and aircraft)	Harbour porpoise (11.9)	0.14	20	57	50	81	69	91
	Harbour porpoise (7.5 European)	0.14	11	42	28	66	50	81
	White-beaked dolphin (18.1)	0.3	12	36	20	46	30	58
	Minke whale (22.1)	0.24	18	47	35	64	51	77
SCANS and SCANS II	Harbour porpoise (11.9)	0.20	13	42	28	59	57	72
	Harbour porpoise (7.5 European)	0.20	8	32	17	47	28	59
	Short-beaked short-beaked common dolphin (14.8)	0.23	14	41	30	54	38	68
	White-beaked dolphin (18.1)	0.30	12	36	20	46	30	58
	Minke whale (22.1)	0.35	11	34	18	43	28	55