Agenda Item 6	Relevant EU Policy Matters
Information Document 6b/Rev.1	**Report from the Joint ACCOBAMS / ASCOBANS Working Group on the Marine Strategy Framework Directive to AC25**
Action Requested	Take note
Submitted by	Joint Working Group on MSFD

Note:
Delegates are kindly reminded to bring their own document copies to the meeting, if needed.

Report from the Joint ACCOBAMS/ASCOBANS Working Group on the Marine Strategy Framework Directive (MSFD)

Report to the 25th 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 2014 and 2015, the ACCOBAMS/ASCOBANS working group on the MSFD previously reported to the ASCOBANS Advisory Committee on assessment units employed for cetaceans in the OSPAR region, common mammal indicators employed by OSPAR, national cetacean indicators that were in development, as well as gaps, with regard to small cetaceans, in both national and OSPAR's MSFD implementation and assessment strategies (ASCOBANS, 2014; 2015).

OSPAR published its Intermediate Assessment in 2017 and included a number of common marine mammal indicators within Descriptors 1 (biodiversity) and 4 (food webs). For cetaceans these are outlined in Table 1. For the cetacean abundance and distribution indicator (excluding coastal bottlenose dolphins), an assessment value was not applied to these data, but a trend assessment was undertaken - though that required three or more comparable estimates of abundance per assessment unit. These types of data were only available for the harbour porpoise, white-beaked dolphin and minke whale in the North Sea, and harbour porpoise in the Skagerrak / Kattegat / Belt Seas. Results of this work reported a lack of evidence of any trend in abundance for these species in these regions (OSPAR, 2017). OSPAR noted that '*For other species, it is not possible to assess with any confidence whether populations are decreasing, stable or increasing. Nevertheless, the most recent estimates of abundance for 2016 are similar to or larger than earlier estimates for comparable areas*. *There is moderate confidence in the methodology and low confidence in the data availability*.'

Table 1. Common cetacean indicators employed within OSPARs intermediate assessment (OSPAR, 2017).

Descriptors	Indicator	Species	Assessment criteria
D1.1 - Species distribution **D1.2 - Population size** **D4.3 - Abundance/distribution of key trophic groups/species**	Abundance and Distribution of Cetaceans	Harbour porpoise Offshore population of bottlenose dolphin White-beaked dolphin Short-beaked common dolphin Striped dolphin Minke whale Fin whale Long-finned pilot whale Sperm whale	No assessment value has been applied in this assessment. For a trends assessment: a significant decline means a decreasing trend of ≥5% over 10 years (significance level $p<0.05$); a significant increase means an increasing trend of ≥5% over 10 years (significance level $p<0.05$); stable means population changes of <5% over 10 years.

		Beaked whales (as a combined species group, Ziphiidae)."	
D1.1 - Species distribution **D1.2 - Population size** **D4.3 - Abundance/distribution of key trophic groups/species**	Abundance and Distribution of Coastal Bottlenose Dolphins	Coastal bottlenose dolphins	No assessment value has been applied in this assessment. For a trends assessment: a significant decline means a decreasing trend of ≥5% over 10 years (significance level $p<0.05$); a significant increase means an increasing trend of ≥5% over 10 years (significance level $p<0.05$); stable means population changes of <5% over 10 years.
D1.1 - Species distribution **D1.2 - Population size** **D4.3 - Abundance/distribution of key trophic groups/species**	Pilot Assessment on Abundance and Distribution of Killer Whales	Killer whale – assessment units TBC	TBC
D1.3 - Population condition	Harbour Porpoise Bycatch	Harbour porpoise	TBC

For the abundance and distribution of coastal bottlenose dolphin's indicator, an overview of results of the assessment is provided in Table 2. For many assessment units, no assessment could be undertaken and where trend could it assessed, the populations showed little long-term change, apart from the declining population in the Sado Estuary in Portugal. As OSPAR noted '*Most populations of coastal bottlenose dolphins in the areas assessed are relatively small. In many coastal areas of the North-East Atlantic Ocean, populations declined or disappeared completely during the 19th and 20th centuries*.'

A pilot assessment on the abundance and distribution of killer whales was included in the intermediate assessment, however as no assessment units were defined, and to a lack of suitable data, it was not possible to assess trend in abundance.

Finally, a harbour porpoise bycatch indicator was included in the intermediate assessment, though an assessment value was not agreed upon. Continued development of this indicator will be undertaken

by OSPAR's Marine Mammal Expert Group and a joint OSPAR-HELCOM workshop to examine possibilities for developing indicators for incidental by-catch of birds and marine mammals in September 2019.

Table 2: Summary of available data and population trend for each coastal bottlenose dolphin assessment unit where an assessment has been made. Taken from OSPAR (2017).

Assessment Unit	Length of time series		Population trend
	≥10 year	≥4 abundance assessments	
West Coast Scotland	No	No	No assessment
East Coast Scotland	Yes	Yes	Possible Increase/Stable
Coastal Wales	Yes	Yes	Stable
Coastal Ireland	Yes	Yes	Stable
Coastal Southwest England	No	No	No assessment
Coastal Normandy and Brittany	No	Yes	Increase/Stable (indicative)
Northern Spain	No	No	No assessment
Southern Galician Rias (Spain)	No	No	No assessment
Coastal Portual	No	No	No assessment
Coastal Portual (Sado Estuary)	Yes	Yes	Decline
Gulf of Cadiz	No	No	No assessment

An overview of the cetacean indicators currently employed by OSPAR's Contracting Parties is shown in Table 3. Similar information summarising indicators currently employed by Contracting Parties within the HELCOM region will be presented in next year's report. Further information on the core indicators being developed by HELCOM for assessing Baltic Sea trends can be found at http://www.helcom.fi/baltic-sea-trends/indicators/.

A number of Contracting Parties in the OSPAR region are employing the OSPAR's common marine mammal indicators, including Denmark, France, the Netherlands and the UK. Separate national cetacean indicators (though some are variants of the common indicators) are being employed by Belgium, France, Germany, the Macaronesian region (of Portugal and Spain), Spain, and Sweden. Indicators are currently in consultation in both Ireland and mainland Portugal.

As can be seen by Table 3, countries are mainly employing indicators related to population size, distribution, and population condition (effects from bycatch). As outlined in ICES WKDIVAGG (2018) "*The German MSFD Report and assessment structure are based as much as possible on the new COM decision 2017/848/EU. Within the assessment, a so called 'Evaluation cascade' is used: 1. Existing EU reporting obligations or regional assessments (OSPAR, HELCOM), 2. Supplementary national assessments, 3. Assessment from the 2012. As a result, the assessment should be coherent in the relevant marine region according to the RSC and in line with the Habitats Directive (HD) assessment.*" Within the German MSFD assessment, indicators for harbour porpoises were not only related to abundance, distribution and mortality from incidental capture, but also include 'population demographic characteristics' such as age distribution, and 'habitat for species', i.e. habitat condition.

Other countries are also employing indicators, or using data that will contribute to indicators, based on cetacean strandings, including Belgium, France and Spain.

In many cases targets/assessment values/thresholds have yet to be determined for indicators being employed by Contracting Parties, and as thus these indicators are still in development. In Sweden, data were insufficient for a quantitative assessment of abundance and distribution, and thereby no target was set. Though if assessment values/thresholds for harbour porpoise population size and distribution can be agreed on in the future they were be used in future assessments.

Figure 1 outlines how indicators and targets were integrated to assess Good Environmental Status (GES) for cetaceans by the UK in collaboration with OSPAR. Indicators for population size and population condition (numbers of cetaceans killed through bycatch in fisheries) were included in the assessment. The status of each species was assessed separately for all indicators. For the most part, cetaceans found in UK waters are part of much larger populations, with ranges extending beyond UK waters. Thus, the appropriate scale for the assessment of GES is at their assessment unit level.

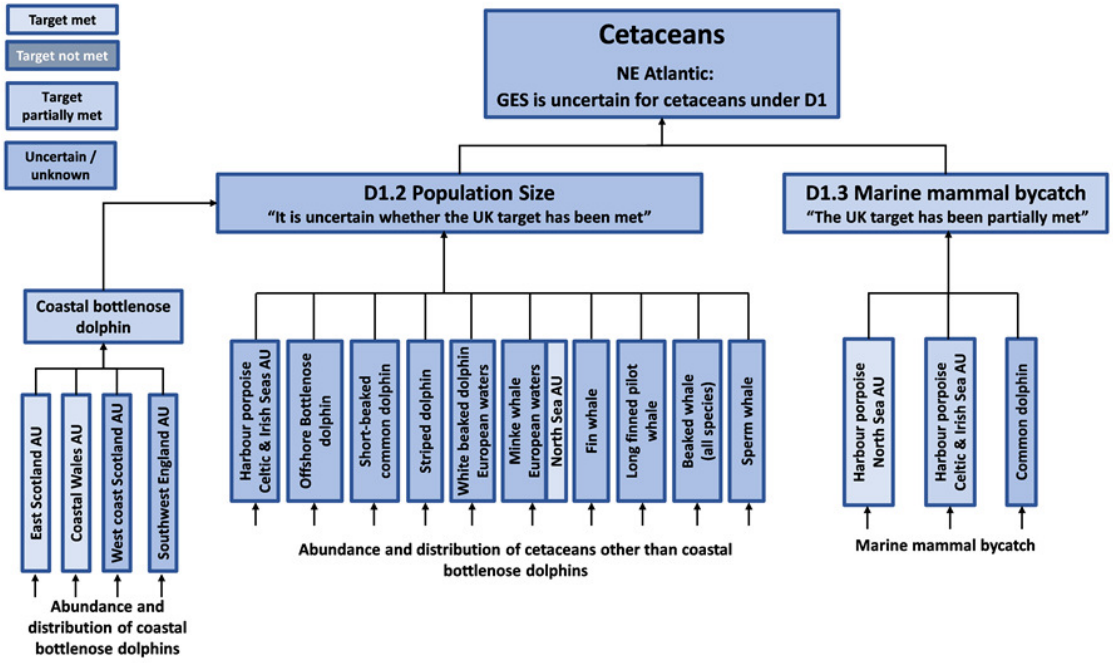

Figure 1. Schematic showing how indicators and targets were integrated to assess progress towards Good Environmental Status (GES) for cetaceans in the North East (NE) Atlantic. AU: Assessment Unit. D1 indicates the Marine Strategy Framework Directive Descriptor 1: "Biological diversity is maintained." (European Commission, 2008), with D1.2 D1.3 referring to the targets defined in the UK Marine Strategy Part One. Taken from https://moat.cefas.co.uk/biodiversity-food-webs-and-marine-protected-areas/cetaceans/.

How indicators will be integrated across species, functional groups, countries and descriptors, to provide an overall assessment of GES for MSFD sub-regions has yet to be decided, though in 2016 ICES advised the EU on a 'species approach' framework for aggregating mammal indicators to species group level (ICES Advice, 2016). Consideration has been given to a range of integration methods such as one-out-all-out, averages, weighted averages, proportional and probabilistic methods (ICES WKD1Agg, 2016; ICES WKDIVAGG, 2018).

Table 3. Cetacean indicators currently employed by Contracting Parties in the OSPAR region as of August 2019. This table will be continued to be populated when information on indicators and targets becomes available to the WG.

Member States	Proposed Indicators	Species	Assessment value/ threshold value/target
Belgium			
D1.1	Mortality among harbour porpoises due to bycatch is lower than the level at which the population is threatened	Harbour porpoise	TBC
D1.2	The long-term trend in the percentage of bycaught porpoises amongst stranded porpoises is decreasing.	Harbour porpoise	TBC
Denmark			
D1.1 - Species distribution **D1.2 - Population size** **D4.3 - Abundance/distribution of key trophic groups/species**	Abundance and distribution of cetaceans *OSPAR Common Indicator M4*	Harbour porpoise	No assessment value has been applied in this assessment. For a trends assessment: a significant decline means a decreasing trend of ≥5% over 10 years (significance level $p<0.05$); a significant increase means an increasing trend of ≥5% over 10 years (significance level $p<0.05$); stable means population changes of <5% over 10 years.

D1.3 - Population condition	Harbour porpoise bycatch *OSPAR Common Indicator M6*	Harbour porpoise	This common indicator currently does not have an assessment value. It will be decided upon by OSPAR in 2019/2020.
France[1]			
D1C1 **D1C2**	Incidental mortality rate (bycatch observer data) *OSPAR Common Indicator M6*	Harbour porpoise	This common indicator currently does not have an assessment value. It will be decided upon by OSPAR in 2019/2020.
	Bycatch mortality rate (strandings data) *National Indicator*	Common dolphin Harbour porpoise	
	Abundance of Cetaceans *OSPAR Common Indicator M4*	Harbour porpoise Bottlenose dolphin White-beaked dolphin Minke whale	No assessment value has been applied in this assessment. For a trends assessment: a significant decline means a decreasing trend of ≥5% over 10 years (significance level $p<0.05$); a significant increase means an increasing trend of ≥5% over 10 years (significance level $p<0.05$); stable means population changes of <5% over 10 years.

[1] Spitz, J., Peltier, H., and Authier, M. (2018). Évaluation du descripteur 1 « Biodiversité - Mammifères marins » en France Métropolitaine. Rapport scientifique pour l'évaluation 2018 au titre de la DCSMM. Observatoire PELAGIS – UMS 3462, Université de La Rochelle / CNRS, 170 Pp.

D1C3	Trend in the relative abundance of Cetaceans *National Indicator*	Common dolphin Striped dolphin Bottlenose dolphin Pilot whale Risso's dolphin Minke whale	
	Recurrence of unusual mortality events *National indicator*	Common dolphin Harbour porpoise Striped dolphin	
D1C4	Trends in occupancy of cetaceans *National indicator*	Common dolphin Striped dolphin Bottlenose dolphin Pilot whale Risso's dolphin Minke whale Fin whale	

Germany[2]			
D1C2 – Population abundance	Abundance (number of individuals)	Harbour porpoise	Favourable conservation status of the population according to national FFH assessment.
D1C4 - Population distributional range and pattern	Distribution (spatial)	Harbour porpoise	Favourable conservation status of the population according to national FFH assessment.
D1C3 - Population demographic characteristics	Age distribution	Harbour porpoise	Favourable conservation status of the population according to national FFH assessment.
D1C5 - Habitat for the species	Habitat Condition	Harbour porpoise	Favourable conservation status of the population according to national FFH assessment.
D1C1 - Mortality rate from incidentally by-catch	Mortality rate / mortality rate from fishing (F) - *OSPAR Common Indicator M6* - *HELCOM number of drowned mammals and waterbirds in fishing gear* -	Harbour porpoise	This common indicator currently does not have an assessment value. It will be decided upon by OSPAR-HELCOM in 2019/2020.

[2] https://cdr.eionet.europa.eu/Converters/run_conversion?file=de/eu/msfd_art17/2018reporting/xmldata/envxlcruw/DE_ART8_GES.xml&conv=577&source=remote#

Ireland[3]			
	Currently in consultation		
Portugal			
	Currently in consultation		
Macaronesian region (Portugal & Spain)[4,5]			
D1.2	Population size: The population size does not deviate from the natural fluctuations of the population	Bottlenose dolphin Short-finned pilot whale Cuvier's beaked whale Atlantic spotted dolphin Short-beaked common dolphin Risso's dolphin Bryde's whale Sperm whale	Population size is at or above baseline levels, with no observed estimated or projected reduction of ≥10% over a 20-year period.

[3] Ireland's Marine Strategy Framework Directive Article 19 Report Initial Assessment, GES and Targets and Indicators published in 2013 did not employ indicators or targets for cetaceans. A second assessment is currently being undertaken, which may include indicators for cetaceans.

[4] MISTIC SEAS project (http://mistic-seas.madeira.gov.pt/en/content/products)

[5] Species implementation depends on the region within Macaronesia

D.1.2	Population size: population size attains levels allowing it to qualify to the Least Concern category of the IUCN	Sperm whale Fin whale	Maintain positive population growth rate until GES is reached.
D1.3	Population condition: population demographic characteristics (productivity, survival rate, calf survival etc.) are not adversely affected by human activities and ensure the long-term variability of the population	Short-finned pilot whales Risso's dolphin Bryde's whale Bottlenose dolphin Cuvier's beaked whale Sperm whale	No statistical significant decrease in survival rates from baseline values.
		Sperm whale	Mortality Rate from ship strikes close to zero.
The Netherlands			
D1.1 - Species distribution **D1.2 - Population size** **D4.3 - Abundance/distribution of key trophic groups/species**	Abundance and distribution of cetaceans *OSPAR Common Indicator M4*	Harbour porpoise	No assessment value has been applied in this assessment. For a trends assessment: a significant decline means a decreasing trend of ≥5% over 10 years (significance level $p<0.05$); a significant increase means an increasing trend of ≥5% over 10 years (significance level $p<0.05$); stable means population changes of <5% over 10 years.

D1.3 - Population condition	Harbour porpoise bycatch *OSPAR Common Indicator M6*	Harbour porpoise	This common indicator currently does not have an assessment value. It will be decided upon by OSPAR in 2019/2020.
Spain[6]			
MT-tam D1.2.1	Population size (Abundance, no. Individuals) *National indicator*	Harbour porpoise Common dolphin Bottlenose dolphin Atlantic fin whale	Maintain or restore the natural balance of the populations of key species for the ecosystem.
MT-dist D1.1.1 D1.1.2	Range and pattern of distribution of the populations *National indicator*	Harbour porpoise Common dolphin Bottlenose dolphin Atlantic fin whale	The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.

[6] Estrategias marinas VI. Programmas de seguimento VI.1: Anexo fichas indicadores. (2014). https://www.miteco.gob.es/es/costas/temas/proteccion-medio-marino/estrategias-marinas/eemm_1erciclo_fase4.aspx

MT-dem D1.3.1	Demographic characteristics of the population (mortality rate) (Parameters required for analysis- population size, mortality caused by these pressures. Others (birth rate, survival / mortality rate, etc.)) *National indicator*	All species of cetaceans	Reduce the main causes of mortality and decrease of populations of groups of non-commercial species in the top of the food chain (marine mammals, reptiles, birds marine, pelagic and demersal elasmobranchs), such as accidental catches, boat collisions, ingestion of marine litter, introduced land predators, pollution, destruction of habitats and overfishing.
Sweden			
	Abundance	Harbour porpoise	TBC; qualitative description based on long time trends[7]

[7] https://www.havochvatten.se/download/18.5b07be29168ba461a9846f4a/1549542287388/rapport-2018-27-marin-strategi-for-nordsjon-och-ostersjon-2018-2023.pdf

United Kingdom[8, 9, 10]			
D1.1 - Species distribution **D1.2 - Population size** **D4.3 - Abundance/distribution of key trophic groups/species**	Abundance and distribution of cetaceans other than coastal bottlenose dolphins *OSPAR Common Indicator M4*	Harbour porpoise White-beaked dolphin Minke whale Common dolphin	GES target - distribution: At the scale of the Marine Strategy Framework Directive Sub-Regions, the distribution of cetaceans is not contracting as a result of human activity. In all of the indicators monitored, there should be no statistically significant contraction in the distribution of marine mammals caused by human activities. GES target - abundance: At the scale of the Marine Strategy Framework Directive Sub-Regions, 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 of marine mammals caused by human activities. Assessment threshold - abundance: The latest assessment considered the target of 'no statistically significant decrease in abundance' was met if, over a ten-year period, the
	Abundance and distribution of coastal bottlenose dolphins *OSPAR Common Indicator M4*	Bottlenose dolphin	

[8] https://moat.cefas.co.uk/biodiversity-food-webs-and-marine-protected-areas/cetaceans/

[9] 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

[10] HM Government (2012). Marine Strategy Part One: UK Initial Assessment and Good Environmental Status. https://www.gov.uk/government/publications/marine-strategy-part-one-uk-initial-assessment-and-good-environmental-status

			abundance of a species increased, or remained stable, or did not decline by 5% or more.
D1.3 - Population condition	Harbour porpoise bycatch *OSPAR Common Indicator M6*	Harbour porpoise	GES target: At the scale of the Marine Strategy Framework Directive Sub-Regions cetacean populations are in good condition: mortality of cetaceans due to fishing bycatch is sufficiently low so as not to inhibit population targets being met. Assessment threshold: The latest assessment uses thresholds set by ASCOBANS of 1.7% of the best available estimate of abundance, and precautionary threshold of 1% of the best available abundance estimate.

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**

As apex predators, cetaceans have been reported as 'keystone species', 'sentinel species', 'umbrella species' and 'flagship species'; overall, they are therefore considered to be good indicator species to measure progress towards the achievement of GES (Murphy et al., in press). There is however a lack of 'common' pressure-related indicators for cetaceans within the OSPAR region. Time-series of pressure indicators are needed to help interpret changes in population status, and to successfully implement a programme of measures to achieve GES. More recently, Commission Decision (EU) 2017/848, laying down criteria and methodological standards for good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU, was adopted in May 2017. This stipulated that for marine mammal species, state (abundance, distribution, habitat, and population demographic characteristics) indicators should be developed, as well as pressure indicators (bycatch, contaminants and marine litter) for those species which at are at risk (ICES WKDIVAGG, 2018). It also proposed using favourable reference population values for those species covered by the Habitats Directive but failed to recognise that these are set for national waters and not Regional Seas (Murphy et al., in press).

OSPAR, though operating as a platform for EU member states to coordinate their approaches in implementing the MSFD and overseeing the development of regional assessment and monitoring of biodiversity, created a new intersessional Marine Mammal Expert Group (MMEG) that has been tasked to:

a. to review completed work on development and assessment of biodiversity indicators related to marine mammals;

b. to review IA2017 and identify problems in data calls and missing data (lessons learned from the IA2017 assessment). MMEG will consider whether i) the species included in M4-B are the most relevant ones and ii) outline the re-establishment of a single M4 indicator (abundance and distribution);

c. to continue developing assessment values (e.g. thresholds, boundaries, ranges or trends as appropriate), against which the indicators could be assessed;

d. to finalise CEMP guideline for indicator M4, with the aim that by 2019 all indicators assessed in the IA2017 have CEMP guidelines published on the OSPAR website;

e. to consider if marine mammals could be integrated into common indicators D8 "contaminants" (e.g. PCB in blubber) (OSPAR HASEC) and D11 "underwater noise" (ICG-Noise);

f. to consider the development of further candidate indicators, like health assessments for seals and cetaceans and demographic parameters for cetaceans;

as detailed in the MME multi-year workplan 2019-2022.

Proposed biodiversity mammal common pressure indicator

A mammal blubber PCB toxicity threshold indicator was proposed by the ICES WGMME in 2013 for inclusion as a biodiversity common indicator[11] (ICES WGMME, 2013). Recently, the OSPAR MMEG further developed this indicator and the proposed pollutant indicator was reviewed by OSPAR's ICG-COBAM and HASEC committees.

While the toxic effects of PCBs is clearly pressure related there is a link with the state of the population (e.g. Descriptor 1 cetacean 'abundance and distribution' indicator). Thus, monitoring blubber PCB concentrations of cetaceans can be considered as a key aspect in assessing GES according to the MSFD (EU, 2017). Given the high mobility of marine mammals, and the distributional range of populations, assessments (of mean concentrations of Σ18/25PCBs lipid) need to be made on a wide scale (population range or assessment units). Though, assessments of blubber PCB concentrations can also be undertaken at the group/cohort/individual level, which may be relevant for small populations. Age and sex are important criteria in the assessments, as individuals bioaccumulate PCB burdens with age, and mature females can offload the majority of their PCB burden to their first born offspring during pregnancy and (early) lactation (Cockcroft et al., 1989; Mongillo et al., 2016; Murphy et al., 2018).

Currently the indicator would contain two parts assessing both 'relative' and 'absolute' aspects of PCB burdens in marine mammals:

a) Trends assessment of blubber ΣPCBs in the harbour porpoise
   'Trend assessment' or spatial distribution assessment to focus on *relative* differences and changes on spatial and temporal scales – provides information about the rates of change

b) Marine mammal blubber ΣPCB toxicity threshold assessment
   'Status' assessment of the significance of the (risk of) pollution, defined as the status where chemicals are at a hazardous level, usually requires assessment criteria that take account of the possible severity of the impacts and hence requires criteria that take account the ecotoxicology of the contaminant.

Within the HELCOM region, a similar biodiversity common indicator could be developed.

It is proposed that the 'status' assessment will utilise established reproductive PCB toxicity thresholds in marine mammals. Reproductive impairment (if it occurs) is directly linked to/influences changes in population size. A number of studies have proposed or established toxicity thresholds for marine mammals. Some of these have used surrogate species or undertaken semi-field experimental studies on marine mammals, while others are based on data collected from wild populations. A PCB toxicity threshold for the onset of earliest physiological (reproductive and immunological) endpoints in marine mammals was determined as 17 mg/kg lipid, as Aroclor 1254, and was based on observed effects in experimental studies on seals, otters, and mink (Kannan et al., 2000). This has been considered as one of the lowest thresholds for sub-lethal PCB effects in exposed marine mammals and was calculated to be equivalent to 9.0 mg/kg, as sum Σ25CBs (individual chlorobiphenyl congeners) lipid) (Jepson et al., 2016). One of the highest PCB thresholds for reproductive impairment in ringed seals in the Baltic Sea,

[11] https://www.ospar.org/work-areas/bdc/biodiversity-monitoring-assessment-1/biodiversity-common-indicators

77.0 mg/kg lipid as Clophen 50 (Helle et al., 1976), was calculated to be equivalent to 41.0 mg/kg, as Σ25CBs congeners lipid (Jepson et al., 2016).

The proposed trend assessment indicator uses the harbour porpoise, one of the most common cetacean species in the North-east Atlantic, as a sentinel species. Within the UK, blubber PCB concentrations have been assessed in stranded and bycaught harbour porpoises sampled from 1990 onwards. A slow decline in ΣPCBs was observed in porpoises in UK waters in the early-to-mid 1990s, following which the decline stalled, suggesting continued inputs of PCBs into the marine environment (Jepson et al., 2016).

While the proposed 'trends' assessment deals with PCBs in relation to the harbour porpoise, longer-lived species, such as the bottlenose dolphin (*Tursiops truncatus*) and killer whale (*Orcinus orca*) have even greater exposures and the highest risk of individual and population level toxicities – particularly apex predators such as the killer whale (Law et al., 2012; Jepson et al., 2016; Desforges et al., 2018). For the state indicator, a number of additional species can be included in the assessment such as the bottlenose dolphin, killer whale, short-beaked common dolphin (*Delphinus delphis*), harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*). Additional species such as the white-beaked (*Lagenorhynchus albirostris),* white-sided (*Lagenorhynchus acutus*), Risso's dolphin (*Grampus griseus*) and striped dolphin (*Stenella coeruleoalba*) in the OSPAR region could also be included following some (further) exploratory toxicological analysis of those species.

Within both OSPAR's ICG-COBAM and HASEC committees, Contracting Parties expressed support for continued evaluation of a marine mammal contaminants-effects based indicator. It was also recommended to broaden the indicator to trends and status of persistent chemicals in marine mammals, as well as further evaluating the technical considerations of developing this approach with respect to sample acquisition, etc.

Thus, future work requires the identification of other potential persistent chemicals that should be included within the indicator. Work is also required for collation of currently available (PCB) data from Contracting Parties into a single database to assess power and sample sizes required for monitoring trends in juvenile porpoises (within AUs). As well as preliminary analysis of the 'state' indicator at an individual/group/cohort/assessment unit level, depending on the species concerned. In addition to further discussions on thresholds utilised for all persistent chemicals within the indicator.

For assessment under this indicator if it was taken forward, Contracting Parties within the OSPAR region would be required to analyse PCB concentrations in marine mammal blubber. With this in mind, a review was undertaken of ongoing pollutant projects within the region. A number of chemical pollutant studies are currently ongoing in western European waters including:

UK: Within the UK, the largescale NERC funded "ChemPop" project is investigating statistical trends in a range of Persistent Organic Pollutants (POPs) and their exposure and associated risks in UK cetaceans (harbour porpoises, bottlenose dolphins and killer whales). The project partners include the Centre for Ecology and Hydrology, the Institute of Zoology London, University of Hull and Brunel University London and will run between 2018 and 2022. The UK Department of the Environment, Food and Rural Affairs is funding a second project that's undertaking analysis of PCBs in UK-stranded species that have not been assessed in detail to date; including the common dolphin, striped dolphin, Atlantic white-sided dolphin, white beaked dolphin, Risso's dolphin and long-finned pilot whale. This project is in collaboration with UK CSIP/SMASS and will also fund extension to the harbour porpoise time series

(2016 and 2017), and recent samples obtained from stranded killer whales and bottlenose dolphins (2016-2017). Analyses will also assess blubber and muscle samples in harbour porpoises, to investigate the potential impact of lipid mobilisation.

Ireland: A recent study has commenced in Ireland, undertaken at the Galway-Mayo Institute of Technology, that is analysing legacy pollutants such as polychlorinated biphenyls, organochlorine pesticides and brominated flame retardants and heavy metals as well as emerging pollutants such as neonicotinoids in a range of cetacean species, including both odontocetes and mysticetes. Previously the Marine Institute analysed mammal blubber tissue samples on an ad hoc basis for organochlorines and a range of other pollutants.

France: Work was recently undertaken assessing persistent organic pollutants (POPs) and mercury (T-Hg) in the blubber and skin, respectively, of free-ranging bottlenose dolphins from the Normanno-Breton Gulf that were sampled between 2010 and 2012 (Zanuttini et al., in press). Among all the POPs analysed in the study, the ΣNDL-PCBs (non-dioxin like PCBs) were the most abundant compounds found in the blubber, followed by ΣDDX > ΣDL-PCBs > ΣPBDEs > dieldrin > Σendosulfan > HCB > ΣHCHs > Σchlordane > ΣPCDFs > ΣPCDDs. Mean concentrations of the ΣNDL-PCBs were 132,940 and 64,504 ng.g-1 lipid weight (lw) for males and females, respectively (Zanuttini et al., in press). Among the NDL-PCBs, the hexachlorobiphenyls (PCB 153 and PCB 138) were the major compounds (ranging from 64 to 80%), followed by the heptachlorobiphenyls (PCB 180). Within the study 57 bottlenose dolphins (out of 58) exceeded the 9 mg/kg threshold (as ΣPCBs – see earlier text), and 51 bottlenose dolphins (out of 58) exceeded the higher 41 mg/kg threshold (as ΣPCBs – see earlier text).

Analysis of temporal trends in organic contaminants in harbour porpoises in French waters is currently being undertaken. Samples from 67 male porpoises have been processed, and individuals were sampled between 2001 and 2017. All males were assumed to be mature – though age determination is ongoing. 69.7% of porpoises showed PCB concentrations above Kannan's toxicity threshold of 17 µg/g lipid for total PCBs (as Aroclor 1254). An increase in PCB concentrations was observed during the time period – though this has not yet been tested statistically.

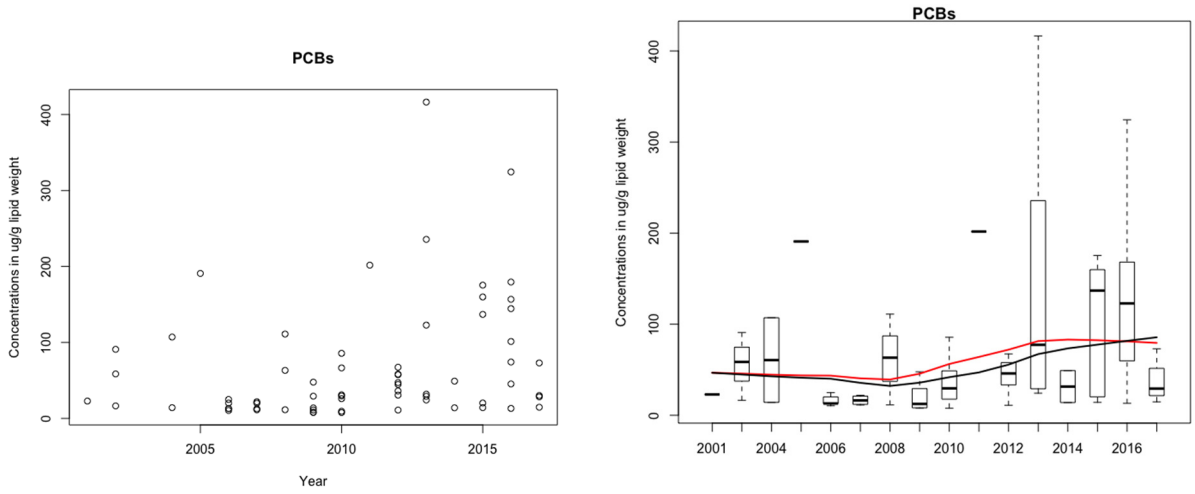

Figure 1. PCB concentrations in 67 male porpoises sampled between 2001 and 2017. Paula Mendez Fernandez unpublished data.

Sweden: Participating in a baseline study to assess the impact of hazardous substances on the health of harbour porpoises in the OSPAR region. It is anticipated that results will be included in an assessment or description of the health status of harbour porpoise in OSPAR's Quality Status Report in 2023.

Cetacean bycatch indicator

While a harbour porpoise bycatch indicator was included in the Intermediate Assessment in 2017, there was no assessment value for the indicator. Though reference was made to ASCOBANS 1.7% limit for total anthropogenic removal, and ASCOBANS precautionary objective of reducing bycatch to less than 1% and ultimately 0%. HELCOM is developing a bycatch indicator for both mammals and birds '*Number of drowned mammals and waterbirds in fishing gear*'. For porpoises in the western Baltic, Belt Sea and Kattegat, a tentative threshold value was proposed of less than 1% of the best population estimate – though it was noted that targets should be primarily determined using the CLA or possibly the PBR approaches, as they take the uncertainty of these types of data into account (HELCOM, 2018).

In the OSPAR porpoise bycatch indicator, the bycatch rate was calculated as number of animals caught per day, i.e. using number of days at sea (for relevant gear types) as the fishing effort. As outlined by the indicator text '*ICES has suggested that fishing effort could be more accurately recorded using measures of 'net meter per day'. This, or a similar metric could more precisely record fishing effort than 'days at sea', for net types (e.g. set gillnets) that are more likely to catch harbour porpoise than mobile gear (e.g. trawls). Information on net length and soak time are rarely reported in fishing effort statistics.' Further, 'ICES (2015) concluded that more effective monitoring of bycatch, fishing effort and population sizes of cetaceans would be required to provide a quantitative assessment of the impact of bycatch on harbour porpoise and other cetacean species.'* Since 2015, the documentation of net length is obligatory in logbooks (i.e. for vessels ≥10 m) in EU fisheries (EU Regulation of Implementation 2015/1962) (HELCOM, 2018).

Due to the lack of agreed assessment value(s), and a full assessment for their respective bycatch indicators, OSPAR and HELCOM are organizing a joint workshop to progress work on assessing the pressure from incidental by-catch of marine mammals and birds. The workshop which will be held between 3rd to 5th September 2019 will progress work on assessing the pressure from incidental by-catch and developing regional indicators.

The objective of the workshop is to develop methods to assess, for conservation purposes, the pressure of incidental by-catch of birds and marine mammals. The focus is on the identification of cost-effective assessment and data collection approaches. Conservation objectives based on already existing agreements will frame and form the basis for exploring the sustainable level of incidental by-catch pressure but are not intended to be the focus of the workshop.

The following aims will guide the work towards the objective;

I. Data needs for carrying out assessments should be identified and compared to current data availability. Where monitoring programmes are currently not generating suitable data, the workshop should investigate barriers to monitoring data becoming available and develop proposals for improved monitoring approaches and data collection in order to move towards operational assessments.

II. Approaches to identify areas of increased and decreased risk of incidental by-catch (i.e. high risk/low risk areas) should be explored. Different methods may be considered for birds and marine mammals as relevant. This information may contribute to proposals on improved monitoring approaches.

III. Regionally harmonised indicators are strived for, and therefore consideration should be given to proposals for approaches to setting thresholds as part of the proposal indicator assessment method.

A verbal summary of the main conclusions of the workshop will be provided at the AC meeting in Stralsund in September 2019.

Re-delineation of porpoise AUs boundaries

As part of a joint IMR/NAMMCO international workshop on the status of harbour porpoises in the North Atlantic undertaken in December 2018, the boundaries of assessment units in western European waters were revised based on new data arising from recent studies. Figure 2a outlines the porpoise assessment units employed by OSPAR's intermediate assessment in 2017, and Figure 2b highlights the revised boundaries between porpoise AUs in the North-east Atlantic.

As reviewed in Murphy et al. (2019), during the last two decades a re-distribution of porpoises occurred range of the North-east Atlantic population, with porpoises moving from the northern to the southern North Sea, as well as the re-population of central English Channel and waters off the French Atlantic coast (Camphuysen, 2004; Hammond et al., 2013; Hammond et al., 2017; Laran et al., 2017). Harbour porpoises however not only re-distributed southwards, but *Phocoena phocoena meridionalis* inhabiting waters off Iberia and Mauritia also migrated northwards crossing the putative environmental barriers described in the region for the sub-species, namely the Capbreton canyon (Fontaine et al., 2007; Fontaine et al., 2010; Alfonsi et al., 2012). Thus, porpoises from the French Atlantic, Celtic and Irish Seas are an admixture of individuals from waters further north (northern ecotype), as well as the Iberian-Mauritian sub-species (southern ecotype) (Alfonsi et al., 2012; Fontaine et al., 2017). The extent of this contact zone for admixed individuals extends into waters off the southwest coast of the UK, where porpoises were found to be genetically admixed and of a larger body size compared to other regions around the UK ((Fontaine et al., 2017); using samples and data collected between 1990 and 2002). Recent analysis of life history parameters in UK porpoise assessment units/management units confirmed that porpoises in the Celtic and Irish Seas were significantly larger in their maximum length, asymptotic length and L50 compared to porpoises in the North Sea (Murphy et al., in prep.).

Based on the newly available genetic and biological data, a re-delineation of the boundaries of the Celtic and Irish Seas AU and the Western Scotland AU was proposed, with the former now confined to the region of the admixed individuals, including waters of the Celtic Sea and Western France, and the

latter now including waters west of Ireland. Both Fontaine et al. (2014) and Fontaine et al. (2017) showed no genetic distinction between the porpoises from the Atlantic coasts of Ireland and North-Western Scotland (Murphy et al., 2019). The Irish Sea was defined as a zone of uncertainty pending further analysis (NAMMCO and IMR, 2019). While the western Scotland/Ireland assessment unit was still retained, recent genetic analysis did not rationalise a western Scotland/Ireland AU based on genetic structure alone (Fontaine et al., 2017). Within the North Sea assessment unit, the boundary with the Kattegat and Belt Seas assessment unit was revised based on findings by Sveegaard et al. (2015) using genetic, morphological, acoustics and satellite tracking data. This information was reviewed at the workshop and adjustments to the boundary with the Kattegat and Belt Seas MU were endorsed by the attendees (NAMMCO and IMR, 2019).

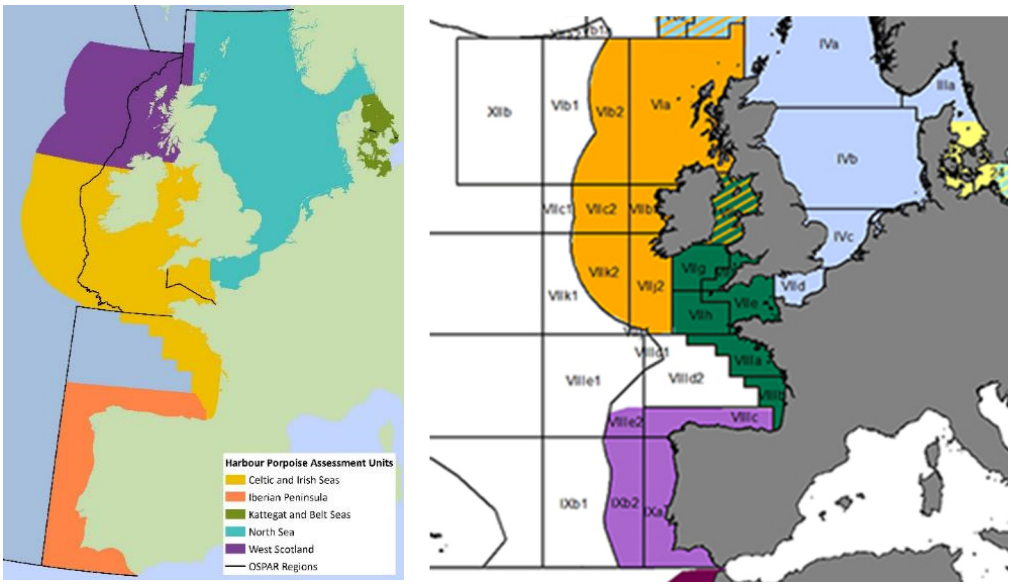

Figure 2. (a) Assessment units employed within the OSPAR Intermediate Assessment (OSPAR, 2017). Taken from ASCOBANS (2018). (b) Revised boundaries for the AUs in the OSPAR region including West Scotland/Ireland (yellow), the Celtic Sea and western France (green), and the zone of uncertainty of the Irish Sea (green and yellow stripes). A revised boundary was also proposed between the North Sea (light blue), and the Kattegat and Belt Seas AUs (proposed by Sveegaard et al. (2015)). Taken from (NAMMCO and IMR, 2019).

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

In 2014, the co-chair representing ASCOBANS submitted to OSPAR's Hazardous Substances and Eutrophication Committee (HASEC) a proposal for a mammal blubber PCB toxicity threshold indicator. The co-chair recently collaborated with colleagues in OSPAR's MMEG and other expert scientists in early 2019 and produced 'draft' indicator text for a mammal blubber PCB toxicity threshold indicator.

The co-chair representing ASCOBANS is attending the Joint OSPAR-HELCOM workshop to examine possibilities for developing indicators for incidental by-catch of birds and marine mammals in early September 2019.

Further information on projects progressing the implementation of the MSFD in the ACCOBAMS region was supplied by Florence Descroix-Comanducci of the ACCOBAMS secretariat.

The implementation of the ACCOBAMS Survey Initiative (ASI) in the Mediterranean and Black Sea:

The ASI aims at establishing an integrated and coordinated monitoring system for cetaceans in the all ACCOBAMS Agreement Area. A synoptic survey was carried out in during the summer 2018 across the Mediterranean Sea combining visual survey methods (aerial- and ship-based surveys) and passive acoustic monitoring (PAM) with the participation of scientists of the area. An aerial cetacean survey was carried out in the Black Sea (June and July 2019) as part of the CeNoBS project (see below). Robust information on cetacean distribution and abundance estimates will be provided and these results should be useful for EU countries as regards the Descriptor 1 on Biodiversity.

ACCOBAMS is involved in the CeNoBS project "Support MSFD implementation in the Black Sea through establishing a regional monitoring system of cetaceans (D1) and noise monitoring (D11) for achieving GES" granted by DG ENV,

The CeNoBs project aims to improve second cycle of MSFD implementation for Descriptor 1 –cetacean and Descriptor 11- noise in the Black Sea, by achieving greater consistency and coherence in determining, assessing and achieving good environmental status (GES). The project will directly support the assessment of the extent to which GES for D1 and D11 have been achieved in the Black Sea region after the implementation of the 1st cycle of the MSFD and to provide the BS Members States with practical outcomes and means for cooperation to contribute to the next 6-year cycle of MSFD for both Descriptors, in particular for updating their monitoring programmes and their programmes of measures. The activities are aimed at filling the lack of background data on the distribution/abundance of BS cetacean populations and on bycatch pressure and the lack of national expertise to implement effective noise monitoring.

ACCOBAMS is also involved in the QuietMed2 project "Joint programme for GES on D11-noise in the Mediterranean Marine Region" granted by DG ENV.

QUIETMED 2 project aims to support Member States Competent Authorities in the assessment of the extent to which GES on D11 has been achieved in the Mediterranean Region to get an updated, improved and more complete regional assessment by providing practical outcomes to implement the 2017/848 Decisions. Main expected results of the project are: i) a joint proposal of a candidate for an impulsive noise indicator in the Mediterranean Region , ii) a common methodology for Competent Authorities to establish threshold values, together with associated lists of elements and integration rules; iii) a data and information tool to support the implementation of the monitoring programmes of impact of impulsive noise based on the current ACCOBAMS joint register which will be demonstrated on iv) an operational pilot of the tool and v) several activities to boost current regional cooperation efforts of Barcelona Convention developing new Mediterranean Region cooperation measures. These expected results of the project will serve to elaborate two Specific Guidance's for competent authorities from MS, the first one addressed to better implement the new GES decision (D7.2.) and the second one to stablish new regionally-coordinated measures (tools, methods and results). Both guidelines will be presented and transferred to Competent Authorities in two training sessions

ACCOBAMS was also involved in another EU funded project, the QUIETMED project: "Joint programme on noise (D11) for the implementation of the Second Cycle of the MSFD in the Mediterranean Sea" carried out between January 2017 and December 2018.

The QUIETMED project aimed to enhance cooperation among Member States (MS) in the Mediterranean Sea to implement the Second Cycle of the Marine Directive and in particular to assist them in the preparation of their MSFD reports by 2018 through: i) promoting a common approach at Mediterranean level to update GES and Environmental targets related to Descriptor 11 in each MS marine strategies ii) development of methodological aspects for the implementation of ambient noise monitoring programs (indicator 11.2.1) iii) development of a joint monitoring programme of impulsive noise (Indicator 11.1.1) based on a common register, including gathering and processing of available data on underwater noise. The project was developed by a consortium made up of 10 entities and it had a duration of 24 months.

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 25th 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 relevant MSFD working groups/workshops in the ASCOBANS region. The co-chair of the WG representing ASCOBANS will continue to collaborate with colleagues on the production of 'pressure' indicators for cetaceans within OSPAR, HELCOM and ICES.

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.

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References

Alfonsi, E., Hassani, S., Carpentier, F.-G., Le Clec'h, J.-Y., Dabin, W., Van Canneyt, O., Fontaine, M.C., and Jung, J.-L. (2012). A European Melting Pot of Harbour Porpoise in the French Atlantic Coasts Inferred from Mitochondrial and Nuclear Data. *PLoS ONE* 7**,** e44425.

Ascobans (2014). Report of the Joint ACCOBAMS/ASCOBANS Working Group on the Marine Strategy Framework Directive (MSFD). 21st ASCOBANS Advisory Committee Meeting, Gothenburg, Sweden, 29 September - 1 October 2014 Dist. 1 September 2014. AC21/Doc.13.3.1 (WG). 22pp

Ascobans (2015). Report of the Joint ACCOBAMS/ASCOBANS Working Group on the Marine Strategy Framework Directive (MSFD). 22nd ASCOBANS Advisory Committee Meeting The Hague, Netherlands, 29 September - 1 October 2015 Dist. 31 August 2015. AC22/Doc.6. 32 pp.

Ascobans (2018). Progress report on the conservation plan for harbour porpoises in the North Sea by the Sea Watch Foundation. 24th ASCOBANS Advisory Committee Meeting AC24/Doc.3.2.b Vilnius, 25 -27 September 2018.

Camphuysen, K. (2004). The return of the harbour porpoise (*Phocoena phocoena*) in Dutch coastal waters. *Lutra* 47**,** 135-144.

Cockcroft, V.G., De Kock, A.C., Lord, D.A., and Ross, G.J.B. (1989). Organochlorines in bottlenose dolphins *Tursiops truncatus* from the east coast of South Africa. *South African Journal of Marine Science* 8**,** 207-217.

Desforges, J.-P., Hall, A., Mcconnell, B., Rosing-Asvid, A., Barber, J.L., Brownlow, A., De Guise, S., Eulaers, I., Jepson, P.D., Letcher, R.J., Levin, M., Ross, P.S., Samarra, F., Víkingson, G., Sonne, C., and Dietz, R. (2018). Predicting global killer whale population collapse from PCB pollution. *Science* 361**,** 1373-1376.

Eu (2017). Commission Decision (EU) 2017/848, laying down criteria and methodological standards for good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU. .

Fontaine, M.C., Baird, S.J.E., Piry, S., Ray, N., Tolley, K.A., Duke, S., Birkun Jr, A., Ferreira, M., Jauniaux, T., Llavona, A., Ozturk, B., Ozturk, A.A., Ridoux, V., Rogan, E., Sequeira, M., Siebert, U., Vikingsson, G.A., Bouquegneau, J.-M., and Michaux, J.R. (2007). Rise of oceanographic barriers in continuous populations of a cetacean: the genetic structure of harbour porpoises in Old World waters. *BMC Biology* 5.

Fontaine, M.C., Roland, K., Calves, I., Austerlitz, F., Palstra, F.P., Tolley, K.A., Ryan, S., Ferreira, M., Jauniaux, T., Llavona, A., Öztürk, B., Öztürk, A.A., Ridoux, V., Rogan, E., Sequeira, M., Siebert, U., Vikingsson, G.A., Borrell, A., Michaux, J.R., and Aguilar, A. (2014). Postglacial climate changes and rise of three ecotypes of harbour porpoises, Phocoena phocoena, in western Palearctic waters. *Molecular Ecology* 23**,** 3306-3321.

Fontaine, M.C., Thatcher, O., Ray, N., Piry, S., Brownlow, A., Davison, N.J., Jepson, P., Deaville, R., and Goodman, S.J. (2017). Mixing of porpoise ecotypes in southwestern UK waters revealed by genetic profiling. *Royal Society Open Science* 4**,** 160992.

Fontaine, M.C., Tolley, K.A., Michaux, J.R., Birkun, A., Ferreira, M., Jauniaux, T., Llavona, Á., Öztürk, B., Öztürk, A.A., Ridoux, V., Rogan, E., Sequeira, M., Bouquegneau, J.-M., and Baird, S.J.E. (2010). Genetic and historic evidence for climate-driven population fragmentation in a top cetacean predator: the harbour porpoises in European water. *Proceedings of the Royal Society B: Biological Sciences*.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J., and Øien, N. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. SCANS-III project report 1, 39pp. .

Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, M.L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M.F., Lovell, P., Øien, N., Paxton, C.G.M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M.L., Teilmann, J., Van Canneyt, O., and Vázquez, J.A. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. *Biological Conservation* 164**,** 107-122.

Helcom (2018). HELCOM core indicator report. Population trends and abundance of seals. http://www.helcom.fi/baltic-sea-trends/indicators/population-trends-and-abundance-of-seals. .

Helle, E., Olsson, M., and Jensen, S. (1976). DDT and PCB levels and reproduction in ringed seal from Bothnian Bay. *Ambio* 5**,** 188-189.

Ices Advice (2016). EU request to provide guidance on the most appropriate method to aggregate species within species groups for the assessment of good environmental status for MSFD Descriptor 1. ICES Special Request Advice Northeast Atlantic Ecoregion. section 1.6.2.3.

Ices Wgmme (2013). Report of the Working Group on Marine Mammal Ecology (WGMME), 4-7 February 2013, Paris, France.

Ices Wkd1agg (2016). Report of the Workshop on providing a method to aggregate species within species groups for the assessment of GES for MSFD D1 (WKD1Agg). 29 February–2 March 2016, ICES HQ, Copenhagen, Denmark. ICES CM 2016/ACOM:43. 45pp.

Ices Wkdivagg (2018). Report on the workshop on MSFD biodiversity of species D1 aggregation (WKDIVAGG). 1-4 May 2016, Copenhagen, Denmark. ICES CM 2018/ACOM:47. 53pp. .

Jepson, P.D., Deaville, R., Barber, J.L., Aguilar, À., Borrell, A., Murphy, S., Barry, J., Brownlow, A., Barnett, J., Berrow, S., Cunningham, A.A., Davison, N.J., Ten Doeschate, M., Esteban, R., Ferreira, M., Foote, A.D., Genov, T., Giménez, J., Loveridge, J., Llavona, Á., Martin, V., Maxwell, D.L., Papachlimitzou, A., Penrose, R., Perkins, M.W., Smith, B., De Stephanis, R., Tregenza, N., Verborgh, P., Fernandez, A., and Law, R.J. (2016). PCB pollution continues to impact populations of orcas and other dolphins in European waters. *Scientific Reports* 6**,** 18573.

Kannan, K., Blankenship, A.L., Jones, P.D., and Giesy, J.P. (2000). Toxicity reference values for the toxic effects of polychlorinated biphenyls to aquatic mammals. *Human and Ecological Risk Assessment* 6**,** 181-201.

Laran, S., Authier, M., Blanck, A., Doremus, G., Falchetto, H., Monestiez, P., Pettex, E., Stephan, E., Van Canneyt, O., and Ridoux, V. (2017). Seasonal distribution and abundance of cetaceans within French waters: Part II: The Bay of Biscay and the English Channel. *Deep-Sea Research II* 14.

Law, R.J., Barry, J., Barber, J.L., Bersuder, P., Deaville, R., Reid, R.J., Brownlow, A., Penrose, R., Barnett, J., Loveridge, J., Smith, B., and Jepson, P.D. (2012). Contaminants in cetaceans from UK waters: status as assessed within the Cetacean Strandings Investigation Programme from 1990 to 2008. *Marine Pollution Bulletin* 64**,** 1485-1494.

Mongillo, T.M., Ylitalo, G.M., Rhodes, L.D., O'neill, S.M., Noren, D.P., and Hanson, M.B. (2016). "Exposure to a mixture of toxic chemicals: Implications for the health of endangered Southern Resident killer whales. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-135, 107 p. doi:10.7289/V5/TM-NWFSC-135".).

Murphy, S., Caurant, F., Evans, P.G.H., Tougaard, J., and Hammond, P.S. (2019). Area Status Report West Scotland/Ireland & Celtic and Irish Seas. Annex 7. Report of Joint IMR/NAMMCO International Workshop on the Status of Harbour Porpoises in the North Atlantic. Tromsø, Norway. North Atlantic Marine Mammal Commission and the Norwegian Institute of Marine Research.

Murphy, S., Evans, P.G.H., Pinn, E., and Pierce, G.J. (in press). Conservation management of common dolphins: lessons learned from the North-east Atlantic. *Aquatic Conservation: Marine and Freshwater Ecosystems*.

Murphy, S., Law, R.J., Deaville, R., Barnett, J., Perkins, M.W., Brownlow, A., Penrose, R., Davison, N.J., Barber, J.L., and Jepson, P.D. (2018). "Chapter 1 - Organochlorine Contaminants and Reproductive Implication in Cetaceans: A Case Study of the Common Dolphin," in *Marine Mammal Ecotoxicology,* eds. M.C. Fossi & C. Panti. Academic Press), 3-38.

Nammco, and Imr (2019). North Atlantic Marine Mammal Commission and the Norwegian Institute of Marine Research. Report of Joint IMR/NAMMCO International Workshop on the Status of Harbour Porpoises in the North Atlantic. Tromsø, Norway.

Ospar (2017). The Intermediate Asssessment 2017. Assessment of the marine environment in OSPAR's waters. https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/.

Sveegaard, S., Galatius, A., Dietz, R., Kyhn, L., Koblitz, J.C., Amundin, M., Nabe-Nielsen, J., Sinding, M.-H.S., Andersen, L.W., and Teilmann, J. (2015). Defining management units for cetaceans by combining genetics, morphology, acoustics and satellite tracking. *Global Ecology and Conservation* 3**,** 839-850.

Zanuttini, C., Gally, F., Scholl, G., Thomé, J.-P., Eppe, G., and Das, K. (in press). High pollutant exposure level of the largest European community of bottlenose dolphins in the English Channel *Scientific Reports*.