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**Sub-committees/working group name:**

**Progress report on the work of the Advisory Group of the Conservation Committee  
Cetacean and Ecosystem Functioning Working Group - April 2023**

**Advisory Group of the Conservation Committee Working Group on Cetacean and  
Ecosystem Functioning**



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## **Progress report on the work of the Advisory Group of the Conservation Committee Cetacean and Ecosystem Functioning Working Group - April 2023**

### **Abstract**

The Advisory Group of the Conservation Committee Working Group on Cetacean and Ecosystem Functioning has been working since January 2023 to advance on the development of a tender for a pilot project to assess the socio-economic values of a single (or set of) species or populations of cetaceans. This includes the selection of species to be assessed and the development of Terms of Reference for a consultancy. Most likely candidate species include the North Pacific humpback whale, the Southern Ocean species (humpback, blue, fin and minke whale) and/or the Southwest Atlantic southern right whales. The advice/endorsement of the Scientific Committee on species selection as well as any other relevant advice on ecosystem function modelling considered here is requested.

### **Introduction**

Since 2016, the IWC has been working on further understanding the scope of the role of cetaceans in the ecosystem functioning. At its 68th biennial meeting, the Commission agreed to a short-term workplan to develop a pilot project assessing the socio-economic values of a single (or set of) species or populations of cetaceans to the well-being of people and the rest of nature.

During January 2023, an Advisory Group was established to define initial steps before a call for consultancy applications.

The Terms of References for the Advisory Group are:

- to work in consultation with the Conservation Committee Cetacean and Ecosystem Functioning Working Group, the Scientific Committee Working Group on Ecosystem Modeling, and the IWC Secretariat;
- to identify and select cetacean species/populations to be assessed from a socio-economic perspective for their contributions to ecosystem functioning;
- to develop Terms of Reference for the consultancy and contracting services; and
- to submit a report to the IWC Scientific Committee and the Conservation Committee Planning Group during 2023.

To date, the Advisory Group has been working by email and has conducted three virtual meetings. This progress report summarizes the ongoing work of the Advisory Group. The advice of the Scientific Committee is requested, particularly in regard to the selection of species/populations to be assessed.

### **Proposals on Species/Populations Candidates**

The Advisory Group considered that the role of cetaceans in ecosystem functioning would be easier to relate from an ecological perspective to what mechanism or model can be applied to specific ecosystem functions rather than to a certain species. It also recognized the current limitations from an ecological perspective on the modelling of different contributions, such as the “whale pump” and “carcasses sinking to deep sea” with likely more ongoing development within the IWC Scientific Committee Ecosystem Modelling (EM) group. It was also suggested that the great whale conveyor (along with whale pump and carbon sequestration) could also have advantages from an ecological modelling perspective.

It has also been noted at the Conservation Committee workshop that from a socio-economic perspective, the ecosystem services are different from the ecosystem functions, and a link needs to be established, narrowing the number of contributions that have potential value for humans.

The Advisory Group also considered that the species/population approach that focuses on one or more candidates with different success stories from conservation, population growth, etc. could be valuable for the pilot project to show different cases of economic valuation.

A decision matrix was developed to select the species or population(s) with suitable information that could be the target(s) for the pilot project (Annex 1). The matrix was shared with experts that attended the 2021 IWC-CMS workshop on cetaceans and ecosystem functioning to invite them to suggest a suitable species/population that could be assessed, where there should be sufficient associated data. The IWC Secretariat also provided a list of abundance estimates that have previously been agreed by the Scientific Committee for several species. The yellow color on population size cells shows which proposed species have an abundance estimate previously agreed by the IWC Scientific Committee.

According to the Conservation Committee 2022 workshop conclusions, the green columns are the ecosystem functions that could be translated into ecosystem services due to the existence of human beneficiaries, the blue ones play a role as “supporting services” and a link needs to be established to translate these into ecosystem services, and the orange columns represent ecosystem functions that are not considered to support any ecosystem services directly. However, the advisory group also noted that several traits may be used to model specific functions such as carbon sequestration.

A total of 15 species/populations have been suggested as possible candidates to be assessed from a socio-economic perspective. Of these only five populations have abundance estimates previously reviewed by the IWC. A population estimate is needed for any calculations, and therefore it would make sense to use species for which the IWC already has agreed estimates.

The Advisory Group noted that the possible candidates offer a wide range of different cases for comparisons, ranging from large whales at breeding or feeding grounds in different ocean basins, as well as small cetaceans. It was noted that although small cetaceans are interesting as they tend to have larger population sizes and smaller body mass than large whales, and may have more local contributions at specific sites, there is still not sufficient data available to propose any of them for such a pilot project.

It was suggested that humpback whale could be a good species to include as it has increased after the moratorium. Specifically, the North Pacific population may be a good option as there is considerable information available.

The Southern Ocean blue whale was also considered as this population provides a contrast with endangered/recovery, pelagic/coastal, as well as historical and current population levels. It was also suggested that if considering the Southern Ocean, the need to include multiple species should be addressed - blue, fin, humpback and minke whale - particularly if working on the whale pump hypothesis there would probably be a need to include all these.

The above candidate species/populations represent mostly feeding grounds for large whales, but it was also proposed to include the South Atlantic southern right whales for which there are considerable data and which represents a breeding/calving ground.

It was also noted that species from the North Atlantic have been subject to some advanced modelling work related to ecosystem functions under the EM group, but there was no feedback received for the matrix. Therefore, it was proposed to ask the EM group to consider filling these gaps in the matrix and provide advice on the selection of candidates.

Sperm whales were also briefly discussed as they may be a good addition with different feeding habits and with some information available. However, it was noted the difficulties had been experience in trying to estimate abundance for sperm whales, as they don't surface as often as the other large baleen whales.

### **Advances on Term of References for Consultancy**

The Advisory Group highlighted that the pilot project represents a first step from the IWC to start understanding the scope and magnitude of the ecosystem services provided by cetaceans. It is anticipated that much modelling work will be undertaken in the future, but given the limitations associated with current data the pilot project should be more focused and simpler to provide a first overview.

Discussions on the ToR and tender for consultancy are still ongoing. The following paragraphs provides a summary of what has been discussed.

The Advisory Group has been working on draft ToR that were initially considered very broad so that this could take several years of work and require a large budget. Considering the nature of a pilot project and difficulties in developing the questions, it was proposed to reduce the scope to have better quality data and accurate estimated numbers for such services that are easier to value and provide broad estimates for those services where the ecological modelling is not still clear or not yet developed.

There was general agreement to simplify the pilot project ToR to try to do small things well and use the pilot project to build a blueprint of the process. The project should also provide background research for a framework that could map out other values (estimates) for future work. This would also help to get a more detailed analysis of time and costs. Non-market valuation methods such as stated preference techniques, including contingent valuation and choice experiments, or the travel cost method in the case of recreation will require a larger budget and more time.

It is proposed that this multiple-year process could be divided into stages a) a pilot project that focuses on one or a few populations with specific market valuations and to provide a future framework and b) an in-depth analysis.

In this sense, the ToRs should be specific regarding what services to calculate, depending on the data that are available. It was also noted that the ToR will need to be explicit concerning the species/populations to be assessed once the selection of species is finalized.

The Advisory Group noted that carbon sequestration and the whale pump were good options to include as ecological modelling work had already been conducted and values assigned, and possibly also the conveyor belt. There was general agreement that carbon sequestration (with biomass (body and carcasses)) would be of relevance to climate change; it should have a direct value which would be relatively easy to obtain. The application of the Social Cost of Carbon, a market-based measure, would be straight-forward for estimating the carbon sequestration value of several cetacean species over time. Although a good start, cautions were raised that these estimates would represent only a small component of the contributions to this sequestration that could be valued economically. It was noted that a previous study of the Southern Ocean blues whales modelled faeces and krill with some success, and that this could be repeated with updated data or for a different species.

The need to consider the nutrient cycling linked to future fish populations was noted, and that there is ongoing discussion in EM on how to include this link. However, it is still unknown how these contributions may affect the increased productivity and the value of fisheries. It was suggested that the pilot project could also provide different scenarios to assess broad estimates for these ecosystem functions that are not yet linked to ecosystem services. These broad estimates should be clearly differentiated from the more accurate estimates of other ecosystem services, such as carbon sequestration using biomass.

There was general agreement that direct value is the easiest ‘low hanging fruit’ for which to make a first valuation, as there are too many ecological processes not yet well understood for others. Therefore, the pilot project should 1) focus on making small accurate estimates and include a sensitivity analysis, 2) provide broader estimates for the others, and 3) develop a research and modelling framework that will guide future work.

It was also proposed to include in the ToR, under further consideration, the need to provide economic valuation of ecosystem services for a) current population size and compare those with historical population size, and b) current population size and the impact which current threats (such as by-catch) could represent in terms of ecosystem service losses.

It was noted that both approaches had value, but considering that the ToRs should be narrowed to have more focus, it was agreed that the current and historical population size comparison could provide a simpler way forward, while modelling the impact of current threats as service losses would require more in-depth work and therefore could better be proposed for future work.

The importance to assess the impact of Critically Endangered populations and their value to the ecosystem was also discussed (e.g., North Atlantic Right Whales), and also where specific problems such as by-catch can be jeopardizing ecosystem functioning. However, while important for management purposes, it was also noted that the ecological function of Critically Endangered animals may be near absent.

Finally, the inclusion in the ToR for the consultancy, a literature review on economic aspects is also suggested, noting that a literature review on ecological aspects had already been done by Roman for the IWC-CMS 2021 workshop.

### **Other considerations**

The Advisory Group has raised the possibility of including other ecosystem services in the consultancy, such as whale watching or subsistence whaling. Notwithstanding their value, it was noted that the IWC resolutions were aimed at understanding the contributions of cetaceans to the ecosystem functioning; that can also be linked to species ecosystem services, but not to any cultural or recreational services. In addition, these other services would require a completely different modelling approach to estimate the associated values (assessment of cultural values, analysis of whale watching market and trends over years, etc.). Therefore, it was agreed that the main work of the consultancy should focus on these ecosystem services related to the ecosystem functioning.

It was considered very important that the tender for pilot project consultancy should also specify which was the audience for the report. Considering that IWC contracting governments have requested this work to be undertaken, it is proposed that the pilot project report should be directed towards the policy makers as this “audience”.

The second Ecosystem Modelling workshop will take place in Bonn, Germany in November 2023. There are two options:

- a) the consultancy could be contracted before the workshop (if the tender is endorsed by CCPG and funds become available); if so the consultants could present preliminary results/questions at the modelling workshop and provide information on which links are still needed from a socio-economic perspective to relate certain ecosystem functions to specific ecosystem services; or
- b) the consultancy could be contracted after the modelling workshop, missing the opportunity to suggest to the modelers on which topics it could be useful to focus their efforts; however, on the other hand, the consultancy would then receive information on perhaps improved ecosystem functions models to be used.

The Advisory Group has considered it to be of high importance to invite consultants (or economists if not yet contracted) to the second workshop of the scientific committee on ecosystem functioning modelling.

It was also suggested that a hybrid meeting (in-person with virtual arrangements) should be arranged during the Scientific Committee meeting in Bled between EM and the advisory group.

### **Conclusions and Future Work**

The pilot project and its results would be a representation of what is possible, but it should not be an all-encompassing project and will set up a framework to advance future work.

The Advisory Group looks forward to the SC's advice and/or endorsement particularly regarding the selection of candidate species/populations that should be assessed by the consultancy. It would also welcome any advice on the identification of ecosystem functions where more modelling work is available and/or any other aspects to which SC could contribute.

Future work of the Advisory Group will be to finalize discussions on the ToR, discuss timeframe and budget (depending on the scope agreed for the ToR), and develop a draft tender for consultancy. It has to be noted that contracting the pilot project consultancy will not require a budget from the Scientific Committee Research Fund. The Advisory Group final report and draft tender for consultancy will be distributed to the CCPG for discussion after the SC meeting.

**Annex 1 – Decision Matrix**

**Notes from CC socio-economic workshop:**

- In green Ecosystem functions that could be translated into ecosystem services due to the existence of human beneficiaries
- In blue Ecosystems functions that play a role as “supporting services” and a link need to be establish to translate into ecosystem service
- In orange Ecosystem functions that are not considered to directly support any ecosystem services

**Notes from the table**

- In yellow Abundance estimates that have been agreed by the IWC

		Data availability (based on 26 traits identified at IWC-CMS workshop)																															
Species/ Population	Geographic Area	Population Size	Trend in abundance	Body Mass	Excretion Rate	Mortality Rate	Macronutrients in whale feces	Life span	Body size	Epidermal molt	Migration	Prey for predator	Whale pump	Soft tissue lipid content	Iron content in feces	Bone lipid content	Consumption rate	Carcass sinking to deep-sea floor	Capital breeding	Skeleton size and calcification	Diving behaviour	Feeding distance	Diel feeding patterns	Social and reproductive behavior	Surplus killing	Trophic Level	Reproduction rate	Cetaceans providing carrion for scavenging seabirds	Cetaceans as ‘beaters’ of live prey for seabirds	Total # data available	References	Comments	Researcher Name / Proponent (s) or Supporters (s)
Humpback Whale	Southern Ocean	x	x	x			x	x	x		x	x	x		x				x		x	x	x							18	Friedlaender et al. 2013, 2016, Tyson et al. 2014,	several other unpublished data sets that are being processed	Ari Friedlaender
Humpback whale	North Pacific	x	x	x		x	x	x	x		x		x		x	x			x		x	x	x				x			17	Savoca et al. 2021, Cheeseman et al. (under revision), Rhodes-Reese et al. 2021, Pearson unpubl. data, Pearson et al. 2022; Atkinson et al. under review; Roman and McCarthy 2010, Pershing et al. 2010, Doughty et al 2016, Smith et al 2015, Smith 2006, Smith et al. 2019	Lots more literature on feeding, migration, and social/reproductive behavior to add	Heidi Pearson





Sperm whale	Mediterranean Sea	x	x	x		x		x	x																											9	ACCOBAMS, 2021a <sup>1</sup> , 2021b <sup>2</sup> ; Panigada et al., submitted Frontiers in Marine Science <sup>3</sup> ; Canadas et al., submitted. Frontiers in Marine Science; Boisseau et al., submitted. Frontiers In Marine Science; Carpinelli et al. 2014 <sup>11</sup> ; Drouot et al. 2004 <sup>12</sup> ; 2007 <sup>13</sup> ; Frantzis et al., 2011 <sup>14</sup> ; Gannier et al. 2012 <sup>15</sup> ; Maio et al. 2022 <sup>16</sup> ; Pierantonio et al. 2017 <sup>17</sup> ; Rendell et al. 2014 <sup>18</sup>	Also check IUCN Red List Assessments for Mediterranean Sea Sub-populations		
Harbour porpoise	North Sea and Eastern Scheldt in Netherlands		x			x		x																												8	<a href="http://www.rugvin.nl">www.rugvin.nl</a>	No publications yet, but short articles on website	Frank Zanderink et al Rugvin foundation	
Sperm whale	Caribbean					x		x																												2				
Long-finned pilot whale	Mediterranean Sea	x	x																																		2	ACCOBAMS, 2021a <sup>1</sup> , 2021b <sup>2</sup> ; Panigada et al., submitted Frontiers in Marine Science <sup>3</sup> ; Canadas et al., submitted. Frontiers in Marine Science; Boisseau et al., submitted. Frontiers In Marine Science;	Also check IUCN Red List Assessments for Mediterranean Sea Sub-populations	

<sup>11</sup> Carpinelli, E., Gauffier, P., Verborgh, P., Airoidi, S., David, L., Di-Méglio, N., et al. (2014). Assessing sperm whale (*Physeter macrocephalus*) movements within the western Mediterranean Sea through photo-identification. *Aquatic Conservation: Marine and Freshwater Ecosystems* 24, 23–30. doi: 10.1002/aqc.2446

<sup>12</sup> Drouot, V., Gannier, A., and Goold, J. C. (2004). Diving and Feeding Behaviour of Sperm Whales (*Physeter macrocephalus*) in the Northwestern Mediterranean Sea. *aquatic mammals* 30, 419–426. doi: 10.1578/AM.30.3.2004.419

<sup>13</sup> Drouot-Dulau, V., and Gannier, A. (2007). Movements of sperm whale in the western Mediterranean Sea: preliminary photo-identification results. *Journal of the Marine Biological Association of the United Kingdom* 87, 195–200. doi: 10.1017/S0025315407054860

<sup>14</sup> Frantzis, A., Airoidi, S., Notarbartolo-di-Sciara, G., Johnson, C., and Mazzariol, S. (2011). Inter-basin movements of Mediterranean sperm whales provide insight into their population structure and conservation. *Deep Sea Research Part I: Oceanographic Research Papers* 58, 454–459. doi: 10.1016/j.dsr.2011.02.005

<sup>15</sup> Gannier, A., Petiau, E., Dulau, V., and Rendell, L. (2012). Foraging dives of sperm whales in the north-western Mediterranean Sea. *J. Mar. Biol. Ass.* 92, 1799–1808. doi: 10.1017/S0025315412001087

<sup>16</sup> Maio, N., Fioravanti, T., Latini, L., Petraccioli, A., Mezzasalma, M., Cozzi, B., et al. (2022). Life History Traits of Sperm Whales *Physeter macrocephalus* Linnaeus, 1758 Stranded along Italian Coasts (Cetartiodactyla: *Physeteridae*). *Animals (Basel)* 13, 79. doi: 10.3390/ani13010079

<sup>17</sup> Pierantonio, N., Ventura, F., and Airoidi, S. (2017). Linking the dots: sperm whale corridors and connectivity in the Mediterranean Sea

<sup>18</sup> Rendell, L., Simião, S., Brotons, J. M., Airoidi, S., Fasano, D., and Gannier, A. (2014). Abundance and movements of sperm whales in the western Mediterranean basin. *Aquatic Conservation: Marine and Freshwater Ecosystems* 24, 31–40. doi: 10.1002/aqc.2426

