Agenda Item 2.5

Review of New Information on Threats and Other Issues Relevant to Small Cetaceans

Other

Information Document 2.5c

Report from the ASCOBANS Workshop on Management of MPAs for Small Cetaceans

Action Requested

Take note

Submitted by

Secretariat

Secretariat's Note

The original document is available on the ASCOBANS website here: https://www.ascobans.org/en/document/report-ascobans-workshop-management-mpas-small-cetaceans . Kindly use this link for sharing the report

ASCOBANS Workshop on Management of MPAs for Small Cetaceans

UNEP ASCOBANS

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Miljöministeriet
Ministry of the Environment

Coalition Clean Baltic

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Introduction

Overview

This ASCOBANS Workshop on the Management of Marine Protected Areas (MPAs) for Small Cetaceans was mandated by the 25th Meeting of the ASCOBANS Advisory Committee. At this meeting, it was agreed that effective management of MPAs for small cetaceans was lacking and that a toolbox of suitable conservation measures would be useful, especially for MPA managers that are not cetacean experts.

The workshop aimed to discuss and share experiences on best practice approaches to MPA management, taking them beyond being mere 'paper parks', in order to make recommendations to ASCOBANS Parties. The workshop was highly interactive, with the objectives to:

- develop and discuss examples of well-formulated conservation objectives for small cetacean MPAs, and
- develop and discuss examples of ambitious and innovative practical conservation measures for small cetacean MPAs.

The workshop was jointly organised by the Finnish Ministry of the Environment, WWF Germany, WWF Sweden, Coalition Clean Baltic, the Natura 2000 Biogeographical Process, and ASCOBANS. It was originally planned for April 2020 but was postponed due to the COVID-19 pandemic, and finally took place online on 18 May and 7–9 June 2021. Participants were cetacean experts e.g. from academia, NGOs, MPA managers, and government agency representatives, mainly from the ASCOBANS and ACCOBAMS regions in Europe.

Selected threats

The discussions on conservation objectives and measures focused on seven different threats to small cetaceans that were thought to be relevant to MPA management. These threats were collated by the workshop organising committee, mainly based on threats discussed within ASCOBANS that are thought to have a negative impact on small cetacean individuals or populations.

Bycatch: The un-intentional catch of small cetaceans in different types of fishing gear used by both commercial and recreational fisheries (also including ghost nets).

Impulsive/acute underwater noise: Impulsive underwater noise from anthropogenic activities, such as seismic surveys, echo-sounders, explosions, and piling.

Continuous/chronic underwater noise: Continuous underwater noise from anthropogenic activities such as commercial shipping, recreational boating, and operation of wind farms or other energy production.

Prey depletion: Changes in the quantity, quality, or availability of prey.

Environmental contaminants and pollutants: Any substances that are not natural in the environment such as organochlorines, pharmaceuticals, or any substances present in unnatural levels, which may impact the ecosystem or physiological functioning of small cetaceans. For the purpose of the workshop, marine debris was also included in this category, including microplastics but excluding ghost nets, which were discussed under bycatch.

Disturbance from the presence of humans: Disturbance from the presence of humans and anthropogenic activities, that does not come from the noise produced. This includes, but is not limited to, cetacean watching activities, recreational sea use (often small fast vessels such as jet skis and RIBs), and ship-strikes.

Habitat quality: Any changes in the habitat quality that do not fall under any of the other categories. E.g. effects of bottom impacting fishing gear, seabed mining, dredging, coastal development, port development, eutrophication, and climate change.

Ways of working

The workshop was planned to be engaging and participatory. In virtual form, this meant that in addition to the basic video conference functionality of Zoom, the workshop relied heavily on work in breakout groups as well as on Miro, an online virtual collaborative whiteboard. The structure and activities of the workshop were reflected in the structure of the Miro board, in which participants could capture their thoughts and ideas, work on materials together, and view and discuss the thoughts of other participants and other breakout groups (see Figure 1).

Workshop participants were invited to familiarise themselves with Zoom and Miro during check-in calls prior to the workshop. Still, there were some technical hurdles especially at the beginning of the workshop, temporarily hindering some participants from joining the breakout groups and using Miro to the fullest.

Each workshop day started with introductions and warm-up activities, designed to encourage active participation and create a supportive environment in which everyone feels welcome to take part. The activities alternated between individual work, group work, and plenary sessions, in order to keep energy levels high. For the same reason, workshop days were kept to four hours, with short breaks every hour, and a one-hour lunch break in the middle.

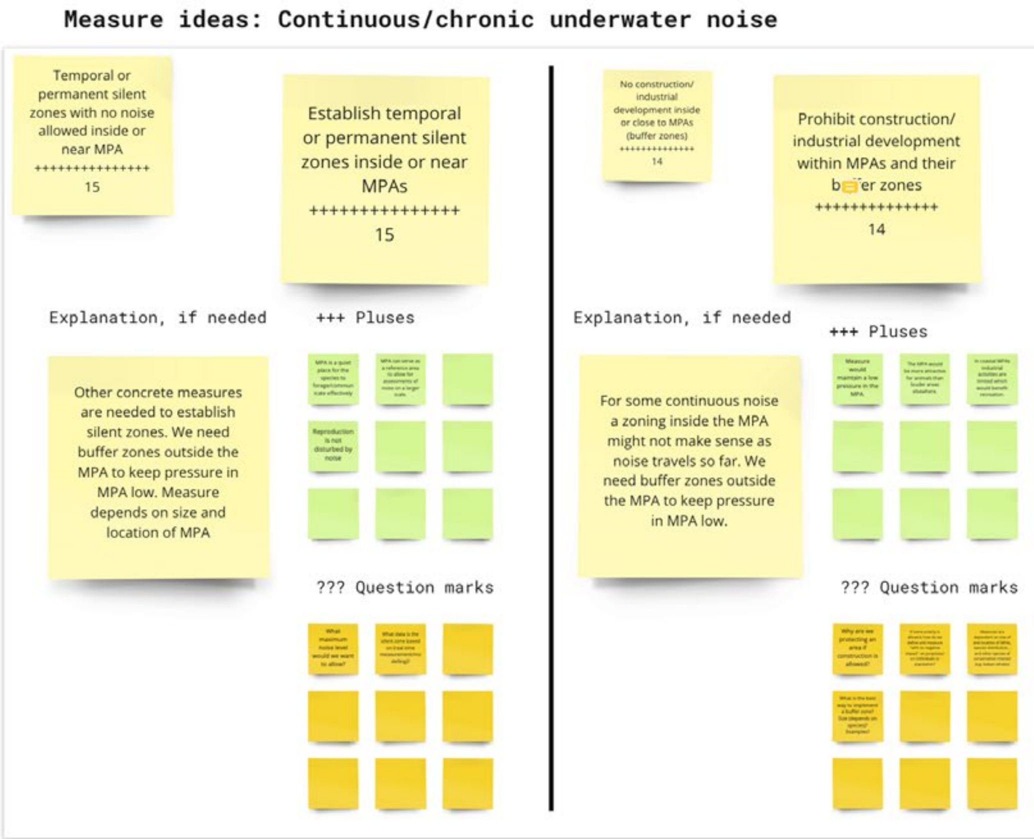

Figure 1. Part of the workshop Miro board from the last day. The screenshot shows the last phase of developing conservation measure ideas for continuous underwater noise.

Part 1. Conservation objectives

Overview

Aims

Development of conservation objectives is key to the successful conservation of species. Such objectives define the desired status of a species of concern and identify threats to its survival and population viability. This allows for the identification and implementation of meaningful measures to protect the species, as well as the ability to track progress and adapt measures along the way to ensure the best outcome for the species.

Today, conservation objectives relating to small cetaceans are often close to non-existent or unclear, and difficult to implement and follow up on. The aim for this part of the workshop was to provide managers with examples of ambitious and well-worded conservation objectives which can be used as ‘templates’ for the species and areas relevant for them. These can be adjusted and made more specific as needed. The examples provided are in no way meant to be seen as an exhaustive list of possible objectives.

Workshop discussions on conservation objectives were focused on the seven threats to small cetaceans listed in the Introduction, although impulsive and continuous underwater noise were grouped together. In addition to these seven threats, for this stage of the workshop, the “species conservation status” was also added as an additional theme or aspect that conservation objectives could be set for within an MPA.

What are conservation objectives?

According to the Commission Note on Setting Conservation Objectives for Natura 2000 sites (November 2012), a conservation objective is “the site-level specification of the conservation target to be achieved for a species or a habitat type for which a site is designated, in order for the site to contribute to maintaining or reaching favourable conservation status of the habitats and species concerned, at national, biogeographical or EU level”. Although workshop results are meant to be applicable to different types of MPAs, this definition was seen as relevant, especially given that Natura 2000 sites are by far the dominant type of MPA in the ASCOBANS region. Objectives often express a desired future state of e.g. a population or species within the MPA, but can also express targets for how a threat should be reduced in the area.

Altantic white-sided dolphins. Photo: Kylie Owen

SMART criteria

The tool chosen for this workshop to ensure the example conservation objectives are well-formulated were the SMART criteria. The SMART criteria are widely used for project management in many different fields. The criteria are intended to ensure that objectives and goals are easy to understand, implement, and evaluate. The acronym stands for:

- ***Specific*** – Clearly defined so that everyone involved in the project has the same understanding of what the terms mean
- ***Measurable*** – Definable in relation to some standard scale (numbers, percentage, fractions, or all/nothing states)
- ***Achievable*** – Practical and appropriate within the context of the project site, and in light of the political, social, and financial context
- ***Results-oriented*** – Represents necessary changes in target condition, threat reduction, and/or other key expected results
- ***Time-limited*** – Achievable within a specific period of time, generally 1–10–20 years in the conservation field

Workshop methods

The task of developing examples of ambitious, well-formulated conservation objectives was broken into two parts:

1. producing ambitious draft ideas, and
2. choosing a few preferred ideas and re-wording them to be well-formulated.

First, participants individually brainstormed ambitious conservation objectives, in the form of BHAGs (Big Hairy Audacious Goals, where "goals" is interpreted as "conservation objectives"), for each of the seven themes. They then divided into breakout groups, each group focusing on one threat, sorting through the ideas, combining any identical or very similar ones, and marking any unclear ones for discussion. After clarifying the unclear ideas in plenary, the same breakout groups chose a handful of ambitious objectives to continue working with and then presented them in plenary for agreement.

In the second phase, the groups applied the SMART criteria to the ambitious draft objectives to make them well-formulated. The aim was to produce at least one well-formulated conservation objective per threat. Due to a lack of time, after a presentation and feedback round in plenary, the draft objectives were left for further processing until after the end of the workshop at the discretion of the respective breakout groups. The objectives presented below have been agreed upon by the respective breakout group, either during the workshop or in further discussions before the finalisation of this report.

Species conservation status

The overarching focus of the workshop and ASCOBANS is small cetacean species, and the ultimate outcome (goal/objective) is therefore 'thriving populations' of the various species. Within this breakout group, the brainstorming produced several aspects of 'thriving populations' and what is needed to achieve this.

Some of the draft objectives produced in the brainstorming could be categorised as intermediate objectives that do not directly concern the species themselves. A few of these draft objectives had to do with evidence-based decisions (i.e. adaptive management), such as monitoring and increased awareness. Others had to do with effective protection both inside and outside MPAs in order to reduce or avoid threats, such as MPAs being large enough for mobile species and fulfilling all their needs. These objectives can be seen as leading to the ultimate objective:

Viable, healthy, and stable or increasing populations (restored to historic levels), i.e. Favourable Conservation Status (FCS)

Although everyone in the group agreed with the overall concept of this ultimate goal, it can be made more precise by focusing on the things that contribute to it, e.g. successful reproduction, survival, and abundance. The team chose to apply the SMART criteria to the 'abundance' component, and the resulting SMART objective is as following:

By 20xx the relative abundance of *species* during the *period/season* has increased from x to y within *site*.

The objective is general and can easily be specified for a certain species and site. The team also came up with an example indicator for how to measure this objective:

 # Days/hours/minutes during the specified season where the species is detected within the specified area.

Bycatch

In the break-out group that dealt with bycatch, five main 'big hairy audacious goal' were identified during the brainstorming session:

- Zero bycatch in the MPA
- No fishing activities that risk bycatch in the MPA
- No ghost gear present in the MPA
- Fisheries fully monitored to detect any bycatch
- Fisheries regulation fully enforced to ensure zero bycatch

Two other 'groups' of objectives were brought up by participants as well, related to cooperation with fisheries and development of cetacean friendly gear. However, these were deemed to be measures rather than objectives and are therefore not included here.

The group decided that the first draft objective, "zero bycatch in the MPA", was the main goal, and that the others were intermediate objectives to reach that goal. Regarding the objectives 'no fishing activities' and 'no ghost gear', it was discussed if they should be limited to certain types of fishing (commercial, recreational) and/or gear types (e.g. static nets), but concluded that the formulation 'activities/gear that risk bycatch' would be precise enough. Regarding the two last objectives, there was some discussion on what full monitoring and enforcement would entail, and if/how any breaches of regulation would result in some form of 'punishment', for example through a 'polluter pays' system.

In the discussions it was also noted that measures inside MPAs, whatever they are, are likely to cause displacement impacts outside of MPAs, unless these too are accounted for. The group noted that this should always be taken into account when designing objectives and measures to mitigate bycatch in MPAs.

For further development according to SMART criteria, the group selected two objectives:

Zero bycatch in MPA

Fisheries fully monitored to ensure zero bycatch

The first main objective is straightforward, and the group agreed that it applied to all criteria but the 'time' one, and therefore the resulting SMART objective would be:

Zero bycatch of *species* in MPA by *point in time*

The second objective was slightly reworded, replacing 'fully monitored' with 'adequate monitoring', as that seemed more achievable. The group discussed the degree of certainty one can obtain within a monitoring system, noting that there must be a confidence interval for detection of bycatches. In the end, the following SMART objective was formulated:

Adequate monitoring to detect any bycatch (x % confidence level) of *species* per year, by *point in time*

Photo: University of Aberdeen

Underwater noise

In the breakout group that dealt with continuous and impulsive noise, there were many ideas for objectives in the brainstorming session, both overarching and divided into specific industries. Some of the overarching objectives were:

- Quiet MPAs: Only natural noise
- No behavioral change in *species* caused by man-made noise
- Background noise levels kept below minimal disturbance threshold of *species*
- Baseline noise levels accounted for in MPA designation
- Precautionary noise levels set, monitored and enforced

The group agreed on the following objective for further discussion:

There is no negative impact on marine mammals from noisy activities

However, when applying the SMART criteria, the group struggled to define how a possible negative impact on a species could be measured, and instead agreed that an intermediate SMART objective on underwater noise may look something like this:

By 20xx, ambient noise within the *site* will be maintained below *threshold*, and impulsive noise will be limited to xx% of the site within *period*

Environmental contaminants and pollutants

In the break-out group that dealt with contaminants, four 'big hairy audacious goals' could be discerned from the brainstorming session:

- Eliminate leaching from existing sources of legacy pollutants
- Eliminate introduction of new pollutants into the marine environment
- Reduce impact of existing pollutants
- There are no human activities that produce environmental contaminants harmful to cetaceans or MPAs

In this draft form, the first three are measures rather than objectives. The first two are related to monitoring, tracing (where the contaminants came from), and addressing the problem, i.e. removing contaminant sources. The third one requires action from outside MPAs: the goal would be, for example, to restore environmental contaminants to natural or pre-industrial levels, to have no agricultural chemicals in the watershed, to incentivize returning litter to shore, and to keep PCBs well below the level where they would negatively impact the cetacean population.

The fourth draft objective requires specific measures within MPAs: no dredging and deposition in nearby areas, all dumped munitions to be removed without explosions or leaching, and no scrubber discharge in MPAs.

In general, the 'polluter pays' principle was discussed as a mechanism to support any necessary clean-up activities or other actions aimed at returning the site to a pristine condition. Any discharges of anthropogenic nutrients should be prevented, so that eutrophication and harmful algal blooms do not occur. Changes in land use in areas adjacent to an MPA, including ecological restoration, should be implemented to address contamination sources. The objective would be to have clean water and sediment with no contaminants from land or sea – and activities causing contamination would also be forbidden near an MPA.

The group agreed on the following objective for further discussion:

No new pollutants into the marine environment

Photo: University of Aberdeen

The group noted that eliminating the introduction of new pollutants would reduce potential exposure and therefore, accumulation in the bodies of cetaceans, potentially improving cetacean health. One or more bioindicators and/or biomarkers would be needed to evaluate pollution effects. Bioindicator/biomarker deployment and development may require measurement in a control area as well as in the MPA. The group noted that in theory the objective is achievable, although it may have a time lag. Changes would be measurable over a period of years. The group also concluded that the objective is indeed results-oriented.

The group agreed that a SMART objective on contaminants (one for each contaminant) may look something like this:

The introduction into the marine environment / concentration in the marine environment / concentration in species tissue of [pollutant] is reduced by X% by 20XX vs. [reference level i.e. year]

Prey depletion

In the breakout group that dealt with prey quality and availability, four different objectives (selected without any socio-economic or other limitations) could be discerned from the brainstorming session:

- No fishing within the MPA
- Strong knowledge about *species* needs in terms of prey and energetic needs
- Healthy and well-functioning food webs to support the prey species and ultimately the *species*
- Quality and quantity of prey at sufficient levels for *species* to thrive

It quickly became clear that the first three of these objectives could be seen as steps which would lead to the last objective for prey quality and availability, namely:

Quality and quantity of prey at sufficient levels for *species* to thrive

However, the group was unable to adapt this objective to the SMART criteria, as knowledge on the energetic requirements and prey preferences of small cetaceans is often lacking. Additionally, there is little knowledge on the availability of prey species that are not targeted by commercial fishing. Even if this knowledge was available, it would be very difficult to measure the different components of prey abundance, quality, and availability to determine whether the objective had been reached.

In marine conservation, it is quite common that limited knowledge results in not taking any action, and the group felt that it is highly important to avoid such reasoning. The group therefore decided to look at one of the other objectives that came up during the brainstorming that may contribute to arriving at the ultimate goal at some point in the future, and decided to take that objective through the SMART “filter”.

No fishing in the MPA

There is scientific evidence that areas that are closed for fisheries eventually become rich in both species and biomass of fish. The group therefore felt that this objective would be a reasonable step towards ensuring prey availability for small cetacean species. A SMART conservation objective to achieve sufficient prey resources for small cetaceans could read:

By 20XX, a minimum of XX% of *MPA* is closed for all fisheries and there is monitoring and enforcement in place to ensure compliance.

Photo: University of Aberdeen

Disturbance from the presence of humans

In the breakout group that dealt with human presence leading to disturbance, many of the objectives listed in the brainstorming session were worded as measures or actions to be taken, for example:

- Establish a zoning scheme within and outside the MPA which separates and prohibits activities within the MPA and which has no negative impacts on cetaceans
- Apply the precautionary principle to decision making on management measures that affect the protected species
- Manage ship traffic routes and vessel speed to mitigate impact of marine traffic
- Funding scheme for management costs based on marine users
- Prevent disturbance from human activities within the MPA
- Comprehensive, regularly applied, adequately managed and funded enforcement scheme in place

For the discussion on SMART criteria, a couple of the proposed objectives were re-worded into goals to bring forward:

There is no disturbance from human activities within the MPA

There is no disturbance from cetacean watching within the MPA

After some discussion, one of those objectives were reworded to a SMART objective:

By 20XX, any cetacean watching activities within the MPA are regulated and monitored and are not causing disturbance, individually or cumulatively with other activities

Habitat quality

In the breakout group that dealt with habitat quality, some of the overarching objectives were:

- Habitat is thriving
- Size: the MPA is large enough to work on habitat quality
- Lost or altered cetacean habitats are restored
- All human impacts on cetacean habitats minimised to level which does not adversely affect the population present in / visiting the MPA, ensuring good conservation status is achieved and maintained.
- Management suitable to achieve good habitat quality

The group agreed on the following objective for further discussion:

The habitat is thriving

However, the group found it difficult to find wording to align the objective with the SMART criteria. It was concluded that there are several elements of the cetacean habitat that would have to reach a certain level or quality, such as seabed, water column, and ecosystem structure and function, that all of these levels would have to be quantified for the objective to be measurable, and that baselines would have to be established. In relation to the amount or quantity of the species that should be present in the MPA, it would have to be established what the habitat requirements for that would be, which would need targeted research, since we do not know today what constitutes good habitat for many cetacean species. If we did know, an attempt at a SMART objective could be:

XX% of the MPA is covered by good quality habitat for *species*

Part 2. Conservation measures

Overview

Aims

The aim of the second and main part of the workshop was to come up with ambitious and innovative examples of conservation measures, to provide tools for effective management of small cetacean MPAs and ensure that they contribute to the overall conservation status of these species. To facilitate discussions, the work was centered around the seven threats listed in the Introduction.

Participants were asked to focus on conservation measures that would improve the situation within the MPA, i.e. very practical measures, although ideas on other types of measures were also noted. Additionally, any limits in policy or socio-economics were put aside to allow for creativity in coming up with innovative measures.

What are conservation measures?

Conservation measures are the actions taken within or outside an MPA in order to achieve the conservation objective set for the site. There are a few different types of measures – they can:

- aim at increasing knowledge and understanding in relevant stakeholder groups,
- strive towards policy change,
- prohibit or restrict certain harmful activities, or
- contribute to restoring certain aspects of the environment.

Situation models as tools for shared understanding

Performing a situation analysis and documenting it in a situation model can help to achieve a common understanding of a problem, which in turn is helpful in identifying potential intervention points and designing conservation measures to achieve conservation objectives.

A situation model is a visual representation of the context of a conservation project, including biological, social, economic and political factors that contribute to impacting conservation targets (i.e., the species or habitat to protect). A team or a group of practitioners can often believe that they have the same understanding of a problem, but different points-of-view might mean that perceptions vary and some factors might be overlooked. Because of this, a situation model is best developed in a participatory way with all relevant stakeholders, to ensure that all relevant local and expert knowledge is captured to give the most accurate insight to the situation. Crucially, a situation model should not strive to be a complete and perfect picture of the situation – rather, it should be seen as a tool developed for the moment for identifying the main human activities that might be addressed in order to improve the status of the conservation target.

A situation model (Figure 2) identifies the direct threats (e.g. illegal logging, unsustainable fishing, or climate-related factors such as increased extreme storm events), i.e. primarily human actions that immediately impact the conservation targets. In addition, it identifies the underlying indirect threats and drivers (e.g. demand for fish, logging policies), as well as the existing opportunities that might be leveraged to mitigate the situation. It maps out a set of causal relationships between factors that are believed to affect the conservation status/viability of one or more conservation targets. It might also contain biophysical factors, i.e. ecological factors that connect a threat to the conservation target and help clarify the relationship between threat and target (e.g. drought, eutrophication).

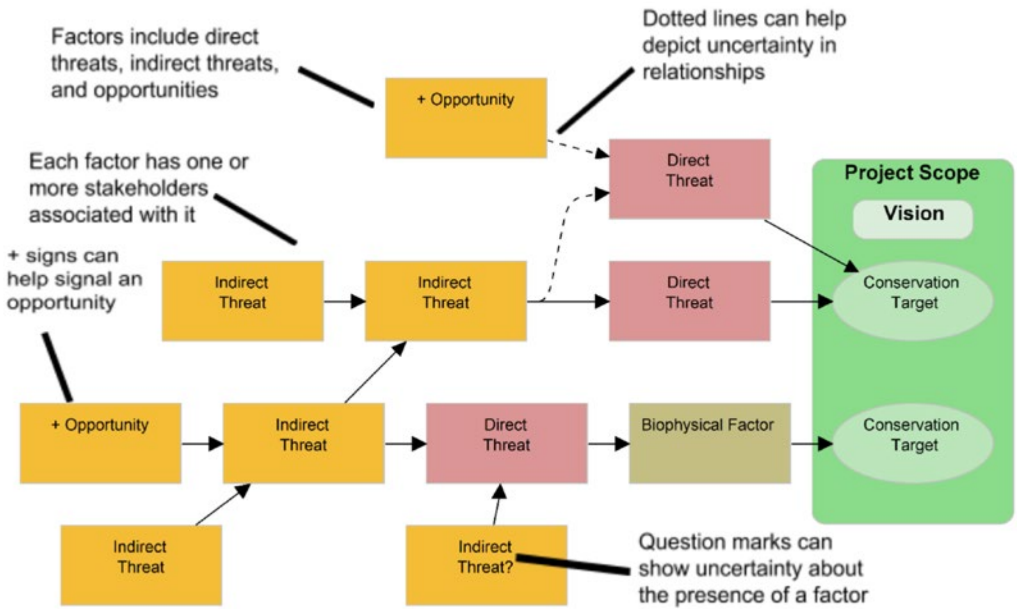

Figure 2. Generic situation model showing the project context. Source: Foundations of Success (2020). Planning for Conservation: A How-To Guide.

Situation analyses and situation models are a key tool in the Open Standards for the Practice of Conservation, developed by the Conservation Measures Partnership.

Workshop methods

To prepare for developing conservation measures, participants first deepened their understanding of the threats by creating situation models for each threat. In breakout groups, each group listed contributing factors and drivers for one threat, gradually sorting them into causal chains. Participants were then divided into new groups to review and discuss each of the other groups' models. The original groups then incorporated the comments into the situation models.

It should be noted that the situation models created during the workshop are first drafts. They could all be improved by checking the logic, to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

In the second phase, participants developed possible measures. To warm up, participants first did a "negative brainstorming" activity, referring to the situation models to come up with ways of making the problems worse. Using these "negative measures" for inspiration, and again referring to the situation models to find intervention points among the contributing factors, participants then brainstormed actual conservation measures. As the aim was to collect ambitious and/or effective ideas for measures, participants were asked to imagine that there are no legal or other hindrances to applying these measures.

The brainstorming activity produced a large number of draft measures. In order to narrow down and prioritise, participants divided into breakout groups, each group choosing a set of 8–12 draft measures for one of the threats. In plenary, voting was used to further prioritise between the ideas, based on the following criteria: new and promising, and/or known to be effective, and/or interesting and worth trying, and/or ambitious.

Finally, and again in breakout groups, participants explored the top 2–4 ideas for each threat, adding explanations if needed as well as listing benefits ("pluses") and any open issues that need resolving in order for the measure to be applied ("question marks"). Before the closing of the workshop, the groups presented their work in plenary, and comments were recorded.

Bycatch

Situation model

In drafting the situation model (Figure 3 on page 27), the group focusing on bycatch discussed the various reasons that bycatch occurs. On different levels of causality, these include:

- Properties of fishing gear
- Overlapping distribution of fishing and cetaceans
- Cetacean behaviour around fishing gear
- Inadequate implementation of legislation
- Traditions and cultural aspects in fishing practices
- Bycatch has always occurred so is not perceived as a problem
- Lack of scientific research and funding
- Lack of good cooperation (based on trust and respect) between fisheries and scientists
- Lack of understanding of the implications on the population level
- Lack of full knowledge on fisheries interactions with cetaceans
- Lack of consumer awareness

The actors relevant for bycatch mitigation were listed as:

- National governments/administrations
- US administration (through the US Import Provision Rule)
- Scientists
- The European Union
- Fisheries organisations
- Environmental NGOs
- Individual fishermen

In the context of developing the situation model, the group noted that fisheries should not be considered the enemy. It also noted that the distinction between impact from industrial versus recreational fishing should be kept in mind.

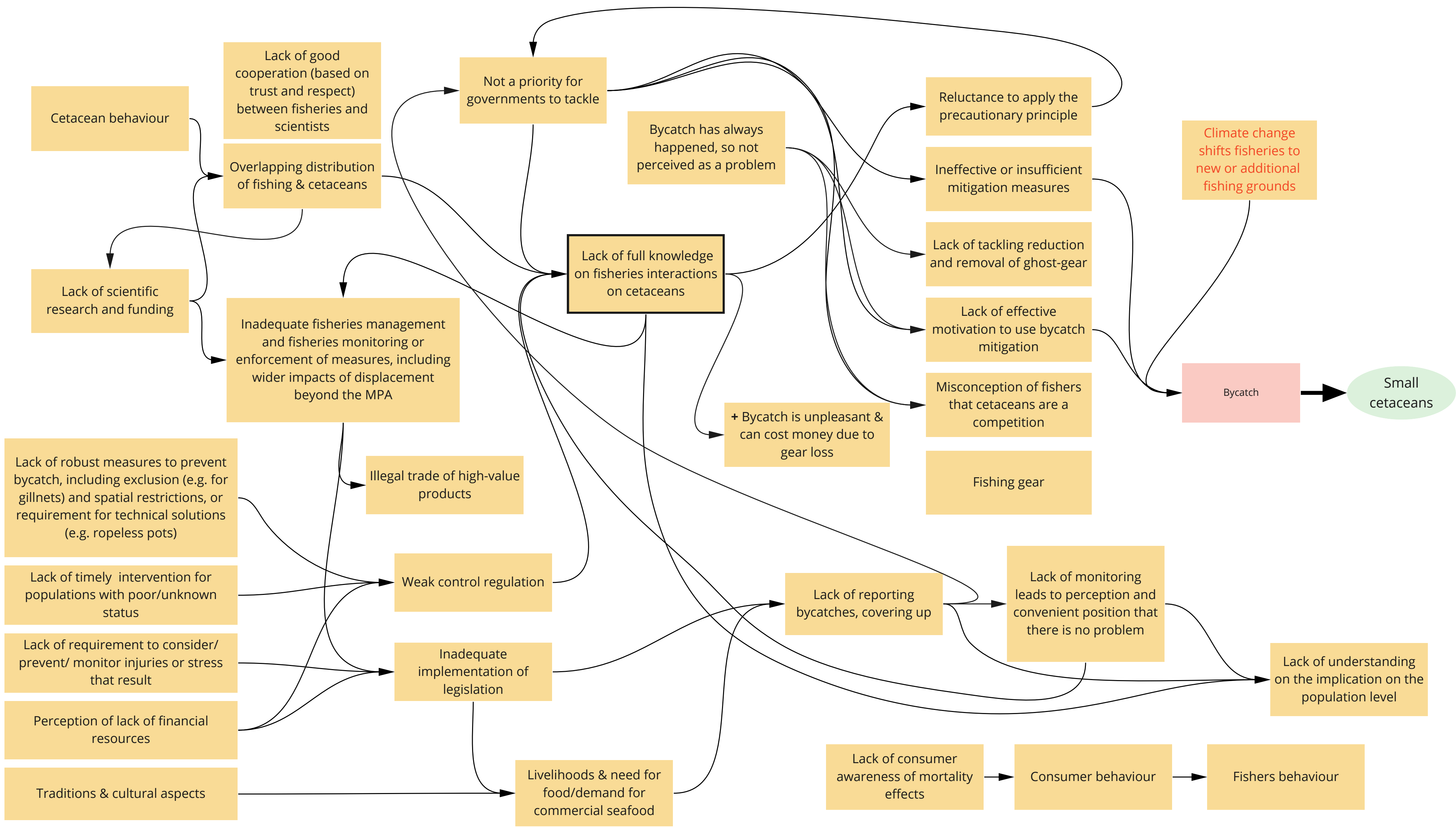

Figure 3. Draft situation model for bycatch. Note that the situation model is not finalised, and requires a review to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

Brainstorming measures

The brainstorming resulted in several measures for eliminating or reducing bycatch in MPAs, as well as some measures that will increase the understanding of mechanisms leading to bycatch, listed below. The top four, receiving the most votes, were:

- Ban fishing within MPAs and cetacean foraging areas
- Develop a platform to engage with fishermen on identifying solutions to bycatch
- Introduce a register for fishing gear, including an app for reporting lost gear
- Implement 100% monitoring coverage through remote electronic monitoring within MPAs

Other suggested measures included:

- Improve public awareness of bycatch, introduce certification
- Set gear and time limits for fishing within MPAs
- Target high risk areas & gear types through risk mapping
- Only allow alternative gears, or gears with adaptations to reduce bycatch. What alternative gears are suitable can vary on a case-by-case basis.
- Create an obligatory reporting scheme for all kinds of recreational fisheries
- Real-time monitoring of vessels through AIS
- Improve metrics for assessing fishing effort
- Nets to be marked with GPS trackers to be found when lost
- Implement state-run structures for removing ghost nets
- Prohibitive fishing license fees for access to MPAs
- Use fisheries subsidies for occupational redeployment of fishers
- Introduce quota system for recreational fishing guided by ICES advice

Refining conservation measures

For bycatch, two measures were selected for further development.

Ban fishing in MPAs and cetacean foraging areas

Banning fishing in MPAs is a simple measure. However, foraging areas can be scattered and if they are not inside MPAs, it may be difficult to define measures for them. Foraging areas can also move from year to year. It may be simpler to just ban fisheries in MPAs, particularly those types of fishing known to cause bycatch of the species of concern. Instead, e.g. buffer zones could be added around MPAs, since the MPAs themselves may not be enough to ensure relevant conservation.

Pros:

- Simple measure and easy to understand
- Implementation is simple from a technical and policy point-of-view
- If all vessels have VMS or AIS, it is easy to monitor and enforce the measure

Question marks:

- Not all vessels will be equipped with VMS/AIS
- The types of fishing to ban depends on the species of cetacean
- How to deal with relocation of fishing effort to outside of the MPA?
- Foraging areas difficult to define and likely move over time
- How to define e.g. buffer zones around MPAs?

Introduce a register for fishing gear and operations, including an app for reporting lost gear

Initially, this measure was intended only for registering fishing gear, as a means to keep track of it and to be able to report it as lost, and thus to decrease the introduction of ghost gear. However, as discussions went on it was also suggested that such a registry could be used as a control measure for operations, but this would be much more complicated. A fishing operation register would also need to include the location and type of fishing gear, and should be combined with full VMS coverage of all fishing vessels. It should be noted that either way this measure will not directly reduce bycatch.

Pros:

- Full information about fishing operations and lost gear
- Full knowledge about areas of high fishing effort and high risk gear

Question marks:

- If fishermen are to register fishing operations, implementation of a system that can be used efficiently is a huge and complicated task, as is identifying the legal requirements
- Vessels might use more than one type of gear and use them interchangeably
- Implementation could distinguish between dealing with gear and monitoring vessels

Impulsive/acute underwater noise

Situation model

In drafting the situation model (Figure 4 on page 32), the group discussing impulsive/acute underwater noise listed quite a few sources of impulsive underwater noise, including:

- Acoustic deterrent devices used in fisheries
- Acoustic harassment devices used in aquaculture to keep predators away
- Echosounders used in recreational vessels
- Echosounders used in professional vessels including fisheries
- Seismic surveys
- Offshore construction of wind farms, tunnels, bridges, pipelines etc., which could include pile driving, dredging etc.
- Decommissioning of offshore constructions such as oil and gas platforms, offshore wind farms
- Unexploded ordnance
- Other underwater explosions
- Military activities including military sonars (pulsed active sonar and continuous active sonar)

The group noted that impacts on species depend on sound characteristics (intensity, duration, frequency spectrum, distance etc.), and can take the form of deafness, death, displacement, stress, energetic consequences, behavioural changes, etc. Impulsive sound also has effects on cetacean prey species.

The increasing demand for energy, especially renewable but also oil and gas, is causing an increase in construction noise. Limited knowledge among both manufacturers and users of echosounders on the environmental impact of these devices has meant that the development and implementation of less disturbing devices, such as high-frequency echosounders, is slow. In the military, there is often limited knowledge and acceptance of the environmental impacts of military activities, and military operations are often exempt from the need for EIAs. It was concluded that there is a general need for coordination of events causing impulsive underwater noise to reduce their cumulative impact.

The group also noted that there are linkages between impulsive/acute underwater noise and some of the other threats, e.g. continuous/chronic underwater noise and disturbance from the presence of humans.

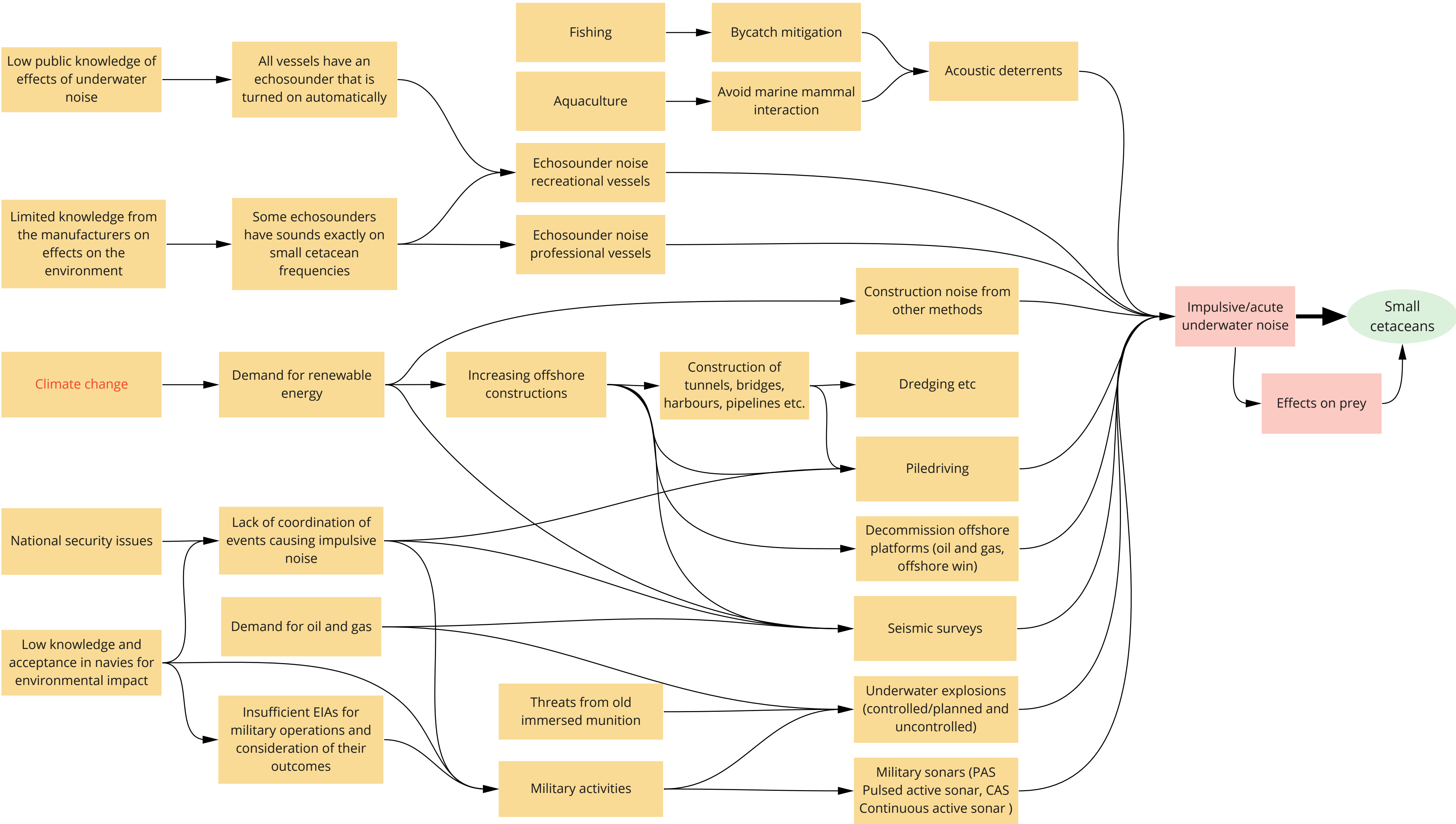

Figure 4. Draft situation model for impulsive/acute underwater noise. Note that the situation model is not finalised, and requires a review to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

Brainstorming measures

The brainstorming resulted in several measures for reducing the impact of impulsive/acute underwater noise in MPAs, listed below. The top four, receiving the most votes, were:

- Ban naval exercises/military activities within the MPA and buffer zone (within XX km)
- Ban pile driving within the MPA and buffer zone
- Use alternative methods to pile driving for foundations within MPA buffer zone
- Establish and enforce mandatory use of effective mitigation measures (e.g. bubble curtains, soft start, etc) during construction and other noise-emitting activities, within MPA and buffer zone

Other suggested measures included:

- Pingers and other ADDs only allowed within the MPA in exceptional cases and only as a temporary solution
- Set regulations for echosounders of problematic frequencies in the area
- Set a minimum proportion of the MPA which should be accessible (i.e. not ensonified by impulsive noise) to the species at any given time, for example 80% of the area should be accessible to the species at any given time
- If possible, unexploded ordnance to be taken from the MPA and detonated at safe distance or removed without detonation
- If unexploded ordnance cannot be moved, in each specific case evaluate if the use of deflagration instead of detonation is an option, being aware that leaking of toxic substances may be an issue
- Establish a zone around the MPA and legislate to limit, police, and monitor impulsive noise within that zone

There were also some ideas for more general measures that were not taken further during the workshop:

- Communicate with echosounder manufacturers about the frequencies used
- Switch to more planet friendly fuel types to stop dependence on oil and gas, and stop seismic surveys
- Increase public awareness about underwater noise, including the impacts of echosounders and boats in general
- Incentivise “noise-free” foundations for wind farms and other constructions
- To inform the management plan: Map the threats and the species distribution, overlap them to determine risk areas and what has to stop or be reduced where and when
- Cetacean scientists to work together with navy /military to eliminate harm to cetaceans (e.g. increase the understanding and develop common guidelines for alternative solutions and mitigation measures for military activities)

Refining conservation measures

For impulsive/acute underwater noise, two measures were selected for further development.

Ban naval exercises/military activities within the MPA and buffer zone

This measure would include banning for example explosions, torpedos, shooting exercises, and use of military sonar. Unexploded ordnance that cannot be moved and other activities that must be carried out within the site are covered by the other proposed measures, i.e. effective mitigation.

Pros:

- This measure would yield good results compared to the current situation
- Zoning according to knowledge on the spatiotemporal distribution of species can be implemented

Question marks:

- This measure depends on the military having and using knowledge on cetacean species presence, and connects to the general measure of scientists working together with the military.
- Can the military be involved in the management structure of the MPA?
- For Natura 2000, in cases that are not an emergency, the military should already make an appropriate assessment. Is this done today?

Establish and enforce mandatory use of effective mitigation measures (e.g. bubble curtains, soft start, etc.) during construction and other noise-emitting activities, within MPAs and their buffer zone

This measure should be applied in cases where activities cannot be avoided, such as already granted permits, existing constructions, necessary explosions of unexploded ordnance, etc. In all other cases, the first option should always be not carrying out the activity if there is a risk that it will negatively impact cetaceans. This measure can also be applied in a buffer zone around an MPA.

This measure often deals with activities that need authorisation for implementation. Mitigation should be taken into account in all stages of planning, implementation and dismantling, and authorisation should only be granted if effective mitigation is included in all stages and the risk for negative impact is minimised as much as possible.

It should be noted that for Natura 2000 sites, appropriate assessments have to be done for all activities that will affect the site, even if the activity itself is outside the site.

Pros:

- Possible to implement with current knowledge and legislation
- Allows for coexistence of different interests
- Mitigation measures exists but improvement of techniques as well as implementation is possible

Question marks:

- Noise level thresholds have to be described in the management plan
- The management plan should be clear on the requirements for authorisation of activities
- Existing mitigation measures should be known to authorizing authorities – guidance document might help here
- If zoning is present, this should be clear in the management plan, with thresholds for different areas and/or seasons
- It should be possible to update mandatory mitigation according to new knowledge
- Integration of new mitigation measures into existing, already authorised activities must be possible
- Seismic activities can have effects tens of kilometers away, which needs to be taken into account in assessments

Continuous/chronic underwater noise

Situation model

In drafting the situation model (Figure 5 on page 37), the group listed quite a few sources of continuous/chronic underwater noise, including:

- Commercial shipping including ferries
- Recreational water sports
- Tour operators
- Wildlife operators
- Some military sonars
- Dredging
- Fishing vessels
- Power generation (e.g. operating wind farms, tidal and wave energy farms)
- Construction noise other than piling
- Dismantling installations (wind farms, pipelines, platforms...)
- Offshore energy service vessels
- Seabed engineering, including cables, etc.
- Operating pumps to extract energy (oil/gas) or sand from the seafloor

The group had difficulties agreeing on how to take climate change into account, but concluded that the associated increased wind speeds and changes in salinity and temperature may increase the level and spread of natural noise in the environment, which may reduce the resilience to anthropogenic sound.

The group noted that some impulsive noise sources may have chronic effects, for example echosounders, and also that impulsive sound becomes continuous at larger distances, so there is some overlap with impulsive sound. Also, sources of continuous noise can be present in MPAs, but are also likely to have impacts if they occur outside of MPAs given how noise travels underwater. Therefore, there is a need to consider what happens inside and outside of MPAs, and to implement the use of buffer zones around MPAs to fully protect a species within the MPA.

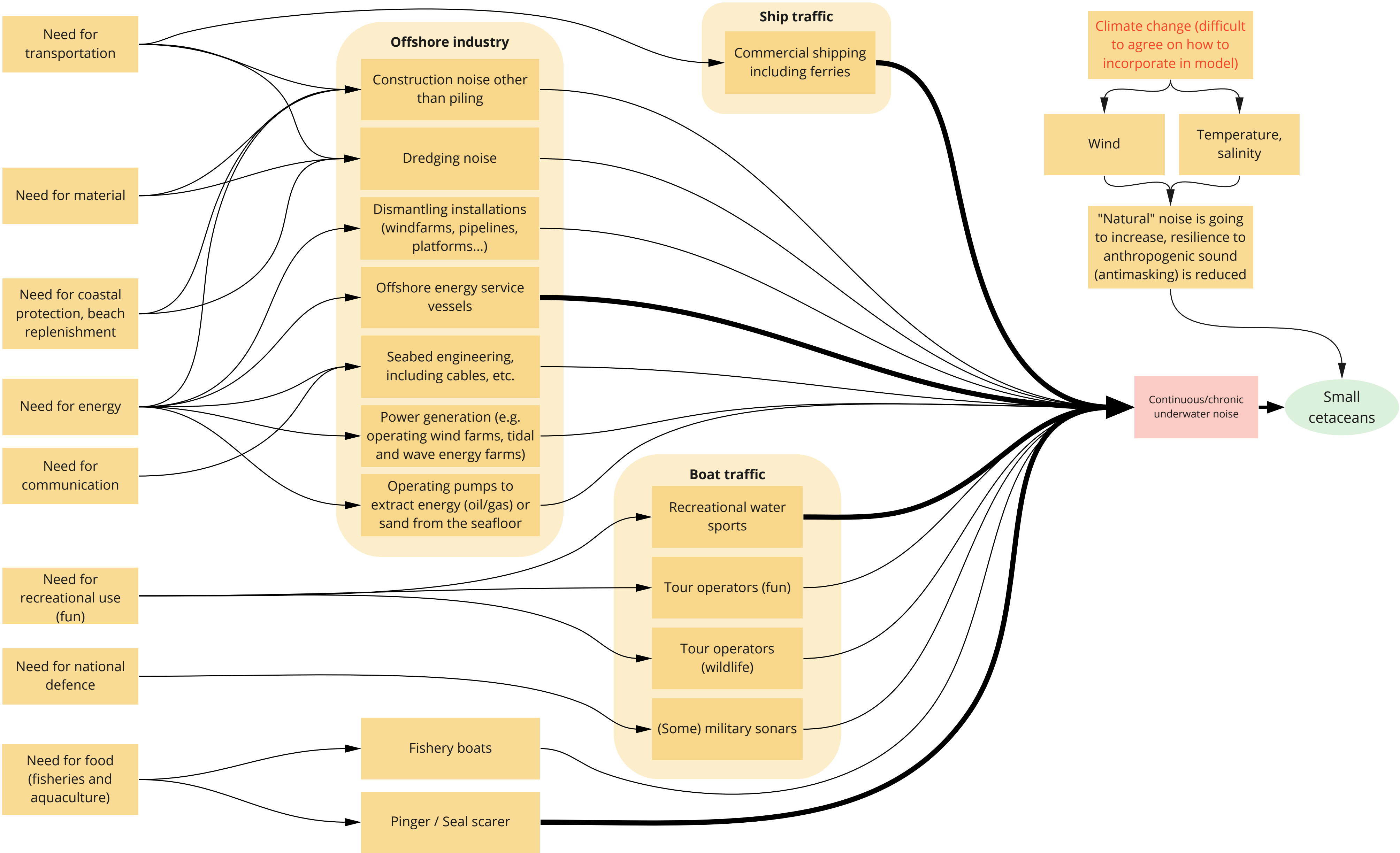

Figure 5. Draft situation model for continuous/chronic underwater noise. Note that the situation model is not finalised, and requires a review to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

Brainstorming measures

The brainstorming resulted in several measures for reducing the impact of continuous/chronic underwater noise in MPAs, listed below. The top three, receiving the most votes, were:

- Establish temporal or permanent silent zones inside and near MPAs
- Prohibit construction/industrial development within MPAs and their buffer zones
- Re-route shipping lanes to bypass MPAs (re-worded from "No shipping lanes through MPA, re-route based on modelling of best placement of shipping routes to achieve lower levels of noise within MPA")

Other suggested measures included:

- Two-way data exchange with the Defence, so the military can adapt their activities and MPA managers are aware of threats
- Map threats and risks (from inside and outside the MPA), define what has to stop or be reduced, where and when.
- Coordinate activities across countries to minimise noise producing activities
- Ban use of seal-scarers in fisheries and aquaculture (only allow for protecting mammals from e.g. unavoidable explosions)
- No engine-driven boats within an MPA or severe noise/speed limits set (here it was discussed whether speed restrictions actually reduces noise enough to warrant the longer time that the noise source is in the vicinity. Reduced speed does decrease the risk of ship-strikes, so it links to disturbance from the presence of humans)
- Allow only "quieter" (not silent) ships (under certification scheme) in MPA (noting that quiet ships may increase the risk of ship-strikes)
- Ban recreational vessels
- Offshore service vessels allowed to travel through MPAs during two 30 min periods a day only (one in the morning, one in the evening)

Refining conservation measures

For continuous/chronic underwater noise, three measures that got the most votes were selected for further development.

Establish temporal or permanent silent zones inside or near MPAs

To implement this mesure, other concrete measures are needed. Buffer zones would be needed outside the MPA to keep the pressure within the MPA low. The measure also depends on the size and location of the MPA.

Pros:

- The MPA is a quiet place for the species to forage/communicate effectively
- The MPA can serve as a reference area to allow for assessments of the impact of noise on a larger scale.
- Reproduction is not disturbed by noise

Question marks:

- What maximum noise level would we want to allow, what are relevant thresholds?
- What data is the silent zone based on (real time measurements or modelling)?

Prohibit construction/industrial development with negative impact on *species* and its prey and habitat, within MPAs and their buffer zones

For some continuous noise, zoning inside the MPA might not make sense, as noise travels so far. Buffer zones are needed outside the MPA to keep pressure in MPA low.

Pros:

- This measure would maintain a low pressure in the MPA.
- The MPA would be more attractive for animals than louder areas elsewhere.
- In coastal MPAs, industrial activities are limited, which would benefit recreation.

Question marks:

- Why are we protecting an area if construction is allowed inside of it?
- If some activity is allowed, how do we define and measure "with no negative impact" on individual or population level? This is a big issue that needs to be considered and defined properly in each case, otherwise it is easy for development to go ahead if the threshold for "negative impact" is not defined and measurable.
- Measures are dependent on the size and location of MPAs, species distribution, and other species of conservation interest (e.g. baleen whales)
- What is the best way to implement a buffer zone? Likely dependent on MPA size and activity that is creating the noise (how far the sound is likely to travel)

Based on modelling results of best placement (to minimise noise within the MPA while also reducing increases in CO_2 emissions), re-route shipping lanes to bypass MPAs

The element of modelling was brought back into this measure after the discussion in the refining stage. Re-routing of shipping lanes to avoid negative impact on MPAs should be based on modelling of both underwater noise and fuel consumption. This measure depends on the size and location of MPAs, proximity to ports, etc. It might not be possible to bypass large MPAs, in which case zonation or speed limit restrictions could be options for decreasing the impact of continuous noise.

Pros:

- The species has the highest level of protection within the MPA, with underwater noise reduced to the minimum levels possible.
- Connects to benefits of less ship-strikes and disturbance from the presence of humans

Question marks:

- Does a decreased speed limit always reduce noise?
- What is better, keeping transit time short or making ships quieter by slowing-down (or a compromise between both)?
- Each MPA needs a tailored solution based on size, pressure, and location.
- If re-routing results in longer ways traveled (and maybe even increased speed to keep the time), this might increase collision risk and disturbance outside the MPA.
- Re-routing might burn more fuel and lead to climate effects.

Environmental contaminants and pollutants

Situation model

In drafting the situation model (Figure 6 on page 43), the group discussing environmental contaminants and pollutants listed quite a few reasons that contaminants that impact the wellbeing of cetaceans occur in the environment, including:

- Agricultural discharge
- Industrial sources, many historical
- Aquaculture
- Pharmaceuticals
- Marine litter including microplastics
- Oil spills, cleaning tanks
- Ballast water, waste from ships
- Runoff, land-based input
- Eutrophication, harmful algal blooms
- Wastewater
- Climate change
- Leaching of cathodic anodes from wind farms and ships
- Exhaust gas cleaning systems (scrubbers) lead to input of hydrocarbons and toxic trace elements.
- Dumping (e.g. pollutants in canisters, explosives, chemical munitions)
- Seabed disturbance leads to resuspension of contaminated substrate

The group debated whether the contaminants theme should include sulfur emissions from marine traffic, as well as pathogens, such as morbillivirus, which may originate from land-based or human-related sources. It also discussed how to take into account the impact of rising sea temperatures.

In general, dealing with contaminants in an MPA is complex because sources are usually not within the MPA itself and often contaminants are the result of historical sources and cannot be removed from the environment. However, there are a few things that can be done to minimize input of new contaminants to the MPA, and the marine environment in general.

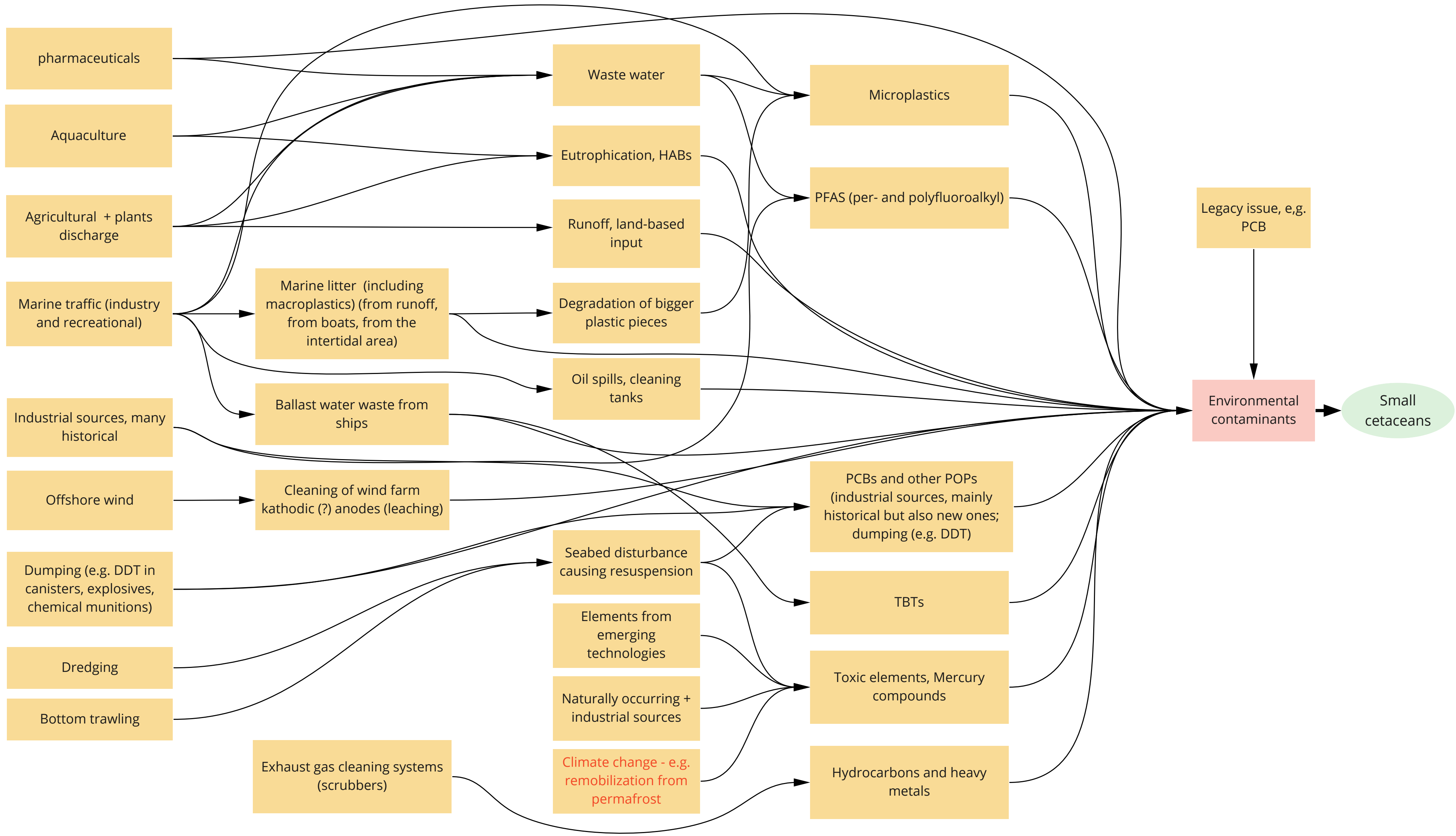

Figure 6. Draft situation model for environmental contaminants. Note that the situation model is not finalised, and requires a review to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

Brainstorming measures

The brainstorming resulted in a few measures that can contribute to reducing environmental contaminants and pollutants in MPAs. The top five, receiving the most votes, were:

- Ensure land-based pollution standards are adequate and enforced to prevent run-off
- Install a fourth cleaning stage in wastewater plants to remove micro-pollutants like pharmaceuticals
- Remove pollutants from the MPA - including clean up/removal of dumped pollutants (e.g. barrels, PCBs, munitions etc), marine debris etc. and consider cleaning contaminated substrate zones
- Avoid harmful discharges from industries inside the MPA - e.g. aquaculture, wind farms, vessel exhaust cleaning systems scrubbers, and cooling water
- Implement a polluters charge/tax (polluter pays principle)

Other suggested measures included:

- Introduce solutions in harbours and relevant control measures to ensure litter is not thrown from vessels into the sea
- Make dumping illegal: No direct dumping of anything to rivers or the sea
- No TBT/toxic antifouling substances used on ships or physical structures, develop environmentally friendly alternatives
- Educate users on the negative influence of products
- Make sure no plant / activity is authorised to operate unless it is warranted it does not release pollutants
- Introduce EIA obligations for the use of (new) military munitions
- Remove input from aquaculture (change the system or stop the activity)
- Ban any discharges from vessels inside the MPA
- Ban glyphosate and other agricultural chemicals

Many of these measures are relevant for MPA management, but would perhaps be even more useful if applied at a larger scale.

Refining conservation measures

For environmental contaminants and pollutants, two measures were selected for further development:

Remove pollutants from MPAs, including dumped pollutants (e.g. barrels, PCBs, munitions etc) and marine debris

Conduct risk assessments and attempt to remove pollutants from MPAs where feasible, including dumped pollutants (e.g. barrels, PCB-contaminated equipment, contaminated sediment, munitions etc.) and marine debris (e.g. plastics, ghost gear).

Pros:

- Practical: removal of contaminants will have a measurable benefit
- Decreases overall environmental load from contaminants (so there will be benefits also outside of MPAs)
- Includes marine debris which can include ghost gears (also contributing to less bycatch/mortality)
- Can include beach clean-ups of marine debris e.g. plastics and ghost gear which has an educational component
- Increased safety: removal of munitions will have benefits for species, industries, and recreational users of the MPA
- Can be listed as a restoration measure

Question marks:

- Pollutants are not mapped - how do we know where to look for these pollutants?
- Who does it? Who is responsible? (government/industry/ MPA management)
- For large MPAs this would be very costly.
- Would there be safety issues?
- Would removal of old barrels of chemicals pose a risk of causing leaks and making issues worse?
- Could this be a ‘compensatory measure’ for offshore indus-tries?
- Where/how are removed pollutants safely deposited?
- Should pollutants be removed from all areas within MPAs, or within certain zones?

Avoid harmful emissions from industries inside the MPA - e.g. aquaculture, wind farms, vessel exhaust cleaning systems (scrubbers), or cooling water

This measure entails avoiding harmful emissions through strict regulations on such emissions into the MPA.

Pros:

- MPA delineation provides the opportunity to regulate/legislate
- Buffer zones could be established, varying depending on industry and hydrography.
- Would promote development of less harmful alternatives
- Measurable changes can be achieved.

Question marks:

- Does this cover waste adequately? Are plastics included?
- Should this be an MPA measure or rather a universal measure?
- Are there alternative substances available to use in some cases, or would these need to be developed?
- Measure needs to be specified further, i.e. what level of regulation is needed?
- It may be a long time before the benefits to species are evident (but this does not reduce its importance, and if anything indicates action should be taken as soon as possible)

Prey depletion

Situation model

In drafting the situation model (Figure 7 on page 48), the group on prey depletion identified a range of contributing factors, which could be broadly divided into three categories:

Factors related directly to commercial and recreational fisheries. High fisheries pressure, whether targeted directly at prey species or causing bycatch of prey species, can cause reduction or depletion of stocks and changes in prey quality. The main drivers identified included demand for cheap protein (for both human consumption and for use as fishmeal in aquaculture) and politically set fishing quotas being too high – not following scientific advice or taking the whole ecosystem into account. It was also raised that recreational and/or part-time fishing might lack set quotas entirely, and that there might be a lack of knowledge on the (negative) impact of fishing by fishers, governments, and the public that consume seafood.

Factors related to habitat/ecosystem changes. Deterioration of habitat quality, or even loss of key habitats, will most likely have an adverse effect on populations of prey species. Changes in fish distribution and food webs were also identified as factors contributing to changes in prey quantity and quality. The main causes for all habitat/ecosystem changes included fisheries, human constructions at sea (for example wind farms), and land-based industry (causing for example eutrophication/dead zones). The drivers identified for these was the need for renewable energy and food production, but there are likely more.

Factors directly related to prey health. In addition to general deterioration of habitats and ecosystem functioning, environmental pollutants were mentioned as a factor affecting the health of prey species, causing for example parasites.

Climate change was also included as an overarching driver, causing for example changes in fish distribution, increased competition for prey, and low recruitment. The need for addressing cumulative impacts was also raised.

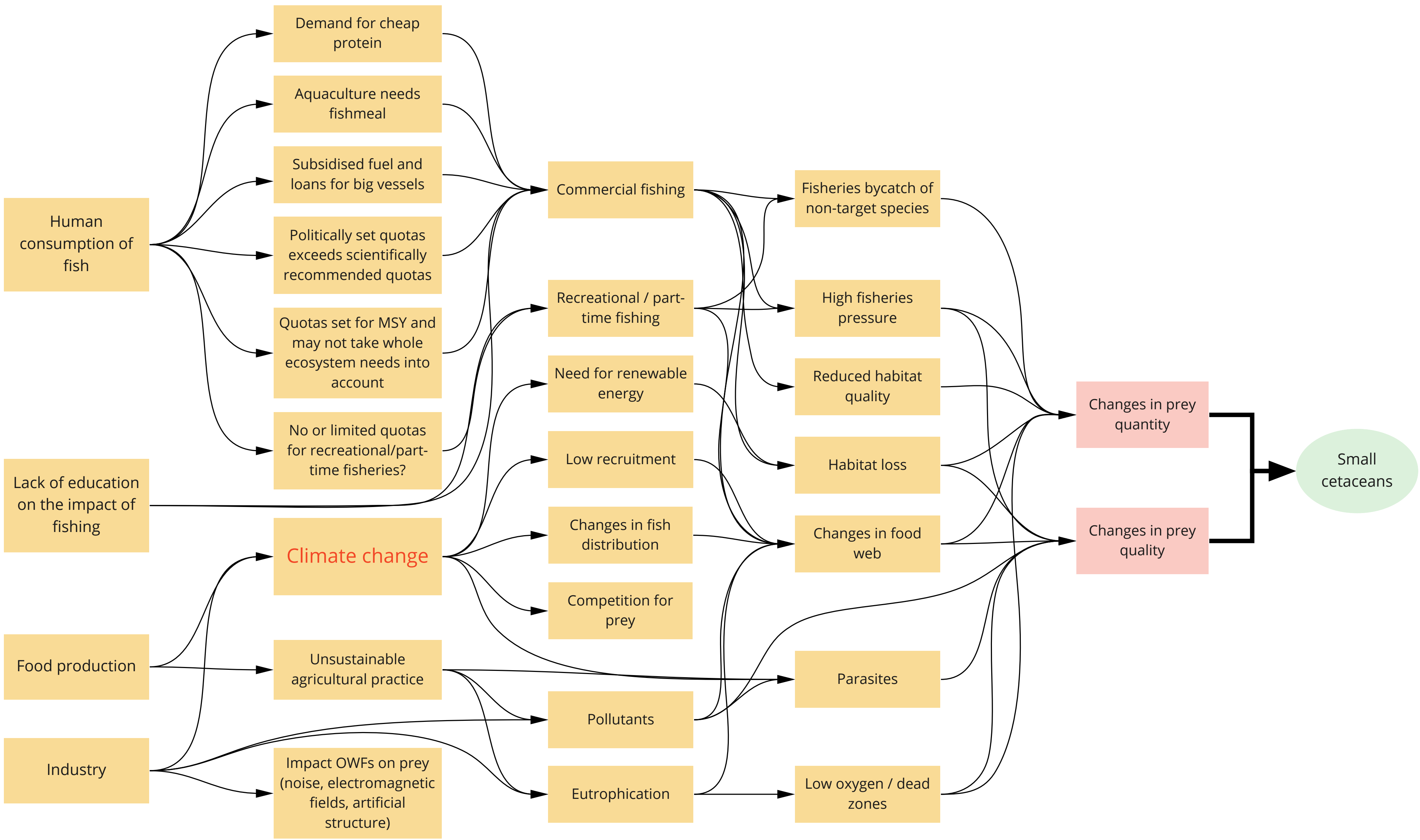

Figure 7. Draft situation model for prey depletion. Note that the situation model is not finalised, and requires a review to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

Brainstorming measures

The brainstorming resulted in several measures for stopping/reversing prey depletion or improving prey quality in MPAs. The top four, receiving the most votes, were:

- Create no-take zones in and around MPAs (and in cetacean foraging areas)
- Ensure that key habitats for prey species are under protection from harmful activities
- Restore degraded key habitats (e.g.. reefs) for prey species
- Set quotas based on an ecosystem approach (allowing consumption by all relevant ecosystem components)

Other suggested measures included:

- No fishing inside MPAs
- Limit industrial fisheries (allow only fishing for human consumption)
- Area- and time-bound fisheries' closures outside MPAs
- Only allow fishing methods that do not harm habitats or physical environment (e.g. no bottom trawling)
- Only allow fishing methods where the size of catch can be regulated, to ensure natural size distribution in fish populations
- Implement limits, controls, and surveillance of fishing and other activities reducing prey quality and quantity in MPAs
- Prohibit all extractive activities within MPA
- Remove old gear, litter, and ghost nets
- Recovery/Restock of prey species (to historical levels)
- Ensure local politician engagement in MPA management
- Engage all concerned parties (locals, scientists, fishermen etc) in finding solutions

Refining conservation measures

For prey depletion, three measures were selected for further development.

Create no-take zones in and around MPAs (or in entire MPA, if MPA is totally protected)

The group suggested the wording above instead of the original wording 'Create no-take zones in and around MPAs'. The rationale for this was that if the MPA is fully protected, no fishing should be allowed at all. Under the explanation section the group also added 'Use precautionary principle', which led to some discussions reflected under 'Question marks'.

Pros:

- Easy to control
- Efficient measure even if the MPA ecosystem is not fully known
- Will benefit all parts of the ecosystem (habitats and species on all levels)
- Can act as a scientific reference area

Question marks:

- Important areas within MPA (e.g., foraging areas, corridors, nursing areas) may have to be mapped first
- (Better) information on dietary requirements of target species may be needed
- Due to interannual differences in species movements, zoning and mapping can be difficult within an MPA
- Climate change can also have an effect
- How is success measured, what is a good indicator of success? Increase in numbers and/or health? Baseline data? Health assessment of animals can indicate nutritional health
- Precaution is a sliding scale, determining what level to apply is important
- Amount of research and evidence needed is also a sliding scale

The measure “Protect (from harmful activities) and restore key habitats (e.g. reefs) for prey species” was divided into two:

Ensure that key habitats for prey species are under protection from harmful activities

Restore degraded key habitats (e.g. reefs) for prey species

The precautionary principle was discussed here as well, as it was perceived that the measures were too vague and nonspecific. Again, this is reflected in the question marks.

Question marks:

- Knowledge on pre-disturbed conditions may be missing
- May need further knowledge on pressures and how they impact prey
- May need to develop methods for restoration and mitigation of harmful activities
- Need to think about how to balance precautionary approach and need for more information
- Ties into adaptive management. We make regulations which may change with new research. Start with precaution and then move on to regulations based on new research as we learn more

Develop and adopt an approach to setting fishing quota through an ecosystem-based approach to management

This wording was suggested by the larger group instead of the original wording ‘Set quotas based on ecosystem-based management approach’.

There was also a discussion on what ‘ecosystem-based management approach’ means, and a definition was suggested; ‘All species in the area must have enough prey species of good quality and quantity’.

Pros:

- Get “bonus” protection for non-target species
- All species have enough prey species of good quality and quantity

Question marks:

- Ecosystem approach can be interpreted and hijacked in different ways (resulting in a lessened effect)
- Is there not an approach to set quotas according to ecosystem-based management?
- A lot of information is needed about all species in the area, i.e., what they require in quantity and quality in terms of prey

Disturbance from the presence of humans

Situation model

In drafting the situation model (Figure 8 on page 54), the group discussing disturbance from the presence of humans listed some sources of disturbance from human activities that do not directly relate to noise produced, but rather to the presence of vessels or other human presence.

- Coastal constructions
- Commercial whale/cetacean watching, including in-water interactions
- Commercial shipping including commercial fishing vessels
- Renewable energy
- Military operations and munitions clearance
- Recreational water sports, diving, surfing, kayaking etc
- Recreational boating, including fast boats, jet skis etc
- Recreational fisheries

It was concluded that effects on individual health (from stress etc.) can feed through to changes in life history parameters (survival, fecundity) of individuals, and up to the population level. Changes in habitat and the distribution or activities (such as feeding) may also impact on health and life history, and ultimately have impact on population viability. The types of impact on individuals and populations could be:

- Stress
- Displacement of individuals
- Changes in activity budget
- Decrease in fitness
- Mortality

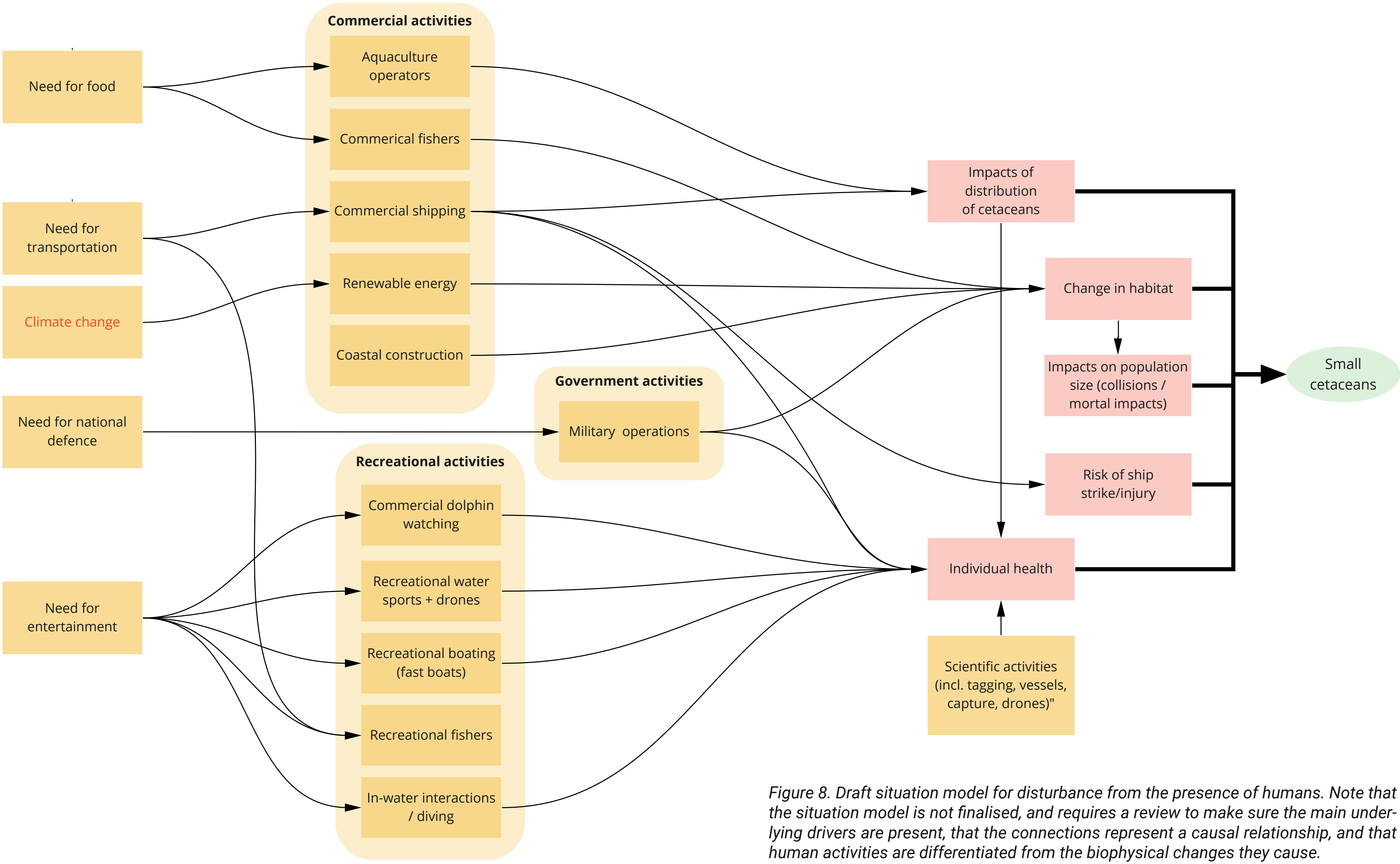

Figure 8. Draft situation model for disturbance from the presence of humans. Note that the situation model is not finalised, and requires a review to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

Brainstorming measures

The brainstorming resulted in several measures (selected without any socio-economic or other limitations) that could reduce the impact of disturbance due to the presence of humans. The top three, receiving the most votes, were:

- Update marine charts to include MPA boundaries, accompanied with details about ecology as well as map alerts that display allowable and prohibited activities within each MPA
- Strengthen patrolling and enforcement of MPAs to avoid harmful activities
- Limit the number of vessels in the area and establish strict speed limits for all vessels within MPAs

Other suggested measures included:

- Ban human presence in the MPA
- Keep an eye out for new users, apply the precautionary principle to their potential impacts if not yet fully known
- Wildlife operators are licensed and numbers capped, and monitored, as appropriate
- Guidelines and rules for leisure activities inside or close to MPAs
- All vessels equipped with a route tracking device

Some more general measures that pertain not to MPAs specifically were also mentioned:

- Increase public buy-in for protected areas
- Consider the health of individual cetaceans in management
- Develop propeller protection to avoid injuries

Refining conservation measures

After voting, three measures were selected for further development.

Update electronic navigation systems to include MPA boundaries (GIS layer), possibly accompanied with details about ecology as well as map alerts that display allowable and prohibited activities within each MPA

This measure would mean that the state agency delivers the MPA boundary and activities layers, as well as information on any restrictions within the MPA, and commercial map providers are encouraged to include them in their software and to ensure layers are updated frequently.

Pros include that this should be an easy and effective tool to use, and it would also be useful in terms of enforcement since users would know where they are and what restrictions are in place within the area. The measure can also relate to Maritime Spatial Planning.

The question marks raised were whether commercial map providers would be interested in using the data provided, and if regulatory bodies would be able to support this effort.

Put in place sufficient patrolling and enforcement of MPAs to avoid harmful activities

This measure also applies to monitoring and enforcement of other measures, and could therefore be very useful.

Establish maximum number of vessels as well as speed limits, and ensure code of conduct is in place, for vessels engaging with cetaceans within MPAs and relevant buffer zones

This could for example include restricting the number of vessels remaining within a set distance to a group of animals for a specified amount of time. It is a simple way to decrease the disturbance to animals, and also has a human safety element (distance to animals).

Question marks may be how to set and enforce limits. The number of vessels, distance and time may be context specific, and different vessels act in different ways.

Habitat quality

Situation model

In drafting the situation model (Figure 9 on page 59), the group discussed habitat quality and listed ‘demand for resources’ as the main driving force for the change. The increasing demand for resources leads to:

- Emissions of CO2 and NOx etc, which leads to ocean acidification and climate change
- Trade, production and consumption leads to continuous coastal and port infrastructure development and maintenance, more shipping and dredging / dumping to keep harbours open, which leads to disturbance of seabed. Shipping also leads to disturbance (e.g. noise, ability to find food, collision risk) and pollution
- Renewable energy infrastructure construction (tidal turbines, wave energy) can lead to ecosystem effects such as changes in stratification and wave patterns
- Seabed mining leads to disturbance of the seabed and resuspension of organic matter, nutrients and contaminated sediments.
- Sand and gravel extraction leads to disturbance of seabed
- Bottom trawling and scallop dredging leads to disturbance of seabed
- Dredging and dumping leads to disturbance of seabed
- Eutrophication, underwater noise and climate change were also all seen as impacting habitat quality as well as prey abundance and distribution.

The group concluded that all of the above factors resulted in loss of habitat, changes in habitat quality, and changes in food web structure. It was noted that some changes are permanent, while others last for a shorter time. The group also thought that there is a need for baseline information on habitat quality and food webs, but information is often not available, and there is an issue of shifting baselines. Many key pressures were considered to be interwoven, such as disturbance, noise, pollution, and bycatch. It should also be noted that activities should not be displaced outside MPAs without thinking about wider management implications.

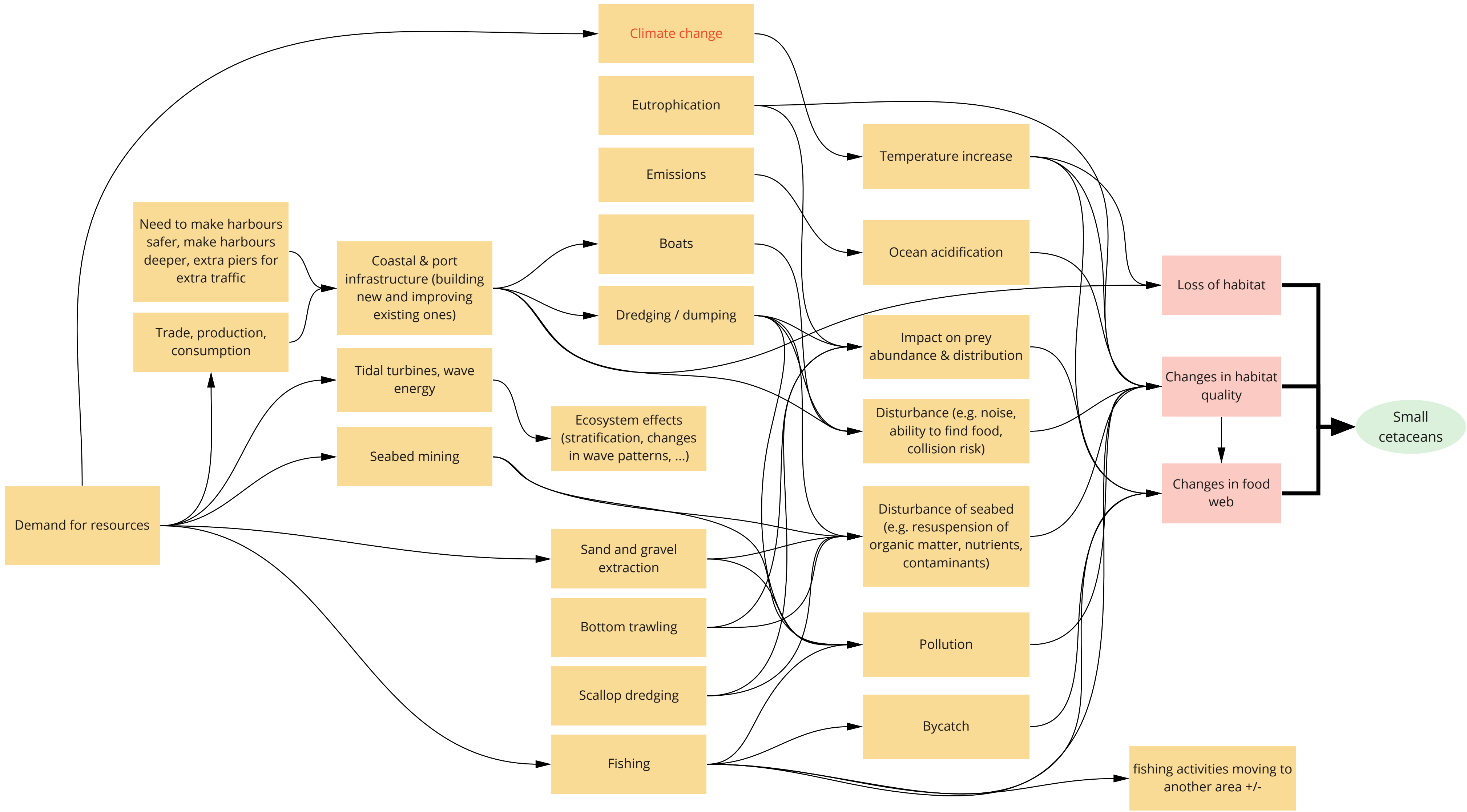

Figure 9. Draft situation model for other changes in habitat quality. Note that the situation model is not finalised, and requires a review to make sure the main underlying drivers are present, that the connections represent a causal relationship, and that human activities are differentiated from the biophysical changes they cause.

Brainstorming measures

The brainstorming resulted in several measures for reducing changes in and improving habitat quality in MPAs. The top three, receiving the most votes, were:

- Prohibit all activities with negative impact on the habitats and species within MPAs
- Ban dredging, seabed mining etc within the MPAs and their buffer zones
- Relevant stakeholders (authorities etc) design and implement effective management and monitoring of MPAs regarding habitat quality and food webs

Other suggested measures included:

- Introduce maximum size limits for fish taken by commercial and recreational fisheries in order to increase recruitment
- No greenhouse gas emissions that negatively affect the Earth's atmosphere (which would negatively affect the oceans)
- Reduce pollution in MPAs by removing dumped hazards, ghost gear etc. and also focusing on effective rules and enforcement to reduce new pollution
- Restrict fishing to certain gear types, certain times of the year, certain areas (rotation)
- Ensure that Marine Stewardship Council does not certify fisheries that have high rates of bycatch of protected, endangered and threatened (PET) species and/or use habitat destroying gear. Ensure all fisheries in the MPA are certified.
- Look at historical records to understand optimal habitat in the MPA and restore them to this baseline (e.g. plant seagrasses, remove invasive species)
- Information campaigns towards consumers / users / stakeholders about sustainable use of the MPAs
- Effective management and monitoring of MPAs, and cooperation within ministries / department / authorities regarding habitat quality and food webs

Refining conservation measures

For changes in habitat quality, three measures were selected for further development:

Prohibit all activities with negative impact on the habitats and species within MPAs

Pros:

- A good 'catch all' measure
- Clear and simple
- Positive long-term effects
- With this measure we would gain a better understanding of the ecosystem
- Precautionary approach

Question marks:

- Should this include all activities or be area-specific?
- Who decides what activities are in scope?
- How do you know if an activity has a negative impact? (e.g. how many kayakers is too much – difficult to prove that there is no negative impact)
- How would you monitor and enforce it?
- How do you define "activity"? Is it just man-made/human activities?

Ban dredging, seabed mining etc. within the MPAs and their buffer zones

Pros:

- Good impact on marine environment
- Protects the whole ecosystem
- Reduction on noise
- Clear and simple measure
- Easy to enforce

Question marks:

- Harbours need to dredge regularly, so how would they implement this?
- How big should the buffer zones be? Does it need to be a case-by-case basis?
- Should it be different for existing vs. new infrastructure?
- Buy in from all stakeholders?

Look at historical records to understand optimal habitat in the MPA and restore them to this baseline (e.g. plant seagrasses, remove invasive species)

Pros:

- Inspiring, restorative
- Potentially positive effect on the whole ecosystem

Question marks:

- How do you figure out what the baseline is?
- "Optimal habitat" might be different for different species / components of the food web
- The impacts of this could be very unknown
- Can be difficult to implement (e.g. planting seagrass, removing invasive species)

Afterword and next steps

This report reflects the discussions that took place during the four days of the online workshop in May and June 2021, with only some small adjustments to wordings made after the workshop in close dialogue with the participants. This means that the lists of proposed conservation objectives and measures are in no way exhaustive, and the objectives and measures are often not fully developed. Consequently, the lists should not be seen as complete or ideal. However, the organising committee is confident that this report can be useful as food for thought on the management of small cetacean MPAs.

The organising committee and the participants all agree that this work should be built upon and continued so that it can eventually be developed into a more complete toolbox of conservation objectives and measures.

The organising committee would like to sincerely thank everyone who has been involved in this work, from the planning starting in autumn 2019 to participating and contributing to the finalised report that you are now reading. We hope to continue this work together with you all in a not too distant future. And who knows, maybe next time we will get to meet in the real world!

Common dolphin. Photo: Kylie Owen

Annex: Participant list

Workshop Participants

Listed in alphabetical order. Kindly note that not all participants attended all four sessions.

Name		Affiliation	Country
Lena	AVELLAN	OSPAR Secretariat	United Kingdom
Simon	BERROW	Irish Whale and Dolphin Group	Ireland
Patricia	BRTNIK	German Oceanographic Museum	Germany
Julia	CARLSTRÖM	Swedish Museum of Natural History	Sweden
Barbara	CHENEY	University of Aberdeen	United Kingdom
Alexandra	COLBING	County administrative board of Gotland	Sweden
Michael	DÄHNE	Meeresmuseum	Germany
Magnus	DANBOLT	County Administrative Board Kalmar	Sweden
Emma	DAY	Department of Environment, Food and Rural Affairs	United Kingdom
Krishna	DAS	University of Liege	Belgium
Sarah	DOLMAN	Whale and Dolphin Conservation	United Kingdom
Alice	DOYLE	Joint Nature Conservation Committee	United Kingdom
Peter	EVANS	Sea Watch Foundation	United Kingdom
Anita	GILLES	University of Veterinary Medicine Hannover, Foundation	Germany
Andrzej	GINALSKI	General Directorate for Environmental Protection	Poland
Mick	GREEN	Independent / Whale and Dolphin Conservation	United Kingdom
Susan	GUBBAY	Marine Ecologist	United Kingdom
Maija	HÄGGBLOM	Ålands landskapsregering	Finland
Chris	JOHNSON	WWF	Australia

Name		Affiliation	Country
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Katarzyna	KAMINSKA	The Fisheries Department	Poland
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Finn	LARSEN	DTU Aqua, Technical University of Denmark	Denmark
Philippe	LE NILIOT	French Biodiversity Agency	France
Miriam	MUELLER	German Federal Agency for Nature Conservation	Germany
Giuseppe	NOTARBARTOLO DI SCIARA	CMS Aquatic Mammals Working Group	Italy
Kylie	OWEN	Swedish Museum of Natural History	Sweden
Iwona	PAWLICZKA	University of Gdańsk, Prof.Krzysztof Skóra Hel Marine Station	Poland
Graham	PIERCE	Insituto de Investigaciones Marinas (CSIC)	Spain
Maylis	SALIVAS	ACCOBAMS	Monaco
Marije	SIEMENSMA	Marine Science & Communication	Netherlands
Francis	STAUB	Ocean Governance project	United Kingdom
Signe	SVEEGAARD	Department of Bioscience, Aarhus University	Denmark

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Penina	BLANKETT	Ministry of the Environment	Finland
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