OSPAR COMMISSION

Protecting and conserving the North-East Atlantic and its resources

HELCOM

Outcome of the OSPAR-HELCOM workshop to examine possibilities for developing indicators for incidental by-catch of birds and marine mammals

10:00 Tuesday 3rd – 13:00 Thursday 5th September 2019.

Eigtveds Pakhus, Strandgade 25G, 1401 Copenhagen, Denmark

Outcome of the workshop

Opening of the workshop and setting the scene

1. The OSPAR-HELCOM workshop to examine possibilities for developing indicators for incidental by-catch on birds and marine mammals took place 3-5 September 2019 in Copenhagen, Denmark at the kind invitation of the Government of Denmark. The workshop was attended by participants from Contracting Parties, Observer organisations and invited guests. The full list of participants is at **Annex 1**.

2. The workshop was chaired by Peter Evans and Katarzyna Kaminska as representatives of the OSPAR and HELCOM perspectives respectively, who also introduced the aims of the workshop (Presentation 1).

3. Introductions to the assessment needs in respect of incidental by-catch were provided for OSPAR (Presentation 2), HELCOM (Presentation 3), European Commission (Presentation 4), ASCOBANS (Presentation 5), ACCOBAMS (Presentation 6), ICES (Presentation 7), IWC and NAMMCO (Presentation 8).

4. The importance of clarity between conservation objectives and management objectives/targets and how such objectives inform the definition of thresholds was presented (Presentation 9).

5. Existing assessment approaches for marine mammals in the OSPAR Regions (Presentation 10) and the HELCOM area (Presentation 11) were presented, as well as for seabirds in the OSPAR Regions (Presentation 12) and HELCOM area (Presentation 13). An overview of available fishing effort data at ICES was also presented (Presentation 14) as well as an overview of approaches for mapping high risk areas (Presentation 15).

6. The introductions were used to set the scene for discussion groups on data requirements, sources and monitoring; Identifying areas of increased risk/low risk of incidental by-catch; methodologies for indicator assessment, including threshold setting as well as for the groups focussing on the synergies and differences between the two major taxa, Seabirds and Marine Mammals.

Data requirements, sources and monitoring

7. The group compared the data needs associated with an incidental by-catch indicator to the current data availability, and identified data gaps and possible additional data sources. The group further worked to identify barriers preventing appropriate monitoring data becoming available. Overall, the group concluded that since the identified barriers exist at various levels, efforts to overcome those barriers need to be addressed at the appropriate level to be effective. They consequently discussed possibilities to provide practical proposals on how to address the data gaps with an aim to enable assessments both in the short- and long-term. The group was also invited to discuss the ideas and proposals included in the draft “HELCOM Roadmap on fisheries data in order to assess incidental by-catches and fisheries impact on benthic biotopes in the Baltic Sea”, regarding an incidental by-catch indicator, and provided feedback to the document authors.

8. Key conclusions from the discussions;

a. the structure of the fisheries differs between the two regions (e.g. scale of fisheries, fishery intensity and métiers), which results in differing levels of effort, extent and methods of data collection;

b. data needed for by-catch estimates are currently not available at the appropriate spatial scale, applicable both at the individual data level (e.g. within and between vessel sizes), and across data types (e.g. bird and fisheries data);

c. fisheries related data are needed for small sized vessels (vessels below 12m) for all areas, especially VMS equivalent data. A minimum data requirement should be Days-at-Sea (DaS) for all areas and all vessel lengths; however, data on soak time and net length/area swept ideally are needed in order to estimate by-catch rate. Data for both part- and full-time fisheries are also needed;

d. there is a clear discrepancy between the amount of resources currently made available and the monitoring and data collection commitments/needs;

e. both fishermen and observers show reluctance towards monitoring. The reluctance of the fishermen often stems from fear that reporting incidental by-catch of protected species may lead to introduction of additional restrictions, while the observer's reluctance reflects the high demands put on them. A reluctance by fishermen to report, as well as low taxonomic knowledge, makes the reported data unreliable;

f. There is a need for regionally comparable methods and reporting formats for monitoring/sampling programs for incidental by-catch, with clear standards/guidelines, at various local, national and international scale, to ensure that collected data are comparable and can be aggregated/collated across areas;

g. Limited access to existing data and limitation in the rights to use existing data inhibit progress towards identifying incidental by-catch risk areas and incidental by-catch rates.

15. Proposals from the workshop;

a. explore options for developing (and implementing) a VMS and logbook equivalent for small sized vessels to collect more data;

b. support simplifying reporting for fishermen, for example by adding changes to the logbooks to include non-mandatory fields, and support efforts encouraging use of electronic logbooks;

c. explore including fields for reporting non-mandatory data in the reporting formats supplied by the data hosts and include these data in the data calls;

d. support the development of a single agreed data and monitoring standard for incidental by-catch related parameters, and a common logbook format for these parameters, within EU and between EU and non-EU countries;

e. explore establishing a closer cooperation of the Regional Seas Conventions (RSCs) with the DC MAP, e.g. through observer status to the RCGs, by combining other national monitoring projects/efforts/pilots with DCF efforts, and by ensuring that the results of both national pilot projects and DCF efforts are comparable and can be compiled together. Providing an evidence base to the RCGs elucidating the need to shifting monitoring effort or e.g. covering a certain % of métier and area under the DCF monitoring.

f. consider alternative methods of collecting data e.g. the use of a reference fleet, a smaller number of vessels proportionally representing the overall fleet, providing relevant data (e.g. by-catch, effort, gear etc.) which can be considered representative for that given métier, to estimate incidental by-catch or including a scientific quota.

9. Further detail on the discussions are presented at **Annex 2** with further technical details presented in a separate technical report.

Identifying areas of increased risk/low risk of incidental by-catch

10. The group discussed the possible approaches for identifying areas of incidental by-catch risk, ways to make assessments of these risk areas, and the data requirements to enable such assessments. Approaches to combine different data strands in a compatible way to make a valid assessment of risk areas were discussed, and how to carry out a harmonised evaluation of potential risk based on available data, to guide the application of monitoring (both in risk and reference areas) was considered.

11. Key conclusions from the discussions

a. Fisheries data, in particular from small vessels and recreational fisheries, need to be enhanced to a level that can support identification of high-risk areas;
b. implementing VMS or equivalent tracking system on smaller vessels may provide valuable new information; cooperation by fishermen in small vessels is critical which could be facilitated through an understanding of the benefit of the data collection approaches (e.g. cameras, VMS, phone apps, etc).
c. Form stronger links with other relevant bodies (e.g. recreational fisheries) to bring best data together from all sources.
d. Cross border data cooperation and harmonised reporting are important so that, for example, fishing effort by foreign vessels can be included in national or regional assessments.
e. Encourage utilisation of all data sources for reported dead animals, including stranded animals, to support the identification of high-risk areas and overall status and occurrence of relevant species. This information can additionally support a greater understanding of other impacts and health and life history parameters, per species;
f. Identification of species of particular conservation relevance (e.g. endangered, threatened or declining), and species that form close interactions with fishing activities (and may become a management problem by feeding directly from fishing activities), could be important. Regional or population and sub-population specificities of these species need to be considered.
g. Data on species distribution (inclusive of spatial and temporal aspects), habitat use, prey specificity, and other relevant parameters are important to enable improved identification of high-risk areas.
h. Identifying high risk areas should be prioritised for species addressed in point f, above, and a regionally agreed list of species (i.e. a rationalised clear list compiled from existing information per region) of concern/relevance would benefit defining priority species. Other species should also be considered, as appropriate, or in response to recorded changes in status (e.g. declining abundances or distribution).

i. Risk-based approaches have the potential to highlight/define the most suitable monitoring approach that should be carried out and help inform relevant frequencies so as to ensure ecological relevance of the assessment procedure.
j. Improved data on monitored and recorded actual incidental by-catch incidence are needed, and could be achieved through:
    i. Appropriate monitoring to cover high-risk areas, reference areas and appropriate spatial coverage needed.
    ii. Areas or species where risk was deemed to be close to high-risk could be monitored, as the tipping point to an area that may become high-risk due to small or localised changes in pressures.
    iii. observers or designated monitoring in times or areas of specific identified high-risk.

12. Further detail on the discussions are presented at **Annex 3** with further technical details presented in a separate technical report.

Methodologies for indicator assessment, including threshold setting

13. The group discussed alternative metrics/parameters and model-based approaches to indicator based assessments; explored relevant resolution for assessment data in terms of spatial assessment units, temporal and taxonomic resolution; considered the need for different methods for data rich and data poor species; compared available methods for threshold setting (e.g. CLA, RLA, PBR, PVA, rule-of-thumb) and proposed threshold values linked to conservation objectives.

14. Key conclusions from the discussions;

a. a step-wise approach to indicator development is needed, where a simple approach could be applied in the short-term and provide incentive for improved data collection to allow for more complex approaches to be used in the longer-term;

b. “borrowing” information between ecologically equivalent species would be needed in order to apply more complex indicator approaches;

c. species are the appropriate taxonomic resolution for assessments, but species could be grouped according to life-history traits, demographic trajectories, and data availability to identify which assessment method and threshold value would be appropriate;

d. assessment units for incidental by-catch assessment should be aligned with the assessment unit used for abundance indicators whenever possible; if these are not available then species specific management/assessment units should be used, and if these are not available the Regional Seas Convention Regions should be used;

e. threshold values, derived based on the proposed conservation objective, would be proposed for different species groups and would require further testing to ascertain their ecological relevance (see below for mammals and birds).

15. Proposals from the workshop;

a. the conservation objective ‘Minimise and where possible eliminate incidental catches of all marine mammal and bird species such that they do not represent a threat to the conservation status of these species’ was proposed to be further considered by OSPAR in

work on the North East Atlantic Environment Strategy and by HELCOM in work on the Baltic Sea Action Plan.

b. An interim management objective could be "The mortality rate from incidental catches should be below levels which threaten any protected species, such that their long-term viability is ensured." However, this will need refining to apply to particular species groups/taxa and level of knowledge about them.

16. Further detail on the discussions are presented at **Annex 4** with further technical details presented in a separate technical report.

Marine mammals

17. The group discussed the data needs for assessing mammal incidental by-catch, including aspects such as the needs or gaps in readily available data for fisheries effort, incidental by-catch data, and species population parameters. Experiences with incidental by-catch monitoring were shared and the pros and cons of various approaches were discussed, with the cost and effectiveness of these also considered. Flow charts to conceptualize approaches for carrying out an assessment of mammal incidental by-catch were developed for cetaceans and seals separately (noting that finer details within these, particularly for certain species, needed to be reviewed by species specific experts).

18. Key conclusions from the discussions;

a. fisheries effort from smaller vessels is critical to carrying out an effective assessment of incidental by-catch, data on net length and soak time also important for static nets. Temporal and spatial details from fisheries data important;

b. population parameters (e.g. demographic or life-history aspects), especially for some rarer species, need to be improved to enable a full assessment of incidental by-catch. In certain species, winter population distribution factors are not well established;

c. trust building between fisheries and incidental by-catch monitoring will be important in gaining good data and numerous options are available that could be applied independently or in combination, such as: cameras (REM), onboard observers, reference fleets, mandatory self-reporting, or interviews. Certain approaches may be more suited to specific areas than others and each approach has its pros and cons;

d. linking cooperation on incidental by-catch with incentives and certification (e.g. Marine Stewardship Council) may also be helpful;

e. risk mapping could contribute to mitigation and also targeted monitoring, and effective stranding networks could contribute to gaining an overview of incidental by-catch however uncertainty in the data needs to be recognised;

f. flow charts were established to identify a common approach for assessing the incidental by-catch of cetaceans and seals.

19. Further detail on the discussions are presented at **Annex 5** with further technical details presented in a separate technical report.

Seabirds

20. The group discussed specificities of seabird assessment approaches and reviewed any synergies with marine mammal assessments. In general, the same methodological approaches were seen as relevant for seabirds and marine mammals, although certain analytical techniques (such as RLA) have not been applied to birds while PVA is recommended where data are available. The concept of "carrying capacity", as proposed for threshold values for marine mammals, is not widely used in marine ornithology in this context and is not recommended. Conclusions on data availability and approaches to identify incidental by-catch high risk areas discussed earlier during the workshop were considered further.

21. Key conclusions from the discussions;

a. The proposed threshold derives from the conservation objective (see above) where 1% is an approximation of zero mortality derived from a definition of 'small numbers' in EU Birds Directive case-law. Testing the ecological relevance of the proposed threshold constitutes a key next step (applying PVA where data are available; RLA as yet untested on birds);

22. Proposals from the workshop:

a. a rule-of-thumb approach to threshold setting is currently the most appropriate approach, and the following threshold is proposed:

    i. The threshold mortality rate from incidental by-catch is 1% of natural annual adult mortality of the species

b. large assessment units are most appropriate, and the following are proposed;

    i. HELCOM; same assessment units as for the abundance indicators, i.e. seven units derived by grouping assessment unit level 2 sub-basins;

    ii. OSPAR; use the same assessment units as in the abundance indicator or existing management units if available, if not available then use OSPAR Regions.

23. Further detail on the discussions are presented at **Annex 6** with further technical details presented in a separate technical report.

Concluding remarks

24. The workshop addressed the marine bird and marine mammal faunas of the combined OSPAR and HELCOM regions. These comprise c. 70 species of birds, 40 species of cetaceans and 8 pinniped species.

25. The workshop concluded that there is much variation in population distributions and sizes, demographic trends, and life history parameters as well as information available, necessitating the need to consider species or species groups at various spatial scales/regions.

26. The workshop supported that assessing the impact of incidental by-catch should, whenever possible, be delineated by species population, followed by obtaining information on its abundance, trends, some key life history parameters (e.g. annual adult mortality, generation length), and incidental by-catch rates. The workshop highlighted that (inter-)regional agreement on which metrics to use is needed, taking into account that these can vary within and between major taxa (e.g.

abundance estimates may be numbers of birds at breeding sites, seal numbers at moulting haul-outs or pup production, or at-sea abundance).

27. The workshop acknowledged that a number of the identified gaps related to assessing incidental by-catch (focal species, spatial distribution, sensitivity etc.) need to be in place prior to the assessments planned in three years' time and that dedicated efforts are needed to fill these gaps.

28. The workshop agreed that the most challenging parameter to estimate is incidental by-catch rate, which is consistently under-recorded due to sampling difficulties. The workshop recognised that there are methods available, such as remote electronic monitoring (REM) for finer scale analyses, which can be used to improve the estimates and better understand the factors affecting incidental by-catch rates. Further development is being made to reduce costs so that in the future REM can be moved between vessels for better statistical sampling.

29. The workshop discussed who should be addressed in the efforts to improve incidental by-catch monitoring and made the following suggestions:

a. Ensure open two-way communication channels between RSCs and EU RCGs.

b. RSCs could prepare clear direction and instruction to be provided to the RCG, e.g. on priority fisheries and priority areas for focus on monitoring.

c. FAO could be used as a platform to improve cooperation with regional fisheries associations (RFMOs), who in turn can improve monitoring.

d. Communicate the conclusions from this workshop directly to the Contracting Parties of HELCOM and OSPAR, with the aim of providing guidance and guidelines in order to in the long term unify and improve national monitoring in the regions.

e. Improved monitoring techniques are important but in addition there is an urgent need for improved, enforceable technical and management solutions to be put in place to minimize incidental by-catch.

30. The workshop agreed that the key messages in the outcome document, outlining the most salient monitoring needs, would be presented to be agreed on by the autumn meetings of HELCOM and OSPAR. Workshop delegates who are engaged in ASCOBANS and ACCOBAMS would bring the workshop conclusions across to the meetings taking place in the following weeks.

31. The workshop agreed that the outcome with the key conclusions and proposals of the workshop would be prepared by 11 October, and that a technical report would be prepared by early-November in order to be made available to the 2019 autumn meetings of HELCOM and OSPAR for further consideration.

Annex 1. List of Participants

OSPAR-HELCOM workshop to examine possibilities for developing indicators for incidental by-catch of birds and marine mammals

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Annex 2. Data requirements, sources and monitoring

1. Data needs vs Data gaps

The subgroup A was invited to compare the data needs associated with an incidental by-catch indicator to current data availability, and as relevant identify possible additional data sources, data gaps;

The subgroup discussed that the structure of the fisheries varies largely between the two regions (e.g. scale, intensity and métiers), which results in varying levels of effort, extent and methods of data collection. These regional differences in turn make it challenging to find a "silver bullet" solution for data collection across regions. métiers and fleets.

The group recognized that the overall aim is to have comparable indicator assessment results across regions. However, these can represent varying levels of confidence (depending on the underlying data used) and possibly different, but comparable, methods.

Taking that into consideration there is a need to commonly identify the most appropriate data parameters needed to make indicator assessments, i.e. from lowest common denominator to what is needed in order to achieve an "optimal" result. E.g. days at sea, while not being the most precise measurement, can be appropriate for risk assessment but not for e.g. incidental by-catch estimates, and can function as the lowest common denominator whereas including information on soak time and net length would allow for estimating incidental by-catch rate which would raise the confidence.

The discussion also revealed that in some areas more precise data are collected nationally than is reported as the regional data nodes (e.g. ICES), and thus do not become available for regional or interregional assessments. This is one of the reasons these data are not included in the data calls or reporting systems. In practice this means that currently at a local/intra-regional level, more precise data can be collected and more precise indicator evaluations be done than at a regional level. The need to assess at a population level should not result in a lowered ambition level where more data are available.

The following data were identified as necessary to the process of assessing incidental by-catch but are currently lacking:

- **Days-at-sea for all areas and all vessel lengths**
- **VMS equivalent data for small sized vessels.**
- Soak time and net length data for static gear (for estimating by-catch rate)
- Data for both part and full time fisheries needed.

Possible additional data sources

The subgroup briefly discussed alternative data sources and considered AIS for estimating fishing effort. The subgroup recommendation was that studies on the use of AIS, e.g. for smaller vessels, or to complement VMS information, are valuable and should continue but should not have the highest priority. It was further highlighted that AIS data need to be used in conjunction with the use of logbook data.

2. Identify Barriers

The Subgroup was invited to identify barriers preventing appropriate monitoring data becoming available. Overall, the group concluded that the barriers identified through the discussions (as listed below) exist at various levels, and that the level needs to be identified for a given barrier and efforts to overcome the barriers need to be addressed at the appropriate level to be effective.

Barriers

- **overall lack of funding.**
- reluctance to monitor (e.g. fishermen reluctant to cooperate with onboard observers and too high/broad demands placed on onboard observers).

- reluctance of fishermen towards CCTV.
- differences in methods and reporting formats (at various local, national and international scales) make data collation difficult.
- data are currently not available at the appropriate spatial scale. This is the case both at the individual data level (e.g. within and between vessel sizes), and across data types (e.g. bird and fisheries data).
- the reluctance by fishermen to report incidental by-catch and the lack of available space for recording the information in the logbooks.
- no monitoring/sampling programs for incidental by-catch.
- data reporting barriers (e.g. more specific data are not included in the data calls or reporting systems).
- the need for anonymity of vessels (possible link to GDPR).
- unreliable data reporting from fishermen.
- species identification in the field is poor and often aggregated to species group level (e.g. duck, gull, etc).
- the lack of monitoring/sampling standards/guidelines.
- increased number of tasks but no increase in financing for the DCF work.
- how to link work under the DCF with the efforts of the countries which are not EU Member States.
- lack of access by incidental by-catch experts to fishing effort data.
- the rights to use existing data for purposes outside of those for which they were originally collected in the data call.
- the need to get access to data from vessels under other national flags fishing in a given area.

3. Practical proposals to fill gaps and overcome barriers

The group was further asked to provide practical proposals on how to address data gaps, taking into consideration and approximating the associated costs, with an aim to enable assessments both in the short- and long-term. The following proposals were brought forward:

Monitoring

- Make it easier to fishermen to report (e.g. add changes to the logbook) and make a “safe space” for reporting by the fishermen (e.g. ensure that there are no repercussions for reporting)
- Counting nets, net length and vessels manually (via satellite, drones or planes).
- The use of a reference fleet to estimate incidental by-catch.
- Estimations done at a national level and then aggregated data reported to data node (to ensure anonymity).
- Provide incentive/obligation by fishermen to accept onboard observers, e.g. limit funding, increased quotas, fines.
- Closer cooperation between the “environmental” side and the DCF (e.g. through observer status to the RCGs, through providing an evidence base to the RCG for the need to shifting monitoring effort).
- A single agreed data and monitoring standard, common logbook format, between EU and non-EU countries.
- Combine national monitoring projects/efforts with DCF efforts, but ensure that the results are comparable and can be compiled together.
- Cover a certain % of métier and area under the DCF monitoring.
- Scientific quota.

- Enforcement mechanisms for non-compliance.
- Use of electronic logbooks would facilitate the sharing of information and shorten the timelag.
- VMS-equivalent required for smaller vessels
- Use of simple mobile app (for the fishermen to use) to help map e.g. effort (example from Germany)

Fishing effort

- include non-mandatory fields for more detailed data in the data reporting formats at the data nodes, and include these data in the data calls.
- enable access to fishing effort data for the purposes of the studies of assessments of incidental by-catch.

4. HELCOM roadmap

The group was invited to discuss the ideas and proposals included in the draft "HELCOM Roadmap on fisheries data in order to assess incidental by-catches and fisheries impact on benthic biotopes in the Baltic Sea", regarding an incidental by-catch indicator. The following points were raised by the subgroup in relation to the HELCOM Roadmap:

- An obligation to provide information on days-at-sea should be included in the document.
- Consider how to raise to fleet level?
- Ensure comparability of different métiers?
- **Clarify where the recommendations in the Roadmap are aimed directly at the DCF and where they are directed at other institutions, organizations or at a national level (e.g. clarify the second point on Actions related to incidental by-catch data).**

Conclusions regarding the HELCOM roadmap

Subgroup A recommends that the suggestions identified in sections 3 and 4 in this document be submitted to CG FISHDATA for their consideration in the further development of the HELCOM Roadmap on fisheries data in order to assess incidental by-catches and fisheries impact on benthic biotopes in the Baltic Sea.

Annex 3. Identifying areas of increased risk/low risk of incidental by-catch

Consider spatial and temporal aspects of identifying areas of high risk/low risk (e.g. due to changes in spatio-temporal distribution of fisheries and the species at risk of incidental by-catch), and how to incorporate this information when defining high risk/low risk areas;

- Risk – do we consider absolute risk (e.g. by-catch rate and actual data needed) or relative risk (identifying areas where risk may occur via overlapping and modelling the likely risk). Important to define as data needs for these two different options are not the same.
- Identifying areas where risk may occur can also be used as a process to show where high levels of monitoring may be needed. Also noted that identifying reference areas will also be critical.
- Identification of risk may involve multiple parameters and a ranking or continuum of risk may be important, so that in addition to reference and high-risk areas, other categories to support evaluation are available.
- Risk mapping can provide clear indication of where to monitor and sample to carry out an assessment.
- A full assessment, and implementation of threshold values, enabling implementation of follow up and measures, would also require the step of incorporating actual incidental by-catch data into the assessment.
- Relative risk - aspects to consider or that can contribute to an assessment include:
    - species sensitivities – characteristics that make them susceptible, length of time at sea (birds), feeding mode (diver or surface feeder),
    - density/abundance – biogeographic aspects
    - environmental conditions and heterogeneity
    - life history aspects – feeding mode, productivity, longevity, breeding, consumption rates, time at surface, time beneath surface
    - seasonality – migration events, seasonal local abundances, breading (and resultant feeding behavioural changes)
    - habitat information and specialisation
    - oceanographic aspects – nutrients, upwelling events
    - prey specificities –
    - productivity –
    - conservation status

Noted that above information can be informed by data and/or expert evaluation in many instances.

- Important to also consider that data can also be misleading if inaccurate or incomplete as such data can incorrectly guide the targeting of monitoring.
- Spatio-temporal aspects are also critical and the scale at which such information is needed is important to define (e.g. to be biologically relevant and to keep sufficiently up-to-date).
- Fishing effort, especially from smaller vessels, was identified as a major information gap in making high quality risk maps.
- Examples of possible ways to support filling this data gap were the phone app utilised in Germany and examples from Norway where information from interviews with fishermen, observers, and a specialist trained fleet (a reference fleet) are combined.
- Objectives of an assessment and the scale of an assessment are also important to consider – for example, threshold values, mitigation measures or the spatial scale of an assessment may be applied at quite broad scales to reflect the ecological reality of the species being assessed.

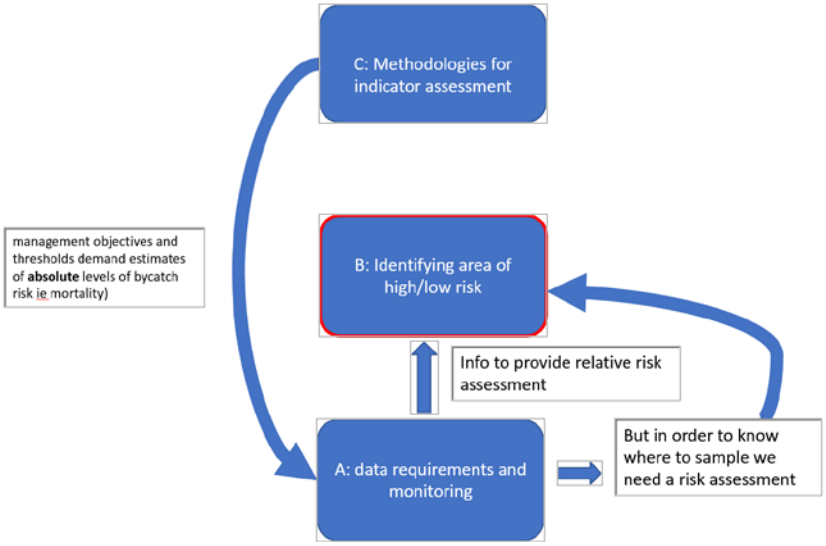
- Absolute risk - aspects to consider or that can contribute to an assessment include:
    - Monitoring data to provide a clear evaluation of incidental by-catch in an identified risk area (a validation of predictions)
    - Seasonal variation as well as temporal and spatial aspects need to be considered at a suitable time scale – i.e. to ensure high-risk areas are as accurate as possible when monitoring is initiated
    - Risk mapping provides an overview from which monitoring can be targeted and result in an evaluation of the risk assessment.
- A framework to define the constituents of risk would support the identification of high-risk areas, leading to an assessment – a possible option to conceptualize this is provided in the table below.

<table>
<tr><th>Parameter</th><th>Approach</th><th>Requirement</th><th>Confidence</th></tr>
<tr><td>Fishing effort</td><td rowspan="5">Relative Risk</td><td rowspan="2">One of these parameters</td><td rowspan="2">Low</td></tr>
<tr><td>Species Distribution/Density/Abundance</td></tr>
<tr><td>Effort and Distribution/ Density/Abundance</td><td>Both previous parameters</td><td>Moderate</td></tr>
<tr><td>Sensitivity and life history aspects (feeding mode, size, longevity, feeding mode, response to fishery)</td><td rowspan="2">Adding on these parameters to the previous ones.</td><td>High</td></tr>
<tr><td>Seasonality, oceanographic and prey parameters (distribution of prey, migratory aspects, seasonal distribution)</td><td>Very high</td></tr>
<tr><td colspan="4">Outcome of above – risk maps of differing confidence (based on what the input data are).
Options could be:
1. High-risk and Low-risk areas
2. Multiple risk categories (e.g. five categories)
3. A continuous scale of risk (e.g. a ranking)</td></tr>
<tr><td rowspan="4">Monitoring (cameras-Remote Electronic Monitoring (REM), actual counts, stranded animals, reported incidental by-catch by fishermen, observers)</td><td rowspan="4">Absolute Risk (a.k.a. an assessment based on monitoring)</td><td>Monitoring</td><td>Assessment against a threshold value</td></tr>
<tr><td>Status based on monitoring in only high-risk areas</td><td>Low confidence</td></tr>
<tr><td>Status based on monitoring in high-risk and another category</td><td>Moderate confidence</td></tr>
<tr><td>Status based on monitoring multiple risk categories.</td><td>High confidence</td></tr>
</table>

- The idea of tabulating all available data and information for each HELCOM and OSPAR sub region was discussed. It was concluded that while such an approach would be highly relevant that it was better to spend time discussing the overall concept and structure of an assessment and that an exercise to fill in detailed information could be carried out intersessionally. It was also considered

important to devise a suitable template and use existing OSPAR and HELCOM assessment areas/units/scales and relevant species to guide the requested information.

- A flow diagram showing the close interlinkages and relatedness of the work within the three sub groups was drawn up.



Methods for identifying spatio-temporal distribution of effort from small-scale and recreational fisheries which do not fall under the logbook obligation;

- The follow up questions were raised: what is available, what are the gaps, and what may be a solution to fill the gaps
- Some VMS and some logbook data are available from small vessels and recreational fisheries.
- Other data sources could be explored also, such as distribution of illegal nets based on enforcement checks (Norway has this). Such additional information can provide information on recreational fisheries.
- Landing information is available for some smaller vessels (sales notes), as is reporting of days at sea, but a more complete data set is needed (across all areas).
- This data gap for smaller vessels can have a critical impact on the ability to carry out viable analyses since the overall incidental by-catch impact of large numbers of smaller vessels can be high (smaller vessels in some areas make up a significant portion of the overall fishing fleet). This is especially relevant for coastal areas and nearshore fisheries.
- Information on aspects such as soak time, net length and number of hooks will be important components.
- Possible approaches for data gathering and national differences in regulation of small vessel and recreational fishing were discussed
    - Norway informed that they have explored the possibility to require VMS on all shipping, including small vessels
    - Recreational and small vessel fisheries may not explicitly need to be separated in the risk analysis approach (i.e. both exert a fishing pressure). However, it was seen as important to differentiate at this stage since the data availability/sources and regulation of the processes were different.
    - Regulation and licencing of recreational fisheries differ greatly between countries and may have an impact on information available to support a risk analysis. For example, in Norway recreational fishing (hook and line) can be carried out by any citizen and thus data are not immediately accessible, while in Portugal line and hook fishing or hand collection of shellfish can be carried out with an annual licence purchased over the

counter. Impact from recreational fishing in Portugal has been recorded (indirectly) although no data and reporting process is in place.

- The question was raised as to whether DCF observers (e.g. on gillnet fishing boats) also record soak time of nets, or simply record incidental by-catch events. Could asking observers to provide greater detail offer an insight into fishing activity and effort data that would support parameterising risk assessment models? Examples of valuable information could be length of net, number of nets, soak time.
- An example of information available, although likely differences between countries, was provided by Norway, indicating that vessels above 15 m report total length of net onboard and not number of nets.
- Small vessels may have a licence to use multiple nets and lines. Thus, to determine which specific fishing equipment is used, where and for how long is often another area where no information s recorded.
- A clear need for gathering more data and information, in particular from smaller vessels, is noted but the practical way to do this was not always immediately clear and may have to differ locally or regionally to meet specific needs. For example, onboard cameras (REM) may not be suitable for some of the smaller vessels and observers on smaller vessels can be problematic (e.g. a crew member may have to be excluded). There are also cost and resource issues for these.
- It was highlighted that no matter what approach is taken then direct interaction with the fishermen involved is vital to ensure that good communication can be established and that the wider ecological value of the requested information is understood. Approaches such as regular interviews and establishing direct contact with fishermen through well respected, knowledgeable and long-term data collectors can have a valid place. Establishing a long-term relationship with the fishermen, particularly in small and local communities was considered important by some participants.
- Back-calculating soak times was discussed as a viable estimate approach, e.g. based on AIS data of smaller vessels (where available) and the stop/start events within the data. The technical issues and time-consuming nature of this work were seen as not optimal in its current form.
- Reporting of relevant data should ideally be commonly agreed and shared across all areas so that foreign boats in other national areas can also provide the same information and facilitate the risk assessment. This would be overcome if reporting is also harmonised (e.g. EU wide) so all information is provided at a common level and form (e.g. standardised reporting to ICES). This would enable national or regional risk assessments to be compiled without potential exclusion of foreign vessel fishing effort.

- Overall, the two issues that need to be addressed are 1) what is the fishing effort of smaller vessels (and where is it occurring), and 2) what actual fishing techniques are these vessels applying during that period. Subsequent data of relevance would also include what is bycaught, net length and numbers (or line length and hook numbers), area swept by trawls, and soak times.
- A brief discussion was help on how risk assessments could be considered from a management perspective. A conceptual example was given, where based on a risk assessment, fishermen may be given permits to fish in areas close to high-risk exclusion zones, but on the basis that they agree to specific reporting criteria or are required to carry a camera/observer.

Explore methodologies for identifying incidental by-catch high-risk (and if possible also low-risk) areas based on the collated background information.

- Direct reporting and recording of incidental by-catch (e.g. on the vessel) were seen as the most important sources of data (i.e. they provide the largest data volume and most immediate link).

- Stranded animals and other risk areas were also seen as a valuable addition. These instances can provide additional insights such as other contributing life history or health parameters. The need for expert based assessment (e.g. by a trained vet/pathologist) was also raised so as to ensure an appropriate assessment.
- Such approaches can identify birds and mammals that have died primarily due to incidental by-catch or if other confounding factors have also contributed.
- Studies where dead animals have been tagged to track the origin of the incidental by-catch event and link the dead animals to areas/populations were also noted.
- Episodic mass mortality events e.g. where a large number of animals wash up on shore is important to incorporate and consider. Moreover, this information can, if evaluated by an expert, be used to inform on if a particular species is affected and other background factors (e.g. how they were feeding, if they were in good condition, cause of death etc).
- HELCOM and OSPAR seal and mammal expert groups are developing protocols on how to handle stranded animals properly and gain most information from the records.
- Data gaps: Fisheries data, especially smaller vessels (likely this is the biggest issue). Details at the species level are also important (e.g. habitat use, movement, seasonal dispersal (i.e. spatial and temporal effects), interaction with prey and fisheries). Distribution and abundance values for seals (e.g. in HELCOM) are often derived from land-based counts which is not a 1-1 relationship with incidental by-catch (i.e. distribution in the marine environment where incidental by-catch takes place may be inferred from the distribution data) but can be overcome to an extent with data from tagged animals also. HELCOM offshore bird data lacking full coverage.

Recommendations:

- Fisheries data – in particular from small vessels and recreational fisheries – need to be enhanced to a level that can support identification of high-risk areas.
    - VMS on smaller vessels may be a valuable way forward (e.g. as discussed in Norway). Cooperation with fishermen on smaller vessels is critical to ensure good progress and that there is an understanding of the benefit of the required data collection approaches they are asked to apply (e.g. cameras, VMS, phone apps, etc).
    - Form stronger links with other relevant bodies (e.g. recreational fisheries) to bring best data together from all sources and cross-check and quality assure monitoring/data collected.
- Cross border data cooperation is important so that relevant parameters can be utilised in all areas. Having a harmonised data reporting to a central source is important so that, for example, fishing effort by foreign vessels can be included in national assessments.
- Encourage utilisation of all data sources for reported dead animals, including stranded animals, to support the identification of high-risk areas and overall status and occurrence of relevant species. This information can additionally support a greater understanding of other impacts and health and life history parameters, per species, as an extension of this information.
- Identification of species from a conservation point of view, and possibly those that are forming close interactions with fishing activities (i.e. may become a management problem by feeding directly from fishing activities), would be important. Regional or population and sub-population specificity needs to be considered also at the species level.
- Data on species distribution (inclusive of spatial and temporal aspects), habitat use, prey specificity, and other relevant parameters are important to enable improved identification of high-risk areas.
- Risk assessment should be prioritised for endangered, problematic, or declining species and a regionally agreed list of species (i.e. a rationalised clear list compiled from existing information per region) of concern/relevance would benefit defining priority species. Other species should also be considered, as appropriate, or in response to recorded changes in status (e.g. declining abundances or distribution).

- Risk assessment to highlight/define the suitable monitoring approach should be carried out at regular enough frequencies so as to ensure ecological relevance of the assessment procedure.
- Improved data on monitored and recorded actual by-catch incidence.
    - Appropriate assessment to cover high-risk areas, reference areas and appropriate spatial coverage needed. Areas or species where risk was deemed to be close to high-risk could also be monitored as tipping point to become high-risk may occur due to small or localised pressures.
    - A possible solution could be to have observers or designated monitoring in times or areas of specific identified high-risk.

Annex 4. Discussions of the group on Method development for indicators, including threshold setting

This annex reflects discussions in the group on developing methods for indicators under the ToR tasks i-iv.
This annex does not provide a complete transcription of the discussion, and only aims to provide some insight into the key issues presented in the main outcome. The annex does not include all technical details and method descriptions as these would be available in a separate technical report.

i) explore alternative metrics/parameters, and model-based approaches for regional indicator based assessment;

1. A modelled approach can be continuously improved as more information becomes available to validate the model, and this can be a positive driver for continuous improvement to the assessment, instead of being content with one approach relying on insufficient data. However, if modelled approaches are heavily relied upon, there is a risk that the problem of determining a relevant threshold might be shifted to a modelling problem and the applicability of the modelled values;

2. Life history and demography should be used to group species to identify which method is most appropriate for which group, as different assessment methods may be relevant for different groups. Harbour porpoise – a-typical, short lived and relatively high mortality species, compared to some of the baleen whales which are long-lived and have very low adult mortality;

3. Abundance information is needed for the ioncidental by-catch indicator. However, this does not have to be the full abundance indicator and so it may be possible to consider a wider range of species. Only good abundance estimates should be used in the indicator, as uncertainty is not accounted for in the methods; uncertain abundance estimates should not be used. Maximum/minimum values are considered more appropriate than a mean value, in the HELCOM indicator a median value has been used. If this is not adhered to, the risk of a shifting-baseline-syndrome may come in;

4. Strandings data were suggested as an additional data source, and available in several countries (UK, France, Netherlands, Germany, Spain, Portugal). In the Baltic Sea, it was not possible to monitor strandings on rocky shores, only on sandy beaches, and it was generally not seen as a good method for monitoring birds. It was noted that it can sometimes be difficult to identify the cause of death in stranded animals.

ii) explore the relevant resolution of data for assessments, taking into consideration spatial-, temporal and taxonomic resolution;

1. The only taxonomic resolution of data which was discussed, was data at species level, and in some cases, abundance/distribution at population level;
2. Assessment units;
    a. Noted that assessments of GES do not need to be made for the marine area of one Contracting Party, but for an ecologically relevant regional assessment unit;
    b. Populations have been defined in abundance indicators for the respective species. An incidental by-catch indicator should use the same definitions and the same spatial assessment units. The units as defined in the abundance indicators would have been defined

based on relevant definitions of populations of species, taking into account data availability. If relevant, this would also have considered any temporal aspects of relevance for defining populations of highly migratory species. It was not clear if all relevant information is available for such considerations. However, it is believed that the best estimates available have been used. This approach would facilitate integration at a later stage;

c. Units defined for wintering waterfowl would be dependent on the % of the population being considered, and it should be noted that large-scale issues such as flyways are to be considered;
d. Units for seals are quite well defined and the differing monitoring frequencies are well documented. Data availability for seals in the high arctic of OSPAR Region I is less clear, and it is known that monitoring has changed as Svalbard ice has melted and Norwegian monitoring efforts have shifted away from this area where seals used to be counted on ice
e. The area beyond national jurisdiction (ABNJ) of the OSPAR maritime area should not be forgotten in these assessments

3. In conclusion the following was proposed for **assessment units;**

- **OSPAR** – use species specific management units or assessment units when they exist, otherwise use the OSPAR Regions when these are not specified
- **HELCOM** – management units for seals exist, and should be used. For porpoise Baltic proper and Kattegat & Belt Seas, management units also have been defined. For birds, suggest Kattegat->Bornholm basin, Baltic Proper, and Bothnian Bay as a third unit; aim to align with grouping of level 2 units as used in the abundance indicators

iii) consider if different methods need to be proposed for data rich and data poor species;

4. Data rich species can be assessed using more complex methods, whereas a simpler approach is needed for data poor species. Currently e.g. harbour porpoise and common dolphin could be assessed using an RLA or PBR approach, whereas other species have insufficient data. For seabirds, a PVA or PBR approach could be possible for data rich cliff-breeding birds, whereas it would not be possible for diving ducks;

5. Borrowing information across species and regions is seen as necessary, and the following was noted:

a. Borrowing demographic information across ecologically equivalent species and neighbouring regions could allow for assessments using the more complex approaches for species where some information is available but not all data needed for a modelled approach;
b. If borrowing is needed, then a precautionary approach is also needed to assess whether the threshold has been achieved;
c. Not having a population abundance estimate available should not by default result in 'no assessment'. Some type of assessment should always be attempted, for example by borrowing information;
d. Data borrowing for seabirds could take account of breeding ground information if wintering ground information is seen as insufficient, even if breeding grounds are outside the assessment areas;

6. Bird at-sea-data do not become available often and the latest available data should be used. In the Baltic Sea region, birds have mainly been monitored from the coast and at-sea data have only recently been collected, and currently these have not been included in abundance indicators;

7. By-catch rate data was anticipated to be 'data poor' for all species, and the following was noted:

   a. that trend data are often not available and will only become available in sufficient detail once improved data collection efforts have been implemented for some years;
   b. Proposed that all incidental by-catch data are summed up for a species over the assessment period e.g. 6 years

iv) compare available methods for threshold setting, such as Catch Limit Algorithm, and propose the most suitable methods to be used.

1. Aim for indicators that allow for harmonisation with EU MSFD and consider this when developing an approach to threshold setting
2. Differing views were expressed on whether a conservation objective and a management objective need to be formulated. In conclusion, the group considered that it would be helpful to propose a conservation objective whereas it was not seen so strictly needed to develop a management objective. The following were proposed:

   - **Conservation objective:**

     Minimise and where possible eliminate incidental catches of all marine mammal and bird [protected] species such that they do not represent a threat to the conservation status of these species
   - **Management objective:**

     The mortality rate from incidental catches should be below levels which threaten any protected species, such that their long-term viability is ensured

3. The objectives as proposed would require further definitions to become fully operational, and the following was noted;

   a. The EU technical measures refer to 'union legislation', and it was clarified that this should be interpreted as always needing to refer to the legislation which is most precautionary, i.e. if MSFD does not advocate zero-by-catch but for example the EU Birds Directive requires zero-by-catch, then the objective should be zero-by-catch. The proposed conservation objective was seen to be in line with this principle;

   b. Populations at 80% of carrying capacity had been adopted as on objective in other legal contexts and could be aligned with this conservation objective

   c. The management objective specifies that we need 'catch rates' and 'long-term viability' and these would be defined through thresholds/indicators; long-term viability would need to be specified for some specific timeframe

4. Based on the above, the group proposed the following for thresholds

   - **Threshold option** (seen as the most precautionary approach);

     The threshold mortality rate from incidental by-catch should be 1% of natural annual adult mortality of the species
   - **Threshold option for data-rich species:**

     The threshold mortality rate from incidental by-catch should not exceed levels that would result in a reduction of the medial population size below 80% of carrying capacity within a 100-year time period for 50% of the time
     (RLA approach, NB **carrying capacity** needs defining)
   - **Threshold option for data-poor species:**

The threshold mortality rate from incidental by-catch should not exceed levels that exceed **0.5%/0.3%/0.1%** of the median population size within a specified time frame (e.g. 10 years) – for species with a generation length (in pre-disturbance conditions with an assumed stable population) **of 12 years or** less (e.g. harbour porpoise)**/13-20 years** (e.g. common dolphin)**/>20 years** (e.g. minke whale, humpback whale) respectively

5. The thresholds, as proposed, would require further definition and testing to ensure that the absolute numbers proposed are appropriate (currently only to be seen as 'placeholders'). The following was noted;

a. Carrying capacity definitions will always be model-dependent, i.e. the absolute value would always be influenced by the chosen model. Critical issue in the timeseries is the starting point, usually a fraction of a value chosen through expert judgement, and this drives a lot of the results. Carrying capacity is dependent on the status of an ecosystem. If the status of the ecosystem improves, the carrying capacity could increase, further emphasising the need to correctly understand the starting point/value and what it represents. For the species under consideration this problem is made worse through short data series.

b. Seabird carrying capacity values are variable and the concept is not considered so relevant, thus indicating that this need not be used in threshold setting for birds;

c. MSY applied in fisheries build on a fraction of carrying capacity, and it is recognised that the final value is dependent on the starting value. Carrying capacity in fisheries in the MSY approach is not considered a good model as it is designed to allow for a certain amount of mortality, and for mammals and birds this should not be the aim. Somewhat similarly, the CLA approach was developed within a whaling context, so relates to the maximum number of whales to take and is therefore not directly applicable.

d. RLA is an adaptation of CLA, and more appropriate for threshold setting. Threshold values proposed based on the RLA approach have been most conservative and precautionary when tested for harbour porpoise as it assumes the lowest population growth rate out of all the available approaches. 9-13% annual adult mortality (13% - age 1 year; 9% - age 2 years) of harbour porpoise in OSPAR Region II is the latest literature estimate (see Winship 2009) known to experts at the workshop, and could be used in a test of RLA to compare with the 1% adult annual mortality rule-of-thumb approach which is expected to deliver a lower absolute value compared to RLA or PBR.

e. Species are affected by several anthropogenic pressures and if there is severe pressure from other human activities, a lower threshold value may be needed for incidental by-catch. High mortality from different human activities has been considered in the HELCOM core indicator, where hunting bag numbers, oiled bird, and incidental by-catch mortality were summed up and then compared to the threshold. There had been discussions with fishermen noting that more birds are hunted than bycaught and so fishing was not the main problem. The suggestion of a rule-of-thumb 1% annual adult mortality would allow for this.

f. Population trend (stable/decreasing/increasing) and size (depleted/threatened/in good status) should be taken into account when determining what the appropriate threshold

value would be used. Rules for this need to be developed, e.g. depicted in an assessment approach flow-diagram and informed by abundance indicators;

g. PVA is considered an appropriate approach for seabirds. However, it does not provide a threshold value but can be used to test the appropriateness of a threshold value. PVA models population size from a given mortality, and could be a testing tool where different threshold values are inputted. PBR, previously tested for seabirds yielding a threshold value which resulted in population decline, would require further testing and development to avoid misinterpreting the simple model;

h. PBR used for marine mammals assumes 50% carrying capacity. If this model is used for a threshold value linked to a conservation objective of 80% carrying capacity, then the model must be adapted to use 80% carrying capacity. PBR accounts for all mortality, which needs to be considered when setting a threshold value for incidental by-catch only.

Next Steps

- Incidental by-catch is a complex issue, and a **step-wise approach** is needed taking account of variable data availability. Over time, knowledge should increase and so a long-term development should be planned for even if an assessment can be completed in the short-term using a more simple approach;
- **Develop tables** summarising known information about relevant species' abundance, distribution, demographic & life history parameters, assessment units and/or management units, and incidental by-catch rate information to inform next steps in identifying data rich and data poor species and to support further considerations on 'borrowing' information between ecologically equivalent species in the determination of thresholds. Aim to also catalogue relevant information which might not have been used in RSC assessments before (e.g. marine mammals in the high arctic);
- **Enhance flow diagrams** of assessment approaches and further develop and specify the selection rules;
- **Test threshold values/numbers** proposed for different species groups.

Reference

Winship, A.J. (2009) *Estimating the impact of bycatch and calculating bycatch limits to achieve conservation objectives as applied to harbour porpoises in the North Sea*. Unpublished PhD thesis. University of St Andrews.

Annex 5. Marine mammals

Identified data gaps, e.g. in terms of metiers/types of fisheries, or population parameters, to be considered for forwarding towards appropriate data collection actors (TOR 19 a).

Fishing effort:

- Better data for small vessels needed: continue using DaS for all static net effort, but also collect data on net length/soak time/area swept.
- Larger vessels: effort data available with VMS.
- Need for fisheries data on a more detailed temporal and spatial scale.

By-catch data:

- Remote Electronic Monitoring (REM) an important option, successfully used in Denmark.
- High by-catch risk assumed for common dolphins in Bay of Biscay, harbour porpoises in Celtic and Irish Seas (ICES WGBYC 2019) and harbour porpoises in Iberian Waters (NAMMCO/IMR 2019), as examples.

Population parameters:

- Reasonably good information available on pinniped abundance, cetaceans covered by SCANS, NASS and other large scale surveys.
- Poor information on winter distribution of cetaceans (surveys mostly during summer).
- Demographic data better for pinnipeds than cetaceans; for rarer species such data is almost absent (e.g. beaked whales).
- Striped dolphin, Atlantic white-sided dolphin, white-beaked dolphin and Risso's dolphin, for example, have limited life history information available. Medium risk for by-catch assumed, gap can be closed with directed research and resources.

Recommendations on the feasibility and cost-efficiency of proposals to appropriately monitoring incidental by-catch in various fisheries to generate information needed for assessments. A prioritization of what areas should be covered first in terms of which fisheries may have the highest importance to be covered thorough additional monitoring (TOR 19 b)

Cost efficiency and feasibility of monitoring methods, By-catch

- The FishPi project compared methods which gives an indication of costs of different methods.
- Cameras do not give the randomised sampling design needed for EU Data Collection Framework (DCF), only small sample size due to high costs.
- REM equipment must be carefully chosen: as simple as possible, as sophisticated as needed. For example:
    - In the Netherlands large and expensive equipment was found not always to be practical.
    - Norway considers a system with machine learning (IMR is building a prototype) – aim: species identification may improve after a while. Noted though that challenges have been documented in other countries: identification might be problematic due to many different light and boat conditions. Human eye is much better than any current technical solution.
- Combination of methods could increase cost efficiency: e.g., landing obligation controls verified using small cameras.

- Dedicated on-board observers: Best method, but expensive and possibly difficult/impractical for "small" vessels (e.g. space/safety limitations).
- Reference fleet: Example given from Norway – contract with ~25 vessels <15 m and few large offshore vessels to report everything, verify information with scientific observers.
- Mandatory self-reporting of by-catch does not often work (for example, as seen in Norway, Germany, France and other countries).
    - Would be interesting to explore under which conditions self-reporting works.
    - Anonymity must be ensured (one way would be randomised response surveys, interviews with respect to poaching in Africa were quite promising)
    - May relate to person who is asking – building trust is important (especially in small communities), interviews must be in person not by mail.

Cost efficiency and feasibility of monitoring methods, Fishing effort

- Data pingers (transmit effort information, soak information of net to a base station on land).
- Self-reporting: smart phone apps make it easy for fishermen to self-report

Prioritization of areas (which fisheries may have the highest importance to be covered thorough additional monitoring)

- Additional monitoring needed for certain metiers (review output from FishPi, WGBYC, and other sub-group information also). Noted though that information may need to be examined at higher resolution to make it more applicable, for example:
    - Areas analysed in FishPi are quite large, e. g. North Sea. Baltic Sea, Bay of Biscay.
    - Risk assessment of fisheries in FishPi (based on expert opinion in a systematic way) was at a rough scale.
    - It would be beneficial for RCGs to do this at a finer scale, although this will be an extensive list, some examples: (1) Static net fisheries in southern North Sea and Baltic Sea, Celtic Sea (birds, mammals), (2) Ground lines from pots and creels in Scotland – re baleen whales, (3) Barents Sea pot fishery for snow crabs (humpback feeding area, possibly seals), (4) Bay of Biscay – relevant metiers to which stranding data and drift models point
- Marine Stewardship Council (MSC) certification could be a driver, and also guide what areas and fisheries should be sampled.
- Ideally, at least 2-5 % of fishery to be monitored.

A proposed common approach for identifying hot-spot areas where there is an increased by-catch risk (TOR 19 c)

- Again: effort data needed and is a critical factor limiting progress. For large vessels data available, but must be improved for small vessels.
- Where data not currently available: strandings and drift models might work with some species, good stranding network required (difficult with long rocky shores in low populated areas).
- Mapping fishing effort data, camera data and up-to-date distribution data of mammal species for risk mapping (Presentation 15), reliability of risk maps is a matter of data quality and scaling.

Purpose of producing risk maps could be:

- Identify areas/times to increase monitoring.
- Consider if mitigation (e.g., closures, alternative gears, pingers) is required

A proposed common approach for incidental by-catch assessment and associated data needs, including proposals on threshold-setting methods (TOR 19 d)

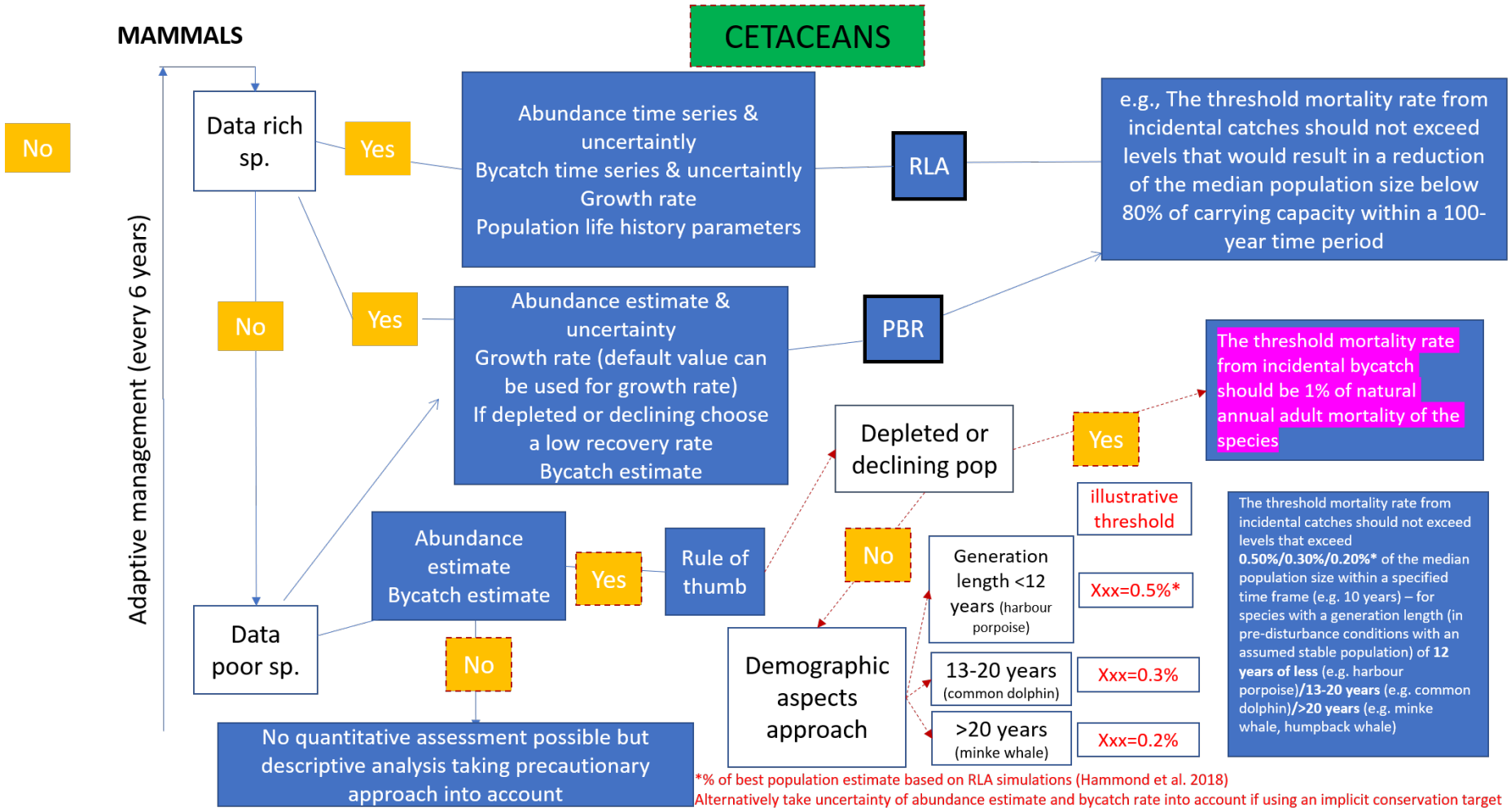
- See flow charts, below.

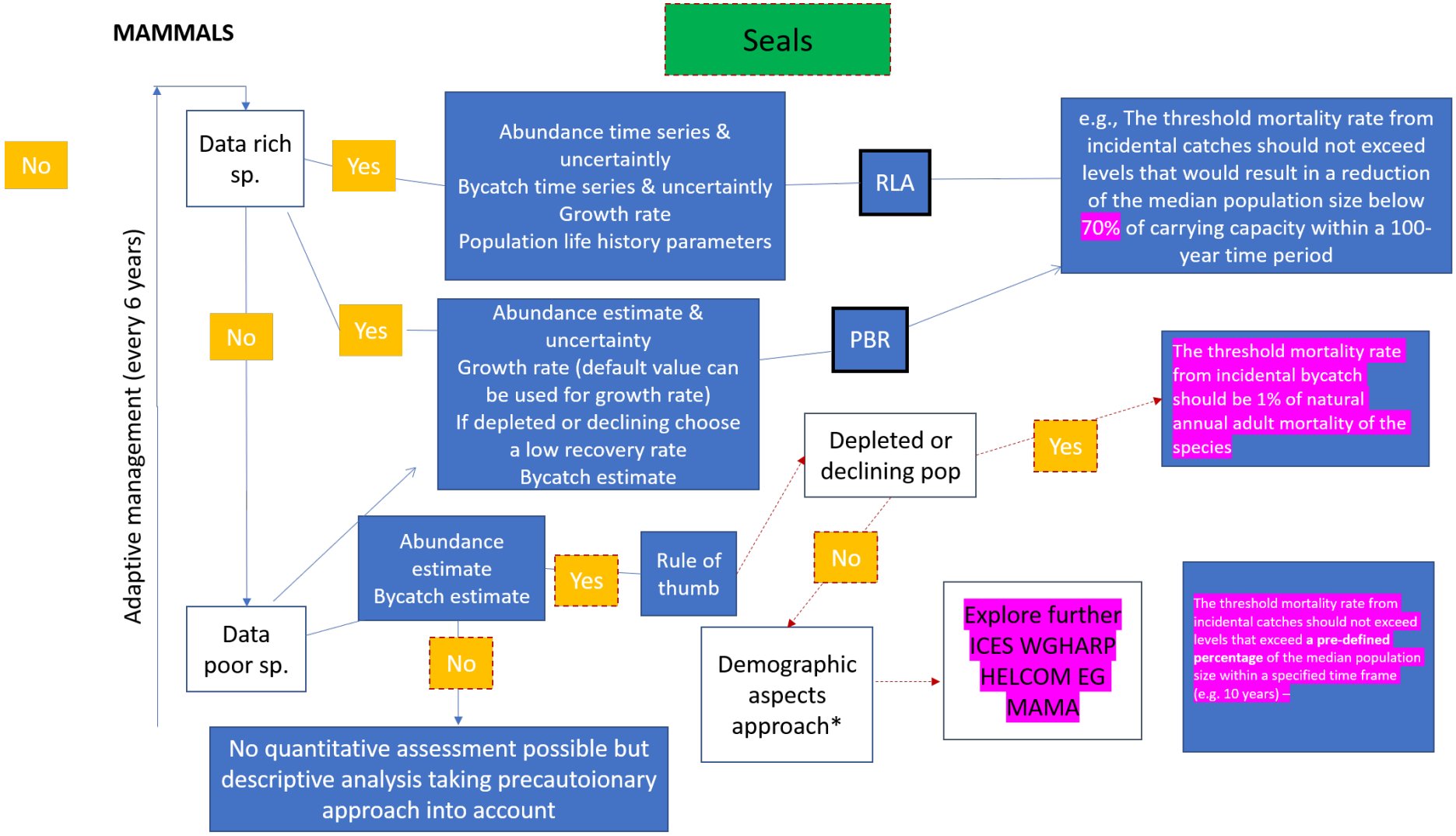
- Some aspects need to be discussed with experts not attending this WS to ensure technical details are appropriate for all relevant species addressed (i.e. not all species covered in the workshop).
- Testing of threshold setting methods needed.

References

ICES WGBYC (2019) Working Group on By-catch of Protected Species (WGBYC). ICES Scientific Reports. 1:51. 163 pp. http://doi.org/10.17895/ices.pub.5563

North Atlantic Marine Mammal Commission and the Norwegian Institute of Marine Research (2019) Report of Joint IMR/NAMMCO International Workshop on the Status of Harbour Porpoises in the North Atlantic. Tromsø, Norway. 235pp.


MAMMALS
CETACEANS
Adaptive management (every 6 years)
No
Data rich sp.
Yes
Abundance time series & uncertaintly
Bycatch time series & uncertaintly
Growth rate
Population life history parameters
RLA
e.g., The threshold mortality rate from incidental catches should not exceed levels that would result in a reduction of the median population size below 80% of carrying capacity within a 100-year time period
No
Yes
Abundance estimate & uncertainty
Growth rate (default value can be used for growth rate)
If depleted or declining choose a low recovery rate
Bycatch estimate
PBR
The threshold mortality rate from incidental bycatch should be 1% of natural annual adult mortality of the species
Depleted or declining pop
Yes
illustrative threshold
Abundance estimate
Bycatch estimate
Yes
Rule of thumb
No
Generation length <12 years (harbour porpoise)
Xxx=0.5%*
Data poor sp.
No
Demographic aspects approach
13-20 years (common dolphin)
Xxx=0.3%
>20 years (minke whale)
Xxx=0.2%
The threshold mortality rate from incidental catches should not exceed levels that exceed 0.50%/0.30%/0.20%* of the median population size within a specified time frame (e.g. 10 years) – for species with a generation length (in pre-disturbance conditions with an assumed stable population) of 12 years of less (e.g. harbour porpoise)/13-20 years (e.g. common dolphin)/>20 years (e.g. minke whale, humpback whale)
No quantitative assessment possible but descriptive analysis taking precautionary approach into account
*% of best population estimate based on RLA simulations (Hammond et al. 2018)
Alternatively take uncertainty of abundance estimate and bycatch rate into account if using an implicit conservation target



*Take uncertaining of abudnance estimate and bycatch rate into account if using an implicit conservation target

A proposal for an action plan to implement the workshop proposals, feeding in e.g. to the implementation of the HELCOM Roadmap on fisheries data (TOR 19 e)

Points raised in discussions:

- **Effort data**: tracking system required on small vessels
    - Could this information gap be addressed to the European Commission.
    - Could incentives for fishermen help.
    - Trust needs to be built up between fishermen and monitoring side to encourage good cooperation regarding incidental by-catch.
- Data aggregation issue (i.e. small spatial or temporal scale not always being immediately available) may be a matter of ICES data policy (not so much GDPR issue), seek solution with ICES or clearer understanding of the issue.
- **By-catch data**: communication with RCGs (under DCF) on data needs and format, e.g., HELCOM (end-user of fisheries data) as observer at RCG Baltic.
- CCTV needs incentives for fishers or pressure from managers (e.g. the European Commission), thus incentives may be better

Assessment areas

- OSPAR – use cetacean species specific management units or assessment units when they exist, in other cases use the OSPAR Regions.
- For pinnipeds, management units would be most appropriate.
- HELCOM uses management units and population factors:
    - Seals: existing management units.
    - Harbour porpoise populations Baltic Proper and Western Baltic, Belt Sea & Kattegat.

Annex 6. Seabirds – Review synergies and differences, reach conclusions and make recommendations

This annex reflects discussions in the group discussing specificities of seabird assessments and/or synergies with methods used for marine mammals based on the findings from previous group. The group covered §15 of the ToR.
This annex does not provide a complete transcription of the discussion, and only aims to provide some insight into the key issues presented in the main outcome. The annex does not include all technical details and method descriptions as these would be available in a separate technical report.

Discussion on data gaps and monitoring;

1. Fishing effort/gear type data is reported by Contracting Parties only from activities within their own national waters, thus there may be data for activity in other areas that do not become available to support assessments. Cooperation over a joint indicator covering ecologically relevant assessment units, rather than national assessments of national waters, was seen to be helpful in order to support efforts to improve data availability.

2. At-sea monitoring provides important information on incidental by-catch rates; however, it is resource intensive and expensive. The following were noted as seabird specific aspects;

   a. REM: difference in detection rate between marine mammals and seabirds (as birds require close up images to identify species, age-class and sex, c.f. mammals). Recording should be done from the side of the boat and at the hauling phase. Trials in Denmark indicate that sufficient resolution can be achieved. Trials in Poland saw fishermen holding up bycaught birds in front of the cameras for identification, barring harsh-weather conditions;

   b. the case study by ACCOBAMS on EU DCF onboard monitoring protocols for marine mammal incidental by-catch monitoring could be considered to identify if some methods could also be relevant for birds;

   c. satellite tracking: provides useful information about at-sea bird distribution, especially relevant for areas rarely surveyed (i.e. OSPAR Regions I and V) and for risk assessment approaches to analyse any interactions between birds and fishing effort. Appropriate methods need to be applied when analysing data, to note that data may only be available from a few individuals that may express individual “specialisms” (e.g. preference for specific areas) rather than representing the population as a whole. It is not clear if the same methods could be readily applied to marine mammals.

3. Beached bird monitoring should not be considered a cost-effective alternative to monitoring incidental by-catch rates on-board vessels; however, it can in some circumstances perhaps provide additional information of specific events. It is believed that fishermen often bring bycaught birds ashore and bury them rather than release them back into the sea; also, dead birds may not be washed onto monitored beaches, thus the information from strandings are now seen to be an unreliable source of information for monitoring purposes. In addition, predators may take away corpses from the beach before being recorded. Norway had identified some local problems with fisheries in fjords when ad hoc information about strandings had been brought to the attention of authorities. However, this example is likely to be unique to areas with similar enclosed topography and therefore not widely applicable.

4. In certain areas, additional information sources for incidental by-catch rate and fishing effort can come from routine compliance monitoring (e.g. inshore gill-netting in Denmark).

5. Certification (voluntary, to demonstrate "sustainably sourced food") should be coupled with demonstrating adequate monitoring effort and reporting (alongside mitigation where appropriate).

Discussion on hot spot detection;

6. Published examples of approaches were presented in plenary and later discussed for OSPAR and HELCOM areas. Additionally, a paper on methods for identifying hot spots of incidental by-catch risk published in the ICES Journal of Marine Science could be a basis for a common framework. This framework could also be applicable to marine mammals.

7. Temporal change in risk, due to changing fishing effort and more significantly bird abundance/distribution, requires careful consideration. Identifying hot-spot areas needs to apply an adaptive management approach. Data collection for assessing this aspect would be a time-consuming process, and therefore efficient working procedures for updating and checking data, e.g. through subsamples, are needed.

Discussion on specificities for threshold setting for seabirds;

8. Figure 1 presents a schematic summary of the proposed approach. Threshold setting approaches for marine mammals typically rely on an understanding of the size of the population at carrying capacity. For seabirds, carrying capacity was not considered to be a good approach, and it is typically not applied to seabirds. It was noted that understanding carrying capacity would require considering the whole population across a wide-ranging area, e.g. crossing RSC borders. The group recommended not to use thresholds that take carrying capacity of a population into account, reducing the number of options compared to the options considered for marine mammals.

9. **Recommendation for proposed threshold** for seabirds, based on the 'rule-of-thumb' approach;

   - The threshold mortality rate from incidental by-catch is 1% of natural annual adult mortality of the species.

10. The proposed threshold has been derived from the conservation objective to "minimise and eliminate where possible". This objective aligns with the prohibition of deliberate killing or capture of birds according to Article 5 of EU Directive 2009/147/EC (Birds Directive). It is also aligned with the conservation target of the EU "Action Plan for reducing incidental catches of seabirds in fishing gears" (COM(2012) 665), which requests Member States to "minimize and, where possible, eliminate the incidental catches of seabirds". The 1% level is an approximation of zero mortality (derived from legal interpretations in European courts of 'small numbers' stemming from the EU Birds Directive). Thus, the workshop noted that the threshold might be most appropriate to Contracting Parties to OSPAR and HELCOM that are also EU Member States, and that views of those Contracting Parties that are not EU Member States need to be considered in the process of proposing the threshold for adoption.

11. As the proposed threshold is related to a conservation objective that has been derived from a regulatory perspective rather than a biological perspective, the workshop recommends testing the proposed thresholds for biological significance. Testing should be done by applying suitable methods of population modelling, which would need data on various demographic parameters. The following aspects were discussed in this respect:

a. tests should consider species with different ecological functions (cf. EU MSFD species groups) and to also test the relevance for populations that are depleted/abundant and declining/increasing.

b. 1% adult annual mortality threshold had not affected the population trajectory (modelled by PVA) of gannets in the UK in an earlier test. Whether this should be interpreted as a threshold that enables achieving the conservation objective or whether it was an overly precautionary threshold would need to be further explored and considered.

c. hunting of eider ducks in the Baltic Sea (also within single Contracting Parties areas) exceed the number which would be derived for the incidental by-catch threshold value based on 1% adult annual mortality. As a hunting pressure of adult males higher than that of the proposed threshold value was allowed, it needs to be further considered if the threshold was aligned with considerations of sustainable use or if it was overly precautionary;

d. the threshold assumes an understanding of the differing contributions to mortality from natural and anthropogenic sources. However, this distinction can only rarely be made in practice, and the effect of this needs to be considered.

e. for many species there are no reliable data for mortality (e.g. velvet scoter) and 'borrowing' of information between ecologically equivalent species would be needed. 'Borrowing' between regions is also foreseen to be needed. Whether sufficient information can be made available to test the approach with sufficiently high confidence needs to be explored;

f. PVA approach could be used for the testing of the value. Tests using this approach should explore the effect of added 1% adult annual mortality and also test with other values e.g. 5% to explore if any breakpoints exist in the models which would "crash" the projected population. Alternatively, the tests could aim to establish the incidental by-catch threshold value which would allow for the population to achieve the abundance objectives in other indicators;

g. where the available demographic data to apply a PVA approach is not possible, the RLA approach, typically applied to marine mammals, could be tested. It has not thus far been applied to birds, and would require some additional testing and development.

12. Fishing industry views should be a consideration in the establishment of assessment approaches; because "buy-in" from the industry is critical to the delivery of incidental by-catch reduction measures; overly precautionary thresholds could risk losing the confidence of fishers.

13. The use of Potential Biological Removal (PBR) is not recommended for threshold-setting purposes, since it was shown that acceptable mortality calculated by PBR actually can lead to a decline of the modelled population (O'Brien et al. 2017).

Discussion on assessment units;

14. Seabirds are highly mobile. Avoiding multiple assessments at a fine spatial scale is seen as reducing the risk of double counting. When establishing the assessment units to be applied, a balance between scale or reporting and data availability needs to be found in order for the assessments to be feasible and relevant. A driver for small scale assessments could be a need to motivate monitoring efforts by presenting outcomes at a local scale.

15. Recommendation: For seabirds, assessments at large spatial scales are more appropriate than at small spatial scales;

- **HELCOM**; same assessment units as for the abundance indicators, i.e. seven units derived by grouping assessment unit level 2 sub-basins;
- **OSPAR**; use the same assessment units as in the abundance indicator or existing management units if available; if not available then use OSPAR Regions.

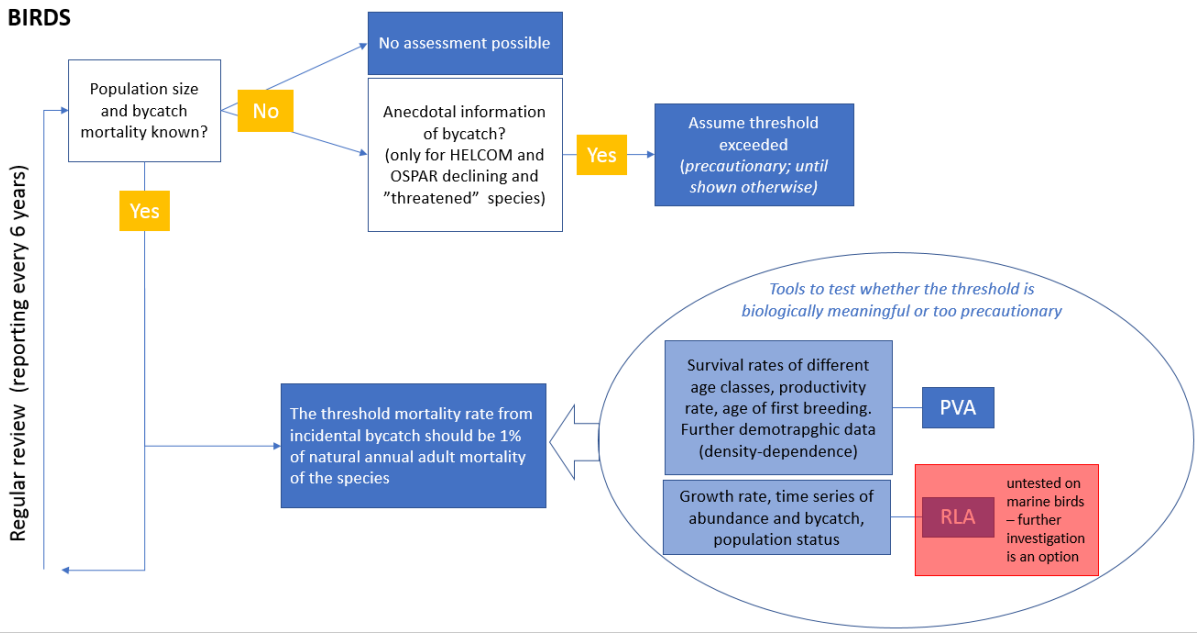


Figure 1. Schematic assessment approach and tools for testing ecological relevance of the proposed threshold.

Reference

O'Brien, S.H., Cook, A.S. & Robinson, R.A. (2017) Implicit assumptions underlying simple harvest models of marine bird populations can mislead environmental management decisions. *Journal of Environmental Management*, 201: 163-171.