# MEETING OF THE NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON HARBOUR PORPOISE

*7-10 November 2022*
*University of Oslo, Norway*

## REPORT

*Presented to the 29th Meeting of the Scientific Committee as NAMMCO/SC/29/06*

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# MAIN REPORT

The NAMMCO Scientific Committee Working Group on Harbour Porpoise (*Phocoena phocoena*) held its third meeting at the University of Oslo, Norway, from 7-10 November 2022. The Working Group (WG) was chaired by Bjarni Mikkelsen (FO). The list of participants and the agenda are available in Appendix 1 and 2 respectively.

## 1. WELCOME FROM THE CHAIR AND OPENING REMARKS

The Chair Bjarni Mikkelsen welcomed participants to the meeting and a round of introductions was made. The Chair thanked Norway for hosting the meeting and reminded that this year was the 30th anniversary of NAMMCO. The NAMMCO Scientific Committee established a Harbour Porpoise Working Group (HPWG) in 2011 (SC 18) because of the existence of direct and indirect removals in the NAMMCO countries and it had been requested by the Council to conduct a comprehensive assessment of the harbour porpoise throughout its range (Request R-3.10.1, 1997). The two first meetings in 2013 and 2019 focussed on Greenlandic waters, this meeting would focus on Norwegian waters.

NAMMCO General Secretary, Geneviève Desportes, emphasised that it was quite problematic that the most important documents to this meeting were only delivered the day prior to the meeting. This did not guarantee the best preparation to and outcome from the meeting. The deadlline for submitting documents to NAMMCO meeting was two weeks ahead of a meeting.

## 2. ADOPTION OF AGENDA

The agenda was adopted.

## 3. APPOINTMENT OF RAPPORTEURS

NAMMCO Scientific Secretary Albert Chacón was appointed as the primary rapporteur, with all participants agreeing to provide summaries of information presented where relevant.

## 4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

The list of meeting documents is available in Appendix 3. All documents were available to the group through a shared folder at the NAMMCO website.

### 4.1 HARBOUR PORPOISE WORKING GROUP MEETINGS OF 2013 AND 2019

The Chair noted that the first meeting of the HPWG took place in 2013, but management recommendations were not provided for West Greenland at that time because of the shortage of some crucial input information. Management recommendations for West Greenland were provided at the 2019 meeting. Reports from these meetings were available to the group as For Information (FI) documents SC/29/HPWG/FI01 and SC/29/HPWG/FI03.

### 4.2 SUMMARY OF PREVIOUS RECOMMENDATIONS

The recommendations for Norway made at the two last HPWG meetings were reviewed. Norway provided updates on the status of the previous recommendations for research and recommendations for conservation and management on harbour porpoise (more detailed information is provided under agenda item 5).

***2013 recommendations to Norway***

- *The working group **recommended** that Norway compile enough information as possible about by-catch from other fisheries, and to look into the lumpfish fishery by-catch next.*

  Norway had progressed with the estimation of porpoise by-catch, with estimates for the period 2006-2018 being endorsed by the By-Catch WG and published (Moan et al. 2020; SC/29/HPWG/FI14). Updates from Norway on by-catch estimates will be provided under agenda item 5.5.

- *The group **recommended** that samples be collected from by-catch in Norway, to obtain data on sex ratio, reproductive status, age structure, diet, contaminants, etc. It would be challenging to gather carcasses for the whole coast; the group therefore suggested that efforts are focused on the Vestfjord area where most of the by-catch occurs.*

  Samples from porpoises by-caught in Norwegian waters had been collected and more details would be given under agenda items 5.1 and 5.4.

- *The working group **recommended** tagging of harbour porpoises in Norway to obtain information about behaviour for use in assessment. Movement data will be important also in light of changing environmental conditions (e.g., food availability).*

  Some tagging efforts had been conducted in the Varanger fjord area, where porpoises trapped in salmon traps (not entagled), were tagged as part of a study to investigate their movement dynamics. Results of the tagging study indicated Varanger is an open system, with some porpoises choosing to stay in the area (residents) and others moving into the Barents Sea.

- *The working group therefore **strongly recommends** that surveys to estimate abundance in Norwegian coastal and fjord waters are carried out. These surveys may start in the areas of highest by-catch (Vestfjorden).*

  Norway noted that surveying the fjords was not a requirement for estimating by-catch and that even though the density of harbour porpoise is higher in the fjords, the proportion of the Norwegian harbour porpoise population living in the fjords is small. Surveys had however been conducted in all major fjords in Southern Norway and some important fjords in Northern Norway which are known for a high density of porpoises, e.g. Balsfjord in Troms County. Preliminary analyses were presented at the meeting, see agenda item 5.2.

- *The working group **recommends** both tracking and genetics studies to clarify stock delineation. Reliance on genetics data alone is not enough because movements are needed to inform on mixing and dispersion of the animals on a management time scale.*

  Some tagging has been performed in the Varanger fjord area – see above. New genetics studies had also been performed on porpoises by-caught in 2016 and 2017 (Quintela et al. 2020; SC/29/HPWG/FI31) however with a sample biased towards Northern Norway. Harbour porpoise stock delination in Norwegian waters will be discussed under agenda item 5.1.

***<u>2019 Recommendations for Research to Norway</u>***

- *By-catch estimates should be finalised and endorsed and this should include efforts to investigate the potential to extrapolate by-catch further back in time.*

See above. Norway progressed with the estimation of porpoise by-catch, with estimates for the period 2006-2018 being endorsed by the By-Catch WG and published (SC/29/HPWG/FI14). Updates from Norway on by-catch estimates will be provided under agenda item 5.5.

- *The ongoing work to establish another abundance estimate that includes the fjord systems should be continued.*

  See above. Surveys have been conducted in all major fjords in Southern Norway and some important fjords in Northern Norway which are known for a high density of porpoises, e.g. Balsfjord in Troms County. Preliminary estimates of abundance based on these surveys were presented at the meeting, see agenda item 5.2.

- *Further information on harbour porpoise movements is required and therefore tagging and tracking studies should be conducted along the coastline to help answer questions about stock identity and consider if smaller management units are necessary.*

  See above. Some tagging efforts in Varanger fjord yielding information on movement behaviour from local harbour porpoises. However, there are no plans for a coastal-wide tagging program in Norway, in part because of practical difficulties in catching the porpoises. Updates from Norway on stock identity and management units will be given under agenda item 5.1.

***2019 Recommendations for Conservation and Management to Norway***

- *[All countries] Given the importance for assessment of having a reliable timeseries of abundance estimates, survey efforts across the areas should be coordinated.*

  The recent NASS surveys have been coordinated between NAMMCO Parties. The coverage of the SCANS surveys covers the Norwegian coast up to 62◦ N.

- *A formal assessment with updated by-catch estimates should be conducted when new abundances estimates become available.*

  This WG is meeting in response to this recommendation.

- *The reference fleet should be expanded as part of an effort to obtain reliable by-catch estimates.*

  Norway indicated that there were no plans to expand the Norwegian coastal reference fleet (CRF), as it cannot handle more than 30 vessels. However, with the aim to improve by-catch data collection, a Remote Electronic System (REM) is currently being implemented on vessels outside the CRF – which *de facto* expand the monitoring effort. Its implementation, however, has been slow due to legal issues regarding privacy of the fishermen and also the performance of the cameras used, which will be replaced by better cameras in the future.

## 5. HARBOUR PORPOISE ASSESSMENT FOR NORWAY

### 5.1 STOCK IDENTITY

The WG noted that available genetic information of harbour porpoise in Norway have not indicated any structuring in the population, suggesting there is a panmictic population of harbour porpoise off

Norway. No isolation by distance was detected at the scale of the Norwegian population (see SC/29/HPWG/FI31), although isolation by distance is seen at the scale of the whole North Atlantic population (see SC/29/HPWG/FI02). However, it is likely that some level of spatial structuring, not captured by the genetic analyses, exists in the population. The group also noted that information on harbour porpoise movements in Norway was limited and uninformative in relation to stock structure, due to the small tagging effort. How to best define regions along the Norwegian coast to perform a population assessment for harbour porpoise was discussed. Traditionally, the Norwegian coast has been divided in two sections, north and south of latitude 62°N, a division that reflects neither stock identity nor population structure but has been previously used for abundance estimation purposes. It was also noted that harbour porpoise by-catch in Norway was higher in the Lofoten-Vesterålen area and in Varanger fjord, making these areas relevant for a precautionary stock delineation.

Moan presented the by-catch regions used in Moan et al. 2020 (SC/29/HPWG/FI14), emphasizing that the actual survey blocks were bigger than the regions used in the paper. The group discussed whether it would be better to use smaller regions for the assessment or, due to a lack of population structure a single region spanning the whole coast. However, it was emphasized that, for performing assessments, it was important, and more precautionary, also to incorporate management considerations when dividing the area in subunits.

The group **agreed** to split the population in regions, following a precautionary approach, but noted that available by-catch and abundance estimates were already based on the regions defined in Moan et al. (SC/29/HPWG/FI14), so if new regions were to be defined, existing estimates would need to be re-calculated.

Based on differences in fishery dynamics north and south of Vestfjorden, Bjørge suggested not to merge fishery areas 06 and 00 (see figure 1 of Moan et al. 2020, document SC/29/HPWG/FI14), but to integrate the Vestfjorden area (area 00) with area 05. The group **reached consensus** on using 4 large areas for population assessment: Region 1 (North) made of fishery areas 03 and 04, Region 2 (North-West) made of fishery areas 00 and 05, Region 3 (West), made of areas 06 and 07, and Region 4 (South) including fishery areas 28, 08 and 09. These regions and areas are shown below in Figure 1.

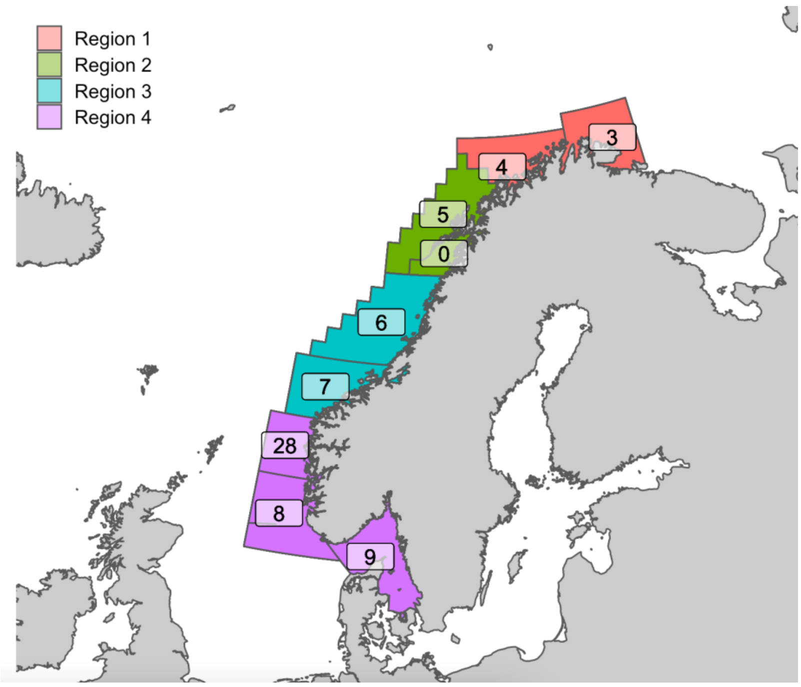


**Figure 1**. Map showing the partitioning of nine coastal fishery statistics areas into the four assessment regions that were used for the group's assessment.

## 5.2 ABUNDANCE ESTIMATION

Øien presented preliminary results on density estimates and abundance of harbour porpoise in Norwegian fjords, obtained from ship surveys conducted in the period 2016-2022. The same vessels and similar methods to those employed in the offshore minke whale surveys were used, i.e., standard line transect surveys in passing mode with two independent platforms but no tracking. Results show varying density estimates, ranging from 0.23 to 1.92 individuals/km$^2$ (values for each fjord system are given in Table 1), with both minimum and maximum values obtained in Northern fjords. Øien noted that the planned transects needed to be adapted in each fjord, due to differences in configuration, depth and the presence of aquaculture pens.

**Table 1:** Average estimates of density and abundance (with Coefficients of Variation; CV) of harbour porpoise obtained at different Norwegian fjord systems surveyed during the period 2016-2022. Note that different surveys conducted by the Norwegian Institute of Marine Research (NOR) and by SCANS-III overlapped at some fjords.

| Survey | Fjord System | Density ind/km$^2$ | Abundance N | CV |
|---|---|---|---|---|
| NOR | Varangerfjorden | 0.570 | 1,519 | 0.200 |
| NOR | Porsangerfjorden | 0.230 | 330 | 0.300 |
| NOR | Balsfjorden | 1.920 | 448 | 0.270 |
| NOR | Vestfjorden | 0.620 | 3,712 | 0.200 |
| SCANS III | Vestfjorden | 0.406 | 4,556 | 0.275 |
| SCANS III | Trondheimsfjorden | 0.282 | 273 | 0.476 |
| NOR | Halsafjorden-Vinjefjorden | 0.490 | 214 | 0.210 |
| NOR | Moldefjorden-Romsdalsfjorden-Langfjorden | 0.490 | 291 | 0.190 |
| NOR | Storfjorden-Hjørundfjorden-Voldfjorden | 0.450 | 300 | 0.130 |
| NOR | Nordfjorden | 0.330 | 82 | 0.230 |
| NOR | Sognefjorden and Lustrafjorden | 0.700 | 752 | 0.150 |
| NOR | Masfjorden | 1.330 | 151 | 0.170 |
| NOR | Bjørnafjorden | 0.410 | 188 | 0.270 |
| NOR | Hardangerfjorden med Sørfjorden | 1.260 | 971 | 0.100 |
| NOR | Boknafjorden | 0.460 | 317 | 0.220 |
| SCANS III | Boknafjorden | 0.593 | 423 | 0.386 |

The density estimates obtained by the Norwegian surveys were corrected for perception bias but not availability bias: the abundance estimates should therefore be regarded as underestimates. Øien clarified that the results presented for each fjord corresponded to aggregated estimates from several years. The detection function was calculated using all the fjord data (different fjords + different years) and the same detection function was applied to all parts of the fjords.

For the assessment, the working group decided to calculate harbour porpoise abundances specific to each of the four assessment regions shown in Figure 1. These abundance calculations were based on density estimates from SCANS and IMR surveys that overlapped with the assessment regions. In areas where IMR and SCANS survey blocks overlapped, SCANS survey blocks were preferred, since the SCANS surveys were targetting harbour porpoises, while the IMR surveys were designed for estimating abundances of minke whales, and may therefore be negatively biased with regard to harbour porpoises. To also include porpoises in fjords and coastal areas, the spatial areas of fjords and coastal areas were assigned to one or more of the survey blocks with which those areas were connected. The WG was not able to use the fjord density estimates presented in Table 1, since the shape files for the fjord surveys were not available, and there was no practical way to easily identify the boundaries of the fjord surveys. The group recognized that applying density estimates from open waters to fjord areas as described above would underestimate harbour porpoise abundances in the fjords, but agreed that it was necessary since the fjord estimates could not be used. It was also pointed out that since the total area of the fjords is so small, this negative bias was not expected to have a large effect on the assessment. The updated abundance estimates for the four regions used in the current assessment are listed in Table 2.

**Table 2.** Abundance per assessment region. loWCI and upCI refer to lower and upper 95% confidence intervals, respectively.

| Region | Estimate | CV | Area (km$^2$) | lowCI | upCI |
|---|---|---|---|---|---|
| N | 6957 | 0.45 | 95646 | 2995 | 16160 |
| NW | 9206 | 0.22 | 86683 | 6046 | 14015 |
| W | 23588 | 0.19 | 143069 | 16180 | 34386 |
| S | 91668 | 0.13 | 164170 | 71303 | 117850 |

Hammond briefly presented a map of harbour porpoise presence (sightings) from the latest SCANS-IV survey (2022). Sightings were numerous in the whole North Sea, in the Belt sea and Kattegat, between Denmark and Western Sweden, as well as in the Irish Sea, and more common in the North Sea than in the English channel. The pattern of higher density in the southern North Sea compared with the northern North Sea, first seen in SCANS-II in 2005, remains evident in the 2022 sightings. The lower density in the Celtic Sea (SW of Britain and Ireland) seen in SCANS-III in 2016 compared to previous surveys is also apparent in the sightings. However, caution is needed in interpreting patterns of sightings because of spatial variation in effort and any inferences should wait until estimates of abundance have been made.

## 5.3 IMPACTS FROM OTHER ANTHROPOGENIC STRESSORS

Small cetaceans are subject to a range of anthropogenic stressors, other than removals, with the most relevant being accumulation of contaminants, disturbance including underwater noise and shipping, climate change and prey depletion. At the Joint NAMMCO/IMR International workshop on harbour porpoise in 2018 (SC/29/HPWG/FI02), the importance of chemical pollutants as stressors to harbour porpoise was emphasised, even if direct effects may be hard to quantify and our current understandings of causal relationships limited. Concerning pollutants, phthalate (plasticizers) concentrations have been measured in porpoises by-caught in Norway in 2016 and 2017 (see SC/29/HPWG/FI32). The measured levels of pollutants in the individuals sampled along the coast were rather low, but animals inhabiting waters adjacent to areas of higher human activity tended to show higher concentrations, indicating that harbour porpoises can be potentially used as tracers of phthalate pollution in the marine environment. However, there are no specific studies in Norway that have tackled the effects of contamination on harbour porpoise reproductive parameters.

Reproductive impairment has been previously associated with polychlorinated biphenyls (PCBs), with numerous studies describing negative effects on marine mammal health. Ijsseldik et al. 2021 (SC/29/HPWG/FI35) explored the effects of PCBs and prey availability on harbour porpoise across a wide geographic area and found that mean energy density of prey constituting diets (MEDD) was the best predictor of reproductive performance. In that study, PCB levels did not associate well with pregnancy rates, indicating that other approaches or pollution biomarkers should be used to assess pollution impacts on small cetaceans.

Given that Norway is at the northern limit of the global distribution of harbour porpoises, climate change is expected to increase the area of suitable habitat for the species in Norway, but no spatial modelling has been conducted to predict its distribution under future climate scenarios.

## 5.4 BIOLOGICAL PARAMETERS

Anne Kirstine Frie presented Working Document SC/29/HPWG/06: Growth and reproductive rates of Norwegian harbour porpoises.

*Summary:*

Growth and reproductive parameters were calculated for 58 female harbour porpoises by-caught along the Norwegian coast in autumn 2016 and late winter-spring 2017. Age estimates used for construction of maturity curves were corrected for recent GLG completion in the spring samples to ensure consistent reference to age at last ovulation. No significant differences were found in growth or maturation curves of females between these two sample units. The overall mean age at maturity and median age at maturity were estimated at 3.2 years and 2.7 years, respectively. The adult pregnancy rate was estimated at 100 % for the 2016 sample and 82 % for the 2017 sample. The difference was not statistically significant and the overall average was 92%.

*Discussion:*

The Working Group needed to reach a consensus on which biological parameter values to be incorporated into the population modelling. The methods used to determine the age of the Norwegian harbour porpoises was discussed, due to the deviation observed between age reading methods/readers. As highlighted in the presentation, using teeth to determine age of harbour porpoises may lead to very different age estimates for the same individual, depending on whether one focuses on the dentin or in the cementum of the tooth. Despite the difficulties to age harbour porpoises, older studies ignored those issues and age values estimated in the 1990's were no longer considered reliable. Therefore the group **agreed** to use the new age data and maturity estimates provided in SC/29/HPWG/06 for the population assessment.

It was noted that the sample size used to calculate sex ratios (n=134) was low and far from the recommended size to obtain a ratio without sample noise (usually in the thousands). Also, calculating sex ratios based on by-caught individuals was not ideal, because by-catch may affect males and females differently. Therefore, the group **agreed** that a skewed sex ratio based on a small sample size could not be used for the assessment and that a default 50:50 sex ratio should be used instead.

## 5.5 BY-CATCH

Moan provided the group with updated by-catch estimates (available in Table 3) for the four regions defined under agenda item 5.1. The group asked whether by-catch estimates could be estimated for past years, i.e. back-calculated from 2006 to as far back as possible (e.g., 1970) using landings as proxies of fishing effort and included in the assessment, as including them in the assessment would be informative. Moan informed that this was not possible to produce for this meeting, as the landing data were not regrouped in a single file. The group **recommended** that Norway carries out such back-calculation of by-catch estimates and that it be incorporated in future assessments, together with by-catch estimates from larger (>15m) vessels and recreational fisheries.

Regarding the reliability of the reported by-catch, it was indicated that there was evidence from other regions (e.g. Denmark and the Netherlands) of by-caught porpoises sometimes spontaneously dropping out of the gillnets as they are hauled on board and that this can go undetected by the fishers. The group further speculated that the drop-out rate is higher in gillnets with smaller mesh size than with bigger mesh size. It was noted that higher speed in hauling the nets could also increase drop-out rates, and that it is possible (although not documented) that porpoises could also drop-out of the net even below the surface.

**Table 3.** Average yearly by-catch per region for the period 2006-2018. LowerCL and upperCL refer to 95% confidence limits.

| Region | Fishery Areas | Estimate | CV | lowerCL | upperCL |
|---|---|---|---|---|---|
| N | 03 & 04 | 403 | 0.31 | 114 | 479 |
| NW | 00 & 05 | 1533 | 0.11 | 1173 | 1847 |
| W | 06 & 07 | 611 | 0.17 | 385 | 746 |
| S | 08, 28 & 09 | 461 | 0.13 | 341 | 574 |

It was emphasized that drop-out rates were not taken into account in the by-catch estimations, so by-catch was potentially underestimated. The group **agreed** to include drop-outs in the bycatch estimates used in the assessment. Four studies in Danish (Kindt-Larsen et al., 2012), Dutch (Scheidat et al., 2018), UK (Tregenza et al., 1997) and US gillnet fisheries (Bravington and Bisack, 1996) have provided estimates of drop-out rates of harbour porpoises yielding a weighted average rate of 42.3% of porpoises missed because of drop-out. However, the group **agreed** to use the drop-out rate of 18% published in Kindt-Larsen et al. (2012) (available as document SC/29/HPWG/FI35), as it was the most recent estimate based on a large sample size.

Lindstrøm indicated that some porpoise mortality might also be caused by lost gear (ghost fishing). The group **recommended** that Norway look into the effects of ghost nets on harbour porpoise mortality dynamics and, if a concern, increase its effort in removing ghost nets in area of high porpoise density.

By-catch estimates can be calculated using number of hauls or landings as a proxy of fishing effort. Moan provided by-catch estimates using both methods. The group agreed that better estimates of by-catch were obtained by using haul as a measure of fishing effort. However, in the absence of data on hauls for back-calculating by-catch estimate in earlier years, the group **agreed** to use landings in this assessment for consistency within the series of by-catch estimates,

## 5.6 POPULATION MODELLING & ASSESSMENT

### 5.6.1 Examples of modelling tools and approaches for population assessments

Lindstrøm presented Working Document SC/29/HPWG/05: Population Viability Analysis of harbour porpoise in Norwegian Waters.

*Summary:*

An age structured population dynamics model, including density dependence on pup survival and fecundity, was used to run 1000 stochastic 10-year population trajectories incorporating uncertainty, using the most recent estimates of abundance, by-catch and fecundity. Age-specific mortalities were estimated by fitting an exponential decay function to age distribution data from animals by-caught in Norwegian fisheries in 2016 and 2017. Using these estimates as the starting point, different scenarios were run with respect to carrying capacity (K) and degree of density dependence (dDD). In the initial simulations, three carrying capacity scenarios, assuming the population is presently at carrying capacity, 67% of carrying capacity and 50% of carrying capacity, were investigated. Also, three scenarios of different degrees of density dependence on fecundity (Low, Medium and High) were investigated. Only, one scenario (K scenario 2 and dDD scenario 2) in one area (by-catch regions 2 and 3; Moan et al. 2020) was displayed in the working document. By-catch areas 2 and 3 was chosen as the default area because it had the highest by-catch rates. Not surprisingly, the output (population trajectories) varies between areas and are sensitive to the assumptions regarding K and dDD. In the final run, the porpoise population was divided into four regions (Figure 1). It was assumed that the porpoise population was at carrying capacity at the start, and that dDD on fecundity was medium. The probability of decline in 10 years varied substantially between areas, from 98% in area 2 (Lofoten/Vesterålen) to 0% in area 4 (NorthSea/Skagerrak/Kattegat). Due to the uncertainty in the underlying assumptions, these results should be interpreted cautiously.

*Discussion:*

Given that the presented modelling approach assumed density dependence effects on biological parameters, it was noted that for running the models some knowledge on density dependence and its effects on harbour porpoise demographic parameters would be necessary. Lindstrøm suggested to focus simulations over a short period of time, rather than over longer periods of time, so carrying capacity would not be so important, pointing to the need to decide on a time horizon, to run the simulations and get a trajectory. The group **agreed** that the model could be a useful tool for exploring the viability of the porpoise population but there was a need to constrain the simulation, i.e. narrow down the underlying assumptions behind the simulations,in order for the results to be informative for management advice.

Authier presented For Information documents SC/29/HPWG/FI23, SC/29/HPWG/FI24, and SC/29/HPWG/FI30.

*Summary*:

Authier presented the Bathtub model to estimate age-specific survival rates or age-specific mortality rates from age-at-death data (assuming these are correct). The model accommodates the so-called bathtub-shaped hazard, with a high mortality of juveniles, followed by a lower and stable adult survival, and a possible increase in mortality in late life due to senescence. The model is flexible and can accommodate covariates such as sex or sampling period. It may be used to estimate age-specific mortalities and use these estimates in simulations. The method is published (Rouby et al. 2020) and the paper is provided as an information document SC/29/HPWG/FI30.

Authier also presented an R package developed in the context of managing by-catch by setting removals limits (Genu et al. 2021). The package includes functions to carry out population dynamics modelling according to a Pella-Tomlinson density-dependence process, and can be used for carrying out various simulations to assess the impact of by-catch on population dynamics. It also includes functionalities to tune the Potential Biological Removal to conservation objectives (Genu et al. 2021). The R package and paper were provided as information documents SC/29/HPWG/FI24 and SC/29/HPWG/FI23.

*Discussion:*

The group welcomed the presentation by Authier and **agreed** that, to carry out simulations to assess the impact of by-catch on harbour porpoise populations, the use of a population dynamics model with a Pella-Tomlinson density dependent process was the best approach, and that it would be used in the population dynamics modelling of harbour porpoise in Norway (see next section).

### 5.6.2 Population dynamics model of harbour porpoise in Norway

Witting presented the results of the assessment for Norwegian harbour porpoise (available as working document SC/29/HPWG/07) based on a population dynamics model used for other small cetaceans in NAMMCO and using the data input agreed by the group, which is summarized in the box below.

*Agreed data input for the assessment:*

4 regions: North (N or 1), North-West (NW or 2), West (W or 3), and South (S or 4)

Sex ratio: 50:50

Abundance estimates

- South (S) area: three abundance estimates: SCANS I (1994), II (2005) and III (2016).
- North (N) area: the 3 Norwegian surveys are used as absolute abundance, but corrected for relative bias to SCANS survey using correction factor 0.322 (see working document SC/29/HPWG/07).
- Areas NW and W: the last estimate, primarily from SCANS, is used as absolute abundance and the two first ones, from Norwegian surveys, are used as relative abundance.

By-catch:

- Annual by-catch split by areas for 2006-2018 and average estimates for the period 1990-2005.
- Landings used as proxy of fishing effort
- Estimates corrected by drop-out rate from Kindt-Larsen et al. (SC/29/HPWG/FI35)

All fecundity and age data from Frie et al. (SC/29/HPWG/06) used for all areas.

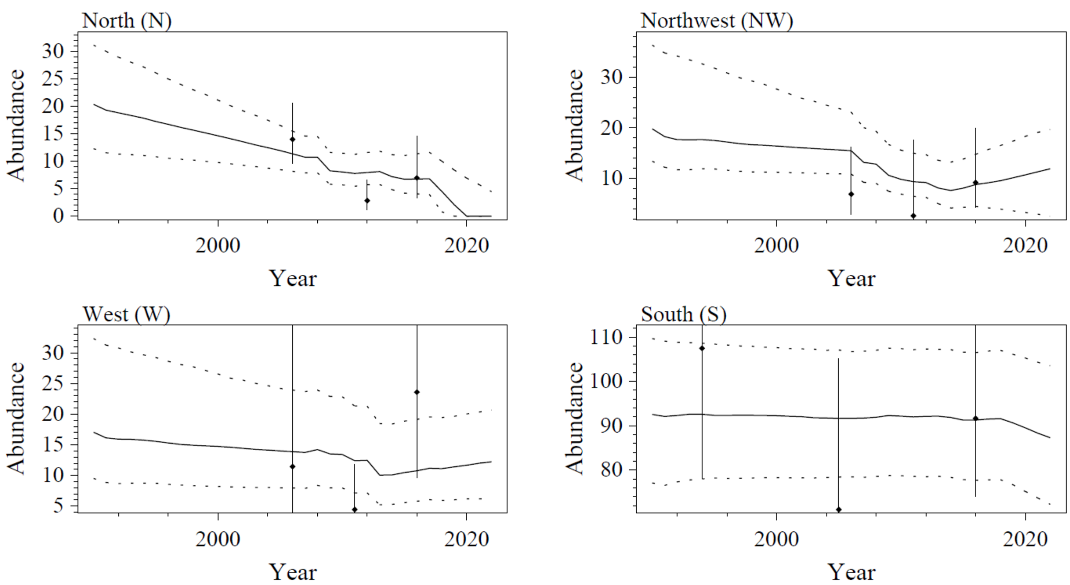


**Figure 2**: Projected medians and 90% credibility intervals for abundance. Data from Moan et al. (SC/29/HPWG/FI14).

**Table 4:** Catch objective trade-off per stock. The annual total removals per stock that meet given probabilities (*P*) of meeting management objectives. The simulated period is from 2018 to 2022, and *F* is the assumed fraction of females in the catch.

| *P* | **N** | **NW** | **W** | **S** |
|---|---|---|---|---|
| *F* | 0.5 | 0.5 | 0.5 | 0.5 |
| 0.50 | 287 | 707 | 483 | 520 |
| 0.55 | 255 | 615 | 443 | 467 |
| 0.60 | 223 | 526 | 402 | 413 |
| 0.65 | 197 | 445 | 361 | 359 |
| 0.70 | 171 | 365 | 322 | 312 |
| 0.75 | 146 | 294 | 275 | 266 |
| 0.80 | 114 | 229 | 225 | 218 |
| 0.85 | 83 | 173 | 155 | 158 |
| 0.90 | 56 | 116 | 106 | 100 |
| 0.95 | 30 | 62 | 54 | 51 |

*Summary:*

SC/29/HPWG/07 used a density regulated model for an assessment of the influence of by-catch on harbour porpoises in four areas (North, North-West, West, and South) along the Norwegian coast. The models integrate three abundance estimates for each area, with the available age structure sampled mainly in the Northern and North-Western areas. Other data include a pregnancy estimate for mature females, and by-catch series from 2006 to 2018 for all areas. These series are corrected for 18% dropouts, and the average by-catches were used as rough estimates of by-catch from 1990 to 2005.
All models were clearly updated by the Bayesian integration, with the population trajectories of the four areas shown in Fig. 2. The north-western area is estimated to be depleted below the maximum sustainable yield level (MSYL), with a depletion ratio of 0.28 (90% CI:0.11-0.58) for 2018. The Northern and Western areas are close to the MSYL with depletion estimates of 0.56 (90% CI:0.27-0.78) and 0.56 (90% CI:0.34-0.74). The southern area is above the MSYL with a depletion estimate of 0.79 (90% CI:0.70-0.90). As there are no quantitative estimates of by-catch before 2006, these levels are roughestimates, and it is important to update the models with longer time series of formal bycatch estimates at the next assessment meeting. The model estimates of abundance for 2018 are 22,800 (90% CI:11,900-36,600), 9,570 (90% CI:5,930-14,000), 23,400 (90% CI:17,000-32,000), and 91,000 (90% CI:76,400-106,000) for the Northern, North-Western, Western, and Southern areas respectively.
The four models provide estimates of the sustainability of the by-catch (as defined by populations that increase when they are below the MSYL, and total by-catch removals that do not exceed 90% of the maximum sustainable yield when the population is above the MSYL). A 70% probability for sustainable by-catches requires total removals below 171, 365, 322, and 312 for the North, North-West, West, and South areas (Table 4). The corresponding average dropout-corrected by-catches from 2006 to 2018 are 595, 1723, 881, and 530 estimating that the Norwegian bycatch of harbour porpoises is unsustainable in all four areas.

*Conclusion:*

The WG **endorsed** the assessment and concluded that the Norwegian by-catch of harbour porpoises (average from 2006 to 2018 ) is unsustainable especially in the North-Western and Northern areas. The degree of unsustainability is somewhat uncertain due to assumptions on stock structure and limited data. The WG **recommended** that Norway reduces the bycatch of harbour porpoises, and improves the available data for a new assessment (see next section).

## 5.7 RECOMMENDATIONS

The group formulated the following recommendations for research and recommendations for conservation and management:

### 5.7.1 Recommendations for Research

*Recommendations to the scientists*

- By-catch estimates be back-calculated as far back as possible (e.g., until 1970) using landings and included in future assessments.
- To use REM and/or other methods to get estimates of harbour porpoise dropout rates in gillnets
- To improve the age-structured population dynamics simulation model by constraining the simulations, i.e. narrow down the underlying assumptions behind the simulations and processes (e.g. density dependent mortality).
- To integrate harbour porpoises in ecological models and run risk assessment with respect to changes in by-catch rates and various ecosystem properties.

*Recommendations with financial implications for Norway*

- Increase tagging efforts to inform on movements, distribution, and stock delineation of harbour porpoise in Norwegian waters.
- Collect more biological samples to increase the life history information feeding the population models.
- Look into potential by-catch of porpoises in recreational fisheries to potentially include recreational fisheries in future by-catch estimates.
- Include by-catch data from larger (>15m) vessels into the by-catch estimates used for the assessment.
- Look into the effects of ghost nets on harbour porpoise mortality dynamics and, if a concern, increase efforts in removing ghost nets in areas of high porpoise density.

### 5.7.2 Recommendations for conservation & management to Norway

*(I.e., recommendations directly related to the management of removals such as quotas, catch limits, area closure, etc…)*

- Continue its efforts to reduce by-catch of harbour porpoises.
- Assess the compliance of the fleet to the pinger regulations in Vestfjorden as a basis for evaluating the efficacy of the pinger mandate.
- Consider expanding the use of pingers to areas north and west of Vestfjorden (fishery area 05).
- Due to the present unsustainable level of by-catch, consider the best way of ensuring that the mandatory use of pingers is enforced
- Implement the use of REM systems in fishing vessels outside the CRF, to complement the by-catch data from the CRF.

- The assessment for Norway should be updated with the requested new information at the next HPWG meeting

# 6. UPDATED INFORMATION ON HARBOUR PORPOISE FROM OTHER NAMMCO AREAS

## 6.1 REVIEW OF NEW AVAILABLE DATA AND FINDINGS FROM ICELAND, GREENLAND, AND THE FAROE ISLANDS

***Greenland***

Hansen informed the WG that catch statistics for Greenland compiled since 2018 had not yet been validated by the Institute of Natural Resources for assessment purposes, and that new abundance estimates would not be available before the completion of the 2024 NASS survey.

Regarding harbour porpoises, Greenland has no plans to conduct further genetic analysis and there has been no more satellite tagging conducted since the last assessment in 2019, so no new information was available for stock delineation. Satellite tagging with acoustic recorders was attempted in 2022 and planned for 2023 in West Greenland. Previous management advice from NAMMCO concerning the West Greenland harbour porpoise population, has not been implemented yet. The group **recommended** a new assessment of harbour porpoise in West Greenland when new abundance estimates are available.

Greenland does not currently separate by-catch from actual catch but at the last BYCWG meeting in May 2022 (Report available as document SC/29/HPWG/FI11), Greenland informed the WG about plans to launch an App for hunters in 2024 to increase reporting and better discriminate by-catch from actual catch.

***Faroe Islands***

Mikkelsen informed the WG that catching of harbour porpoises is legal in the Faroe Islands, and that it is mandatory to report all catches to the authorities. The numbers reported in the last ten years have been very low, therefore the catch is assumed to also be very limited, likely because there is not a strong tradition for it anymore. There exist no reliable catch statistics for this species. The Faroes conducted an aerial survey targeting harbour porpoises in 2010, that provided an absolute minimum estimate, but the logistics were complicated because of only one airfield and fog. There are currently no plans to conduct a new aerial survey for this species.

It is mandatory to report by-catch of marine mammals for the commercial fleet in electronic log-books, but the reporting is very low for any species and notably for harbour porpoises with only one animal being reported by-caught since 2000. Due to the lack of independent observer program, there is no independent by-catch data. However, the by-catch of harbour porpoise is assumed to be low because there are no coastal gillnet fisheries, such as e.g. the monkfish and cod fisheries operating in near-shore waters in other NAMMCO areas. Mikkelsen further noted that, because no harbour porpoises had been caught in the Faroes, biological samples had not been collected and no information on biological parameters currently existed for this species in the Faroes.

The group **recommended** that biological data be collected if harbour porpoises are caught or by-caught. The group **recommended** that users of coastal areas (i.e., professional and recreational fishers, as well others) be incited more fermely to report catch, by-catch and sightings of harbour porpoises. The group recommended developing an mobile App for such reporting.

***Iceland***

Sigurdsson indicated that a population estimate of harbour porpoise in Iceland waters was available from an aerial survey conducted in 2007, but noted that the survey was incomplete and the abundance estimate obtained then was probably an underestimate. Sigurdsson informed the WG about plans to conduct an aerial survey in July 2023 to obtain updated abundance estimates for harbour porpoise in Iceland. The group commanded the planning of such a survey. Given that abundance estimates from the NASS surveys may not be usable for harbour porpoise in Iceland, the group **agreed** that the 2023 abundance estimate be the one used in the future Icelandic assessment.

Sigurdsson indicated that previous work using close kin Mark-Recapture genetics and presented at the 2018 NAMMCO/IMR International Workshop on harbour porpoise indicated that the Icelandic population was increasing. Sigurdsson informed the WG that around 500 animals were by-caught annually in the Icelandic lumpsucker fishery and 1500-2000 in the cod fishery, noting that by-catch levels were much higher in the past.

Sigurdsson informed the WG that Iceland was also conducting isotopic work and investigating the diet of harbour porpoise using samples from by-caught and stranded animals. Life history parameters and age distribution histograms are possible to infer from these samples.

The group **recommended** that an assessment for Iceland be made when the new abundance estimate becomes available.

Sigurdsson informed the WG of the by-catch time series available in Iceland, including some back-calculated by-catch estimates, and presented at the international harbour porpoise workshop in 2018. As in the case of Norway, the group **recommended** Iceland to generate the best back-calculated by-catch estimates (i.e., generate a time series going back to the beginning of the fishery) for the upcoming Icelandic assessment, planned for 2024.

### 6.2 RECOMMENDATIONS OF THE WORKING GROUP BEFORE FUTURE ASSESSMENTS

The group made the following **recommendations** ahead of next assessments of harbour porpoise in the NAMMCO countries:

***To Greenland:***

- Plan to conduct a new assessment on harbour porpoise when new abundance estimates are available.

***To the Faroe Islands:***

- Support the creation of an App where users of coastal areas (i.e., fishers, recreational boats) can report observations, catch and by-catch of harbour porpoises.
- Initiate the collection of biological data on harbour porpoise.

***To Iceland:***

- An assessment of harbour porpoise be made when the new abundance estimate becomes available after the aerial survey planned in 2023.
- Generate the best back-calculated by-catch estimates (i.e., a time series going back to the beginning of the fishery) for the upcoming Icelandic assessment.

## 7. DATA NEEDED FOR CONDUCTING AN ASSESSMENT OF LAGENORHYNCHUS SP

### 7.1 REVIEW OF AVAILABLE DATA IN THE NAMMCO COUNTRIES AND ADJACENT AREAS

#### 7.1.1 Stock identity

***Greenland***

Hansen informed the WG that no information was available from Greenland on stock identity and that there was no programme for collecting biological samples. However, Hansen also informed that Greenland had performed genetic analyses on biopsy samples collected from 14 white-sided dolphins (*Lagenorhynchus acutus*), so some genetic information for this species was currently available from

Greenland. There are currently no satellite studies being conducted in Greenland but, due to an ongoing collaborative project between Faroe Islands and Greenland tracking white-sided and white-beaked (*Lagenorhyncus albirostris*) dolphins, there are intentions to join efforts on monitoring and collecting data between both countries. The group **recommended** that Faroe Islands, together with Greenland, collect data for genetic analyses and make sure they are integrated within the current European genetic analyses for *Lagenorhynchus sp.* coordinated by ASCOBANS (See SC/29/HPWG/FI25).

***Faroe Islands***

Mikkelsen informed the WG that, in the case of white-sided dolphins, genetic analyses were conducted on 25 samples from Faroes in a joint study and results presented at the ASCOBANS 26th advisory committee meeting in 2021 (SC/29/HPWG/FI25). Results showed no genetic structuring but, to improve stock delineation for management, the Faroes are also conducting tracking studies. Results from tracked individuals indicate that pods do not correspond to family units, as individuals from the same pod did not remain together and, unlike pilot whales, such groups did not show stability. This correlated well with the genetic results. The project plans to tag also *Lagenorhynchus* dolphins in East Greenland and more data and knowledge of movements are expected to be available by the end of the study in 2025.

### 7.1.2 Biological parameters

***Greenland***

Hansen informed the WG that Greenland had biopsy data from 14 white-sided dolphins and 2 white-beaked dolphins that had been aged using teeth, but such sample sizes were considered too low to provide reliable information on biological parameters.

***Faroe Islands***

Mikkelsen presented age-structure data of white-sided dolphins from 10 drive hunts occurring in different years. Taken together, some cohorts, i.e. ages 4-8, seemed underrepresented in the data. The group **recommended** to look at the age structure over different years to potentially resolve this issue. For the purpose of future assessements, the group **recommended** age determination from random teeth samples from different periods of time should be added to the age structure information and that the analyses of life history parameters be completed. Mikkelsen informed the WG that 123 samples could still be added to increase the available information on age structure and life history.

***Iceland***

Sigurdsson informed the WG that the analysis of samples from stranded individuals had provided some information on diet (via isotopic analysis) and biological parameters of *Lagenorhynchus* dolphins in Iceland.

### 7.1.3 Abundance estimation

There are separate abundance estimates for white-sided and white-beaked dolphins from NASS 2007 and 2015 for Greenland, Iceland and Faroe Islands. Abundance estimates of both *Lagenorhynchus* species in the NAMMCO countries can hopefully be updated after the completion of the NASS surveys in 2024.

### 7.1.4 Removals (catch and by-catch)

***Greenland***

Greenland has a time series of catch statistics starting in 1993, but the two *Lagenorhynchus* species have not been discriminated in the catch data until 2022. Therefore, separate catch statistics will be available for future assessments, but only from 2022 onwards. Catch statistics are provided per municipality but there are no management regions for dolphin species in Greenland.

***Faroe Islands***

Catches of white-sided dolphin in the Faroes have increased since 1992, including also an exceptional hunt of more than 1400 individuals in 2021.

***Norway***

Bjørge indicated that *Lagenorhynchus* dolphins had been observed close to the coasts in the Finmark area in Norway, and there were concerns that, as the by-catch of harbour propoises is high in the Varanger fjord area, by-catch could also be a threat to *Lagenorhynchus* dolphins. The WG **recommended** that the NAMMCO BYCWG should extend its focus beyond coastal seals and harbour porpoises to also include *Lagenorhynchus* dolphin species.

***Iceland***

Sigurdsson informed the WG of a limited by-catch of *Lagenorhynchus* dolphins in Iceland, ranging between 10 and 50 animals annually, noting that white-beaked dolphins were more commonly by-caught than white-sided dolphins. The group **recommended** Iceland to provide a table with the by-catch information available for each species.

#### 7.1.5 Impacts from other anthropogenic stressors

No information was provided under this item.

### 7.2 RECOMMENDATIONS OF THE WORKING GROUP BEFORE FUTURE ASSESSMENTS

The group made the following **recommendations** for the upcoming 2023 assessment on *Lagenorhynchus sp.*

***To Faroe Islands:***

- Age determination from random teeth samples from different periods of time should be added to the age structure information on *Lagenorhynchus acutus.*
- Investigate any changes in age structure over different years to resolve whether some cohorts are underrepresented in the samples.
- Complete the analyses of life history parameters
- Together with Greenland, collect data for genetic analyses and make sure they are integrated within the current European genetic analyses for *Lagenorhynchus sp.* coordinated by ASCOBANS.

***To Greenland:***

- Increase effort in collecting samples for genetic analysis.
- Prepare catch statistics separating both species, where possible.

***To Iceland:***

- Provide a table with the by-catch information available for each *Lagenorhynchus* species.

***General:***

- The By-Catch Working Group should expand its focus to *Lagenorhynchus* dolphins

## 8. DATA NEEDED FOR CONDUCTING AN ASSESSMENT ON PILOT WHALES

### 8.1 REVIEW OF AVAILABLE DATA IN THE NAMMCO COUNTRIES AND ADJACENT AREAS

### 8.1.1 Stock identity

***Greenland***

Hansen informed the WG that biopsies analysed 22 years ago indicated that long-finned pilot whales (*Globicephala melas*) in West Greenland were similar to those in Canada. However, there are no samples from East Greenland that could be used to investigate genetic similarities between pilot whales from Iceland and Faroes. It was noted that a more recent study had found strong regional levels of divergence for the species in the North Atlantic, but Greenland data were not included there.

***Faroe Islands***

Mikkelsen noted that, contrary to white-sided dolphins, there had been not much interest in analysing genetics of long-finned pilot whales. There are, however, tracking data on 47 tagged animals from 10 pods providing information on seasonal distribution over the North Atlantic. Based on this study, the distribution does not seem to extend further into the Norwegian Sea, but nevertheless westward into the Irminger Sea. To get better knowledge on stock identity, the group **recommended** that the Faroes collect and analyse genetic samples together with Greenland and Iceland.

### 8.1.2 Biological parameters

***Greenland***

Hansen informed the WG that teeth from 18 individual pilot whales, belonging to the biopsy sample, were available for age determination in Greenland.

***Faroe islands***

Mikkelsen noted that large numbers of pilot whale teeth had been collected in the Faroes, potentially for detailed yearly age structure and year-class strength determination, with more than 2000 teeth available to be analysed for aging. Given the high number of available data (2000+), the group **recommended** that age from 150+ teeth samples collected randomly at the end and at the beginning of the 2013-2022 period should be determined, together with reproductive data, to investigate life history parameters.

***Iceland***

Sigurdsson informed the WG that the analysis of samples from stranded individuals had provided some information on diet (via isotopic analysis) and biological parameters of pilot whales in Iceland.

### 8.1.3 Abundance estimation

***Greenland***

Hansen indicated that abundance estimates of pilot whale from Greenland were available for 2007 and 2015 NASS surveys and could potentially be compared with catch statistics dating back to 1993. However, the available abundance estimates from Greenland are underestimates, as surveys cover only a small part of the distribution area of pilot whales, which are found predominantly offshore outside of the surveyed area.

***Iceland / Faroe Islands***

Sigurdsson indicated that the most recent abundance estimates of pilot whale from Iceland had been provided by the last NASS survey in 2015, and that new abundance estimates would be produced after the upcoming NASS 2024 survey.

### 8.1.4 Removals (catch and by-catch)

***Greenland***

Hansen reported that catches had generally increased in Greenland over the last decade and that no estimates of struck and lost were available from Greenland.

***Faroe Islands***

Mikkelsen presented the complete pilot whale catch time series of the Faroe Islands, showing temporal fluctuations in harvest that seem correlated with prey availability and oceanographic variability factors. The complete time series of catch data is available.

***Norway / Iceland***

The long-finned pilot whale is a protected species in both Norway and Iceland, and by-catch is uncommonly reported.

#### 8.1.5 Impacts from other anthropogenic stressors

***Faroe Islands***

Mikkelsen informed the WG that Faroese food authorities recommend a reduced intake of pilot whale meat and blubber in the Faroe Islands due to a high level of mercury (Hg) in pilot whale meat and PCBs in blubber. The group r**ecommended** to investigate potential relationship between pollutant burdens and changes in life history parameters of pilot whales, by comparing the first sampling period (1986-1989) with the present one (2013-2022).

### 8.2 RECOMMENDATIONS OF THE WORKING GROUP BEFORE FUTURE ASSESSMENTS

The group made the following **recommendations** for the upcoming assessment on pilot whale (tentatively planned for 2024).

***To Faroe Islands:***

- Given the high number of available data (2000+), 150+ teeth samples collected randomly at the end and at the beginning of the 2013-2022 period should be aged and the corresponding reproductive data analysed to obtain a long term trend in life history parameters.
- To collect and analyse genetic samples together with IS and GL, to get better knowledge on stock identity.
- To investigate the potential relationship between pollutants and life history parameters of pilot whales between the first sampling period (1986-1989) and the present one (2013-2022).

## 9. OTHER BUSINESS

There was no other business

## 10. ACCEPTANCE OF REPORT

The report was provisionally adopted by the WG at the conclusion of the meeting on November 10th 2022. Following formatting and editorial revisions, the final report was adopted by correspondence on November 24th 2022.

## 11. CLOSING REMARKS

The Chair acknowledged the finalization of an assessment for Norway as a significant outcome of the WG meeting, although an updated assessment is needed in the near future, and thanked both the participants for their work and Chacon for his effective rapporteuring. The participants also thanked Mikkelsen for his orderly and able chairing. The meeting was closed at 15:45 on November 10th 2022.

## 12. REFERENCES

Bravington, M. V., and K. D. Bisack. 1996. Estimates of harbor porpoise bycatch in the Gulf of Maine sink gillnetfishery, 1990–1993. Reports of the International WhalingCommission 46:567–574.

Scheidat, M., Couperus, B., Siemensma, M., 2018. Electronic monitoring of incidental bycatch of harbour porpoise (*Phocoena phocoena*) in the Dutch bottom set gillnet fishery (September 2013 to March 2017). Wageningen University & Research report C102/18.

Tregenza, N.J.C., Berrow, S.D., Hammond, P.S., Leaper, R., 1997. Harbour porpoise (*Phocoena phocoena* L.) by-catch in set gillnets in the Celtic Sea. ICES Journal of Marine Science 54, 896-904.

## APPENDIX 1: LIST OF PARTICIPANTS

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## APPENDIX 2: AGENDA

1. **Chairman welcome and opening remarks**
2. **Adoption of agenda**
3. **Appointment of rapporteurs**
4. **Review of available documents and reports**
   - 4.1. Harbour Porpoise Working Group 2019
   - 4.2. Harbour Porpoise Workshop 2018
   - 4.3. Harbour porpoise Working Group 2013
   - 4.4. Summary of previous recommendations
   - 4.5. Others
5. **Harbour porpoise assessment for Norway**
   - 5.1. Stock identity
   - 5.2. Biological parameters
   - 5.3. Abundance estimation
   - 5.4. By-catch
   - 5.5. Impacts from other anthropogenic stressors
   - 5.6. Population modelling & assessment
   - 5.7. Recommendations
     - 5.7.1. Recommendations for Research
     - 5.7.2. Recommendations for conservation & management
6. **Updated information on Harbour porpoise from other NAMMCO areas**
   - 6.1. Review of new available data and findings from Iceland, Greenland, and the Faroe Islands
   - 6.2. Data gaps to be filled before future assessments
7. **Data needed for conducting an assessment on** *Lagenorhynchus sp*
   - 7.1. Review of available data in the NAMMCO countries and adjacent areas
     - 7.1.1. Stock identity
     - 7.1.2. Biological parameters
     - 7.1.3. Abundance estimation
     - 7.1.4. Removals (catch and by-catch)
     - 7.1.5. Impacts from other anthropogenic stressors

7.2. Data gaps to be filled before an assessment (with prioritization)

- 

**8. Data needed for conducting an assessment on Pilot whales**

8.1. Review of available data in the NAMMCO countries and adjacent areas

8.1.1. Stock identity

8.1.2. Biological parameters

8.1.3. Abundance estimation

8.1.4. Removals (catch and by-catch)

8.1.5. Impacts from other anthropogenic stressors

8.2. Data gaps to be filled before an assessment (with prioritization)

**9. Other business**

**10. Acceptance of report**

**11. Closing remarks**

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For information:

***Terms of Reference of the HPWG 2022 Group established by SC 28:***

*a) Conduct an assessment of the sustainability of the removals of harbour porpoise in Norway*
*b) Identify knowledge gaps and needs for further research*
*c) Assess impacts from non-hunting related anthropogenic stresses (pollution, climate change, noise etc)*

*Additionally, the SC decided that this WG should:*

*d) Review the information available on the genus Lagenorhynchus in the NAMMCO area and advise on how progressing towards and preparing of an assessment of the species in 2023.*
*e) Review the information available on pilot whales in the NAMMCO area and advise on how progressing towards and preparing of an assessment of the species in 2023.*

## APPENDIX 3: LIST OF DOCUMENTS

### WORKING DOCUMENTS

| Doc. No. | Title | Agenda item |
|---|---|---|
| SC/29/HPWG/01 | Draft Agenda | 2 |
| SC/29/HPWG/02 | Draft List of Participants | 3 |
| SC/29/HPWG/03 | Draft List of Documents | 4 |
| SC/29/HPWG/04 | Catch data of Harbour porpoise, Pilot whales and Lagenorhynchus dolphins in the Faroe Islands. Mikkelsen B., 2022. | 6.1, 7.1.4 & 8.1.4 |
| SC/29/HPWG/05 | Population Viability Analysis of harbour porpoise in Norwegian Waters (Preliminary results). Biuw M., Lindstrøm U., Frie A. K., Øien N., & Bjørge A., 2022. | 5.6 |
| SC/29/HPWG/06 | Growth and reproductive rates of Norwegian harbour porpoises 2016-2017. Frie, A. K., Cervin, L.,Lindström, U. 2022 | 5.2 |
| SC/29/HPWG/07 | Assessment of Norwegian harbour porpoise. Witting, L. 2022 | 5.6 |

### FOR INFORMATION DOCUMENTS

| Doc. No. | Title | Agenda item |
|---|---|---|
| SC/29/HPWG/FI01 | Report of HPWG Meeting (2019) | 4.1 |
| SC/29/HPWG/FI02 | Report of the Joint IMR/NAMMCO International Workshop on the Status of Harbour Porpoises in the North Atlantic (2018) | 4.2 |
| SC/29/HPWG/FI03 | Report of HPWG Meeting (2013) | 4.3 |
| SC/29/HPWG/FI04 | Report of the 28th Scientific Committee Meeting (2022) | 4-8 |
| SC/29/HPWG/FI05 | Ben Chehida et al. (2021). No leading-edge effect in North Atlantic harbor porpoises: Evolutionary and conservation implications. Evolutionary Applications, 14(6), 1588–1611. | 5.1, 6.1 |
| SC/29/HPWG/FI06 | Morin et al. (2021). Population structure in a continuously distributed coastal marine species, the harbor porpoise, based on microhaplotypes derived from poor-quality samples. Molecular Ecology, 30(6), 1457–1476. | 5.1, 6.1 |
| SC/29/HPWG/FI07 | Murphy et al. (2020). Spatio-Temporal Variability of Harbor Porpoise Life History Parameters in the North-East Atlantic. Frontiers in Marine Science, 7, 502352. | 5.2, 6.1 |

| | | |
|---|---|---|
| SC/29/HPWG/FI08 | Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys (June 2021). | 5.3, 7.1, 8.1 |
| SC/29/HPWG/FI09 | Modelled density surfaces of cetaceans in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys | 5.3, 7.1, 8.1 |
| SC/29/HPWG/FI10 | Report of BYCWG Meeting (2021) | 5.4 |
| SC/29/HPWG/FI11 | Report of BYCWG Meeting (2022) | 5.4 |
| SC/29/HPWG/FI12 | Rogan et al. (2017). Distribution, abundance and habitat use of deep diving cetaceans in the North-East Atlantic. Deep–Sea Research Part II 141, 8–19 | 8.1 |
| SC/29/HPWG/FI13 | Supporting Information, Rogan et al. (2017). | 8.1 |
| SC/29/HPWG/FI14 | Moan, A. et al. (2020). Assessing the impact of fisheries-related mortality of harbour porpoise (*Phocoena phocoena*) caused by incidental bycatch in the dynamic Norwegian gillnet fisheries. ICES Journal of Marine Science, 77(7–8), 3039–3049. | 5.4 |
| SC/29/HPWG/FI15 | Banguera-Hinestroza, E., et al. (2014). Phylogeography and population dynamics of the white-sided dolphin (*Lagenorhynchus acutus*) in the North Atlantic. Conservation Genetics, 15(4), 789–802. | 7.1 |
| SC/29/HPWG/FI16 | Bloch, D., & Mikkelsen, B. (2017). Catch history and distribution of white- sided dolphin (*Lagenorhynchus acutus*) of the Faroe Islands / Veiðisøga og útbreiðsla av skjórutum springara (*Lagenorhynchus acutus*) í Føroyum. Fróðskaparrit - Faroese Scientific Journal, 190–198. | 7.1 |
| SC/29/HPWG/FI17 | Calderan, S. (2021). Atlantic white-sided dolphins in the northeast Atlantic: population status and structure (Report for OceanCare). | 7.1 |
| SC/29/HPWG/FI18 | Fernández, R., et al. (2016). A genomewide catalogue of single nucleotide polymorphisms in white-beaked and Atlantic white-sided dolphins. Molecular Ecology Resources, 16(1), 266–276. | 7.1 |
| SC/29/HPWG/FI19 | Pike, D., et al. (2019a). Estimates of the relative abundance of long-finned pilot whales (*Globicephala melas*) in the Northeast Atlantic from 1987 to 2015 indicate no long-term trends. NAMMCO Scientific Publications, 11. | 8.1.3 |
| SC/29/HPWG/FI20 | Pike, D., et al. (2019b). Estimates of the abundance of cetaceans in the central North Atlantic based on the NASS Icelandic and Faroese shipboard surveys conducted in 2015. NAMMCO Scientific Publications, 11. | 5.3, 7.1.3, 8.1.3 |
| SC/29/HPWG/FI21 | ASCOBANS 27TH Advisory Committee Meeting: Action points and recommendations. | 5, 6, 7 & 8 |

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| SC/29/HPWG/FI22 | Authier, M., et al. (2021). Estimating Cetacean Bycatch From Non-representative Samples (I): A Simulation Study With Regularized Multilevel Regression and Post-stratification. Frontiers in Marine Science, 8, 719956. | 5.4 |
| SC/29/HPWG/FI23 | Genu, M., et al. (2021). Evaluating Strategies for Managing Anthropogenic Mortality on Marine Mammals: An R Implementation With the Package RLA. Frontiers in Marine Science, 8, 795953. | 5.4 |
| SC/29/HPWG/FI24 | R library associated to document SC/29/HPWG/FI23 | 5.4 |
| SC/29/HPWG/FI25 | Update on Lagenorhynchus – new findings and sample archive. Gose & Brownlow. 26th ASCOBANS Advisory Committee Meeting, November 2021. | 7 |
| SC/29/HPWG/FI26 | Leonard, D., & Øien, N. (2020). Estimated Abundances of Cetacean Species in the Northeast Atlantic from Two Multiyear Surveys Conducted by Norwegian Vessels between 2002–2013. NAMMCO Scientific Publications, 11. | 5.3 |
| SC/29/HPWG/FI27 | Leonard, D., & Øien, N. (2020). Estimated Abundances of Cetacean Species in the Northeast Atlantic from Norwegian Shipboard Surveys Conducted in 2014–2018. NAMMCO Scientific Publications, 11. | 5.3 |
| SC/29/HPWG/FI28 | Johanna Fall & Mette Skern-Mauritzen (2014) White-beaked dolphin distribution and association with prey in the Barents Sea, Marine Biology Research, 10:10, 957-971. | 7.1 |
| SC/29/HPWG/FI29 | Threshold value for Belt Sea harbour porpoise bycatch . Authors: Matthieu Authier, Julia Carlström, Mathieu Genu, Anita Gilles, Lotte Kindt-Larsen, Finn Larsen, David Lusseau, Kylie Owen, Martin Sköld, Signe Sveegaard (HELCOM Report, 2022) | 5.4 |
| SC/29/HPWG/FI30 | Rouby, E, Ridoux, V, Authier, M. Flexible parametric modeling of survival from age at death data: A mixed linear regression framework. Population Ecology. 2021; 63: 108– 122. | 5.2 & 5.6 |
| SC/29/HPWG/FI31 | Quintela, M., Besnier, F., Seliussen, B,. Glover, K.A. & Lindstrøm, U.(2020): Population structure of bycaught harbour porpoise (*Phocoenaphocoena*) in Norway, Marine Biology Research. | 5.1 |
| SC/29/HPWG/FI32 | Rian MB, Vike-Jonas K, Gonzalez SV, Ciesielski TM, Venkatraman V, Lindstrøm U, Jenssen BM, Asimakopoulos AG. Phthalate metabolites in harbor porpoises (*Phocoena phocoena*) from Norwegian coastal waters. Environ Int. 2020 Apr;137:105525. | 5.4 |
| SC/29/HPWG/FI33 | Dietz, R., Fort, J., Sonne, C., Albert, C., Bustnes, J.O., Christensen, T.K. ... Eulaers, I. (2021) A risk assessment of the effects of mercury on Baltic Sea, Greater North Sea and North Atlantic wildlife, fish and bivalves. Environment International, 146, 106178. | 5.4 |

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| SC/29/HPWG/FI34 | R. Dietz, R.J. Letcher, J. Aars, M. Andersen, A. Boltunov, E.W. Born, T.M. Ciesielski, K. Das, S. Dastnai, A.E. Derocher, J.P. Desforges (2022) A risk assessment review of mercury exposure in Arctic marine and terrestrial mammals<br>Sci. Total Environ., 829, Article 154445 | 5.4, 7.1.5 & 8.1.5 |
| SC/29/HPWG/FI35 | Kindt-Larsen, L., Dalskov, J., Stage, B., Larsen, F. (2012). Observing incidental harbour porpoise *Phocoena phocoena* bycatch by remote electronic monitoring. Endangered Species Research. Vol. 19: 75–83 | 5.4 |
| SC/29/HPWG/FI36 | IJsseldijk, L. L.,et al. (2021). Nutritional status and prey energy density govern reproductive success in a small cetacean. Scientific Reports, 11(1), 19201. | 5.4 |