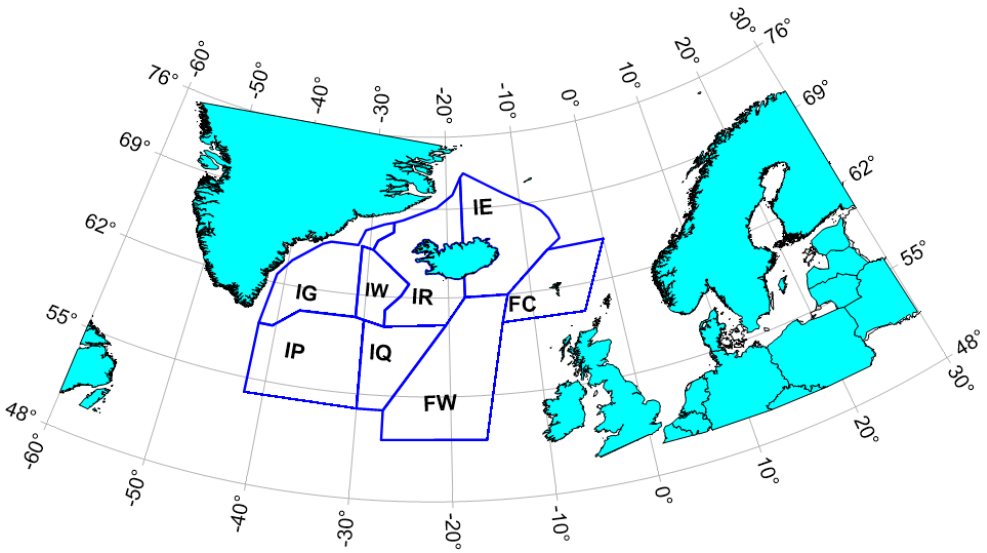
NASS 2024 SCIENTIFIC PLANNING COMMITTEE

2–3 November
Copenhagen, Denmark

REPORT



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MAIN REPORT

The NAMMCO Scientific Planning Committee (SpC) for NASS 2024 held its 8th meeting in Copenhagen, Denmark, on November 2–3. The meeting was chaired by Rikke Guldborg Hansen (Greenland). The draft agenda and list of participants are available in Appendix 1 and 2, respectively.

1. TO-DO LIST FOLLOW-UP

1.1. COMBINED TRANSECTS OF MACKEREL/REDFISH SURVEYS & DEDICATED VESSELS

Daniel Pike showed some preliminary stratification options for NASS 2024 (Figure 1), duplicating the 2015 survey area and incorporating the mackerel and redfish surveys for the Faroese and Icelandic blocks, with no additional dedicated effort in the areas covered by the fish surveys. It was noted that the Faroese mackerel survey may extend eastward towards Norway (beyond what is currently indicated). This survey, as well as the Icelandic redfish survey, do not allow much flexibility regarding effort, and will continue sailing during fog, bad weather, and darkness, so the appropriateness of using the mackerel survey in the Faroese area needs to be considered (see also items 2.3.3 and 3.3). The Icelandic mackerel survey allows slightly more flexibility, as they have added an extra week of survey effort, and will be used as a cetacean survey platform. Once the stratification boundaries and available dedicated and opportunistic effort have been fully decided, the final transects will be drawn.

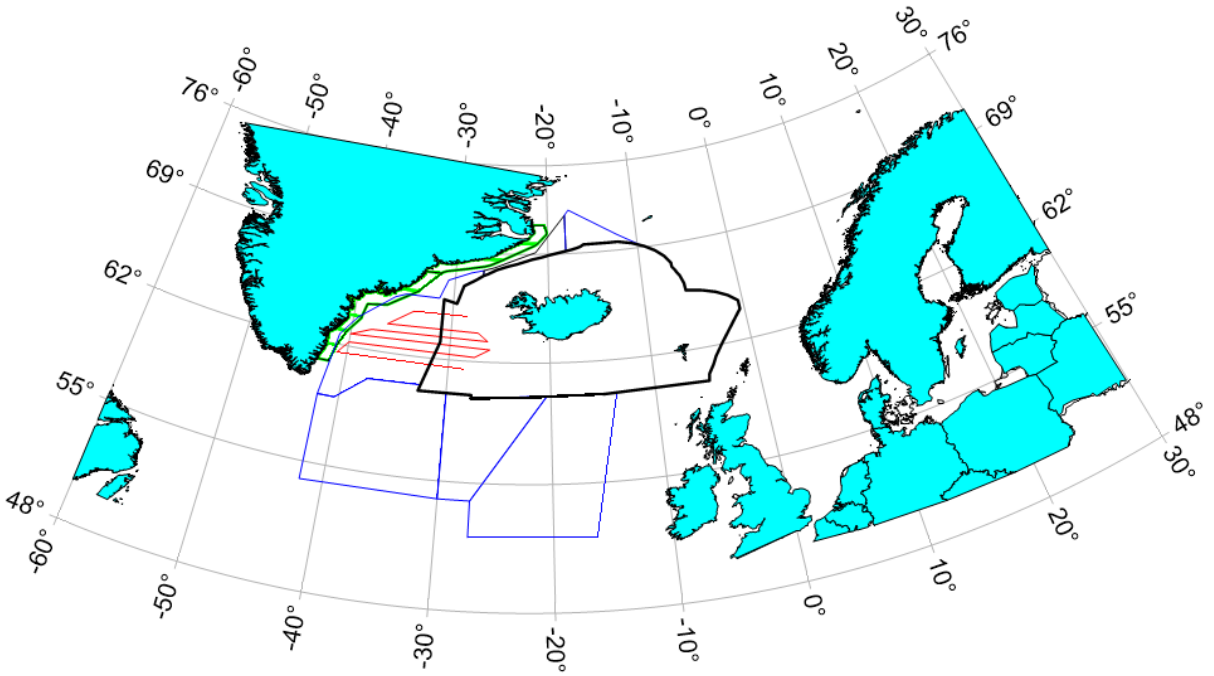

Figure 1. Combined Faroese and Icelandic mackerel strata (black), planned redfish effort (red), NASS 2015 strata excluding areas within the mackerel strata (blue), and planned East Greenland strata (green).

2. SURVEY STRATA & TRANSECT DESIGN

2.1. TARGET SPECIES DISTRIBUTION

The target species for each country are pilot whales for the Faroe Islands; minke whales, fin whales, and humpback whales for Greenland; minke whales and fin whales for Iceland; minke whales for Norway.

Based on the sightings distribution of target species in previous surveys, the group concurred that the

southern survey blocks can be truncated without losing a significant proportion of sightings (i.e., historically, those blocks have provided few sightings of minke, fin, humpback, and pilot whales, relative to their surface area). With the exception of fin whales, which have been sighted near the southern block boundaries, the abundance estimates for the target species are unlikely to be affected. The loss of fin whale observations from block IP will not be significant, although it may be more so in blocks IQ and FW. However, reducing the amount of sailing time required to cover those further offshore transects would allow more effort to be concentrated in high density areas for fin whales and areas that have been covered by all previous NASS. Indeed, for pilot whales, NASS have never covered their entire known range, but trends in their abundance have been calculated based on the repeated coverage of that core NASS area. A southern truncation will not affect this approach. Therefore, the group **agreed** to redraw the southern boundary of block FW at 53°N, and of blocks IP and IQ at 57°N (Figure 2).

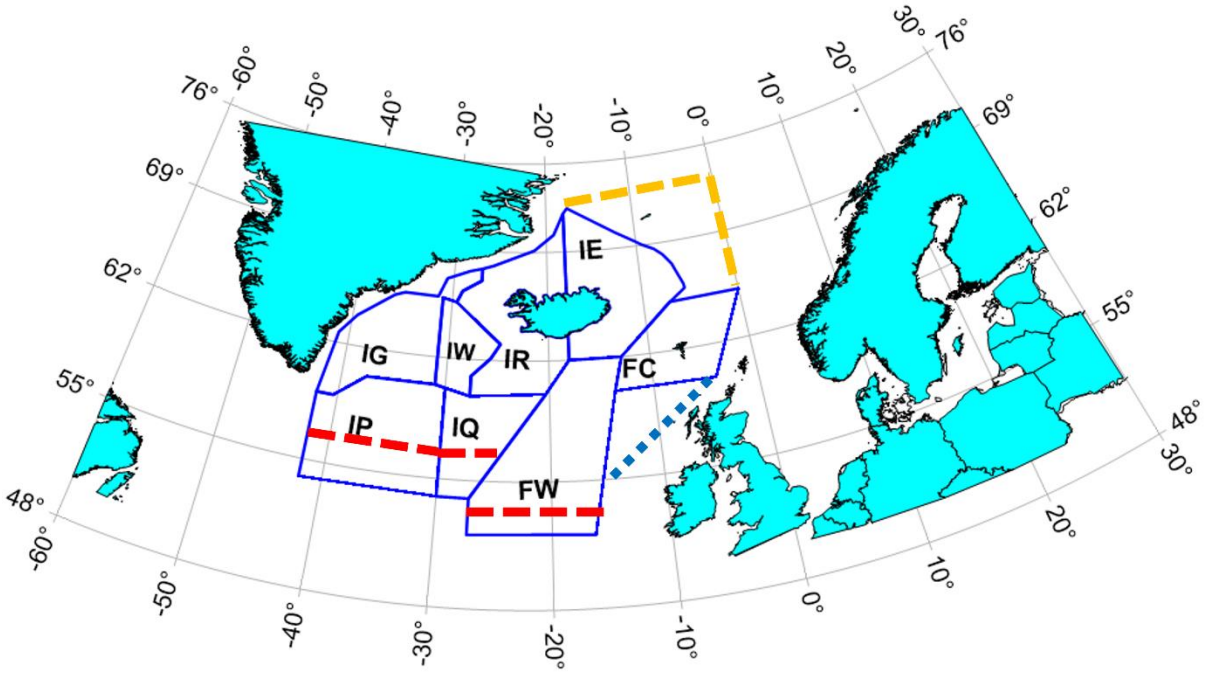

Figure 2. Proposed modifications to previous strata: truncation of southern blocks (red dashes), increased effort of core pilot whale areas (blue dotted line), and potential coverage of Jan Mayen (yellow dashes).

When designing transect density, it is possible to consider the expected contribution of each survey block to the final abundance estimates for target species. Allocating more effort to blocks where more sightings are expected, based on previous surveys, would reduce the variance of the resulting estimates. However, this is difficult or even impossible to optimise for a multi-species survey.

2.2. STRATA AND COVERAGE FOR SHIPBOARD SURVEYS FO, IS, NO

Pike flagged that in 2015 the Greenlandic survey boundaries did not align perfectly with the Icelandic survey blocks (Figure 1). Hansen explained that the biggest gaps, from Tasiilaq and above, are due to their distance from the nearest airports, as well as time constraints. Also, the aerial survey of East Greenland will be conducted in August, rather than in July when NASS have been conducted in the past. Inclement weather in July in East Greenland prevents the execution of aerial surveys then. This may be problematic, as whales may occupy the area as the ice retreats earlier than previous years, raising the possibility of double counting by the ship and aerial surveys. The aerial survey of West Greenland, which is conducted in August and September, requires at least five weeks, thus limiting the available effort to cover East Greenland. Persistent ice cover and bad weather are further issues, but Greenland is hoping to charter two planes to maximise coverage during good weather windows.

The group discussed ways to extend the ship-based surveys westwards to 1) fill in the gaps between aerial and ship-based surveys, ensuring synoptic coverage, and 2) eliminate the possible double counting due to migrating whales between July (ship based strata) and August (aerial survey strata) in East Greenland. One possibility would be to extend the ship blocks westwards, ideally to the Greenlandic coast or the ice edge, using either the Icelandic dedicated vessel (available for three weeks in July) or by redirecting effort from the Jan Mayen area, as discussed under item 2.2.2 (Norwegian funds, but not necessarily Norwegian vessel). If this is not feasible, the Greenlandic aerial survey should ideally be conducted as early as possible and the western Icelandic ship-based coverage as late as possible in their respective seasons, to minimise the risk of cetaceans moving into the East Greenland area over the course of the surveys and hence the possibility of double counting. To that end, the group agreed to consider the allocation of funds towards extending the availability of the aerial survey crew in East Greenland, as well as the ship-based survey crew on the Icelandic vessel.

2.2.1. SCANS-IV ADDITION

The Joint Nature Conservation Committee (JNCC, UK) will confirm by end of year if funding is available to survey the offshore block 8 west of Scotland in summer 2024, which was unable to be covered as part of the SCANS-IV survey in 2022. If this survey does not take place, the group **recommended** that the Faroese survey should extend into UK waters, in order to cover a known high-density area for pilot whales (Figure 2). It would also ensure that the survey covers the core area surveyed by most previous NASS.

UPDATE: JNCC are confident the funding will be available, but this will not be 100% confirmed until February 2024. Preparatory work will start on the assumption that the survey will be funded. Hammond will keep the SpC informed of developments and liaise with Mikkelsen regarding timing and to ensure a contiguous boundary between SCANS-IV block 8 and NASS blocks FC and FW.

2.2.2. JAN MAYEN

The coverage of the waters around Jan Mayen in 2015 did not result in many fin whale sightings. The group questioned the benefit of surveying this area in NASS 2024, considering that the Norwegian mosaic survey (NILS) covered it in 2021. There is a trade-off between the need to conduct a synoptic survey throughout the NAMMCO region—which might reveal any changes in cetacean distribution in recent years—and the ability to allocate more survey effort to other areas, which might have higher densities of whales. It was argued that NILS should also detect distribution shifts, and Nils Øien opined that the benefit of allocating 5 million NOK worth of survey effort elsewhere outweighs the cost of the surveys not being synoptic.

On the other hand, Jan Mayen is an area of interest for minke whales. However, the proposed survey block (Figure 2) would require considerable sailing time, both on and off effort (at least 20 days). The Norwegian research vessel will not be available to survey that in addition to the 7 weeks it has already been chartered for, and mackerel survey vessels are a suboptimal platform, as they spend little time near Jan Mayen, allow no flexibility around bad weather conditions, and can only take four observers on board. Ecosystem surveys also operate under such conditions that it would be impossible to calculate robust abundance estimates therefrom.

The primary considerations before deciding whether and how to survey Jan Mayen during NASS 2024 are as follows:

- Whether or not the voluntary contribution of Norway allocated to cover the area, can be reallocated to other purposes.
- The feasibility of using the Icelandic and Faroese mackerel and redfish survey platforms to a high standard, thus freeing up dedicated resources for Jan Mayen and other regions.

- The robustness of including the 2021 survey results for Jan Mayen in total abundance estimates for 2024; this procedure has already been accepted for dedicated surveys of cetaceans in Norway.
- The pressing interest in covering core NASS areas, and thus the need to ensure that those regions are sufficiently covered.
- The fact that the minke whale surveys follow the six-year mosaic cycle, and Jan Mayen was adequately covered in 2021.

The group **recommended** two options regarding Jan Mayen coverage, namely: a) agree not to survey the area because it is adequately covered by mosaic surveys or b) conduct minimal coverage around the island and then allocate remaining resources towards East Greenland, in order to cover the gaps between the Greenlandic aerial survey strata and blocks IW and IR.

2.2.3. USE OF THE FAROESE MACKEREL SURVEY

It is not certain at this point whether the Faroese mackerel survey is a suitable platform for NASS. The vessel can only accommodate up to four observers, precluding shift changes. During extended periods with good conditions, resting periods will be required by the observers, which will reduce the amount of effort that would be realized with two shifts of observers. However, the total planned effort by the mackerel survey vessel in block FC is about double that realized by the dedicated vessel in the same block in 2015, which makes it likely that an adequate level of effort could be achieved.

The group agreed that using the mackerel survey platform would free up the dedicated Faroese vessel to survey southward (block FW) and, if required, southeast (block 8 of SCANS-IV), perhaps even with a higher transect density than in previous NASS. This would increase the coverage of core pilot whale habitat and ensure that the core NASS survey area was covered. It was therefore recommended that the Faroe Islands should pursue co-platforming with the mackerel survey in the FC stratum, if it is logistically and technically feasible.

3. SHIPBOARD SURVEY PROTOCOLS FOR THE FAROE ISLANDS AND ICELAND

The chosen methodology for the Faroese and Icelandic shipboard surveys is Independent Observer (IO). The overall setup will be the same as in NASS 2015. Protocols should be identical, as the data will be analysed together.

3.1. CHOICE OF METHODS FOR RECORDING ANGLE & DISTANCE

Bjarni Mikkelsen has obtained protocols from SCANS and SAMMOA regarding distance and angle recording. While the SAMMOA protocol is designed for aerial surveys, it is very complete and could potentially be adapted for ship-based surveys. The observers on Norwegian mosaic surveys search and estimate distance to sightings with naked eye (following distance training with buoys), although the group agreed that measuring sticks are much more consistent between users. Binocular reticles are more accurate and were used extensively in NASS 2015, although some group members argued that their use is more time-consuming and thus results in more missed sightings. It was noted that reticles are the most commonly used tool, and that the loss of information on more distant sightings is made up for by the accuracy of closer sightings, which are overall more important for estimating detection probability, including g(0).

SCANS attempted to combine video recording with Big-Eye binoculars, but the setup is complicated and has been prone to failure. The use of a drone was also suggested, namely, to fly it during a subset of sightings and use the camera height and angle to calculate the animals' distance from the vessel. This could then potentially be used to calibrate all distance estimates.

Mikkelsen would ideally like to incorporate digital angle recorders instead of manual ones for recording lateral angles, not so much for the increased precision level—it was agreed that precision finer than 1 degree is unnecessary—but in order to save time during the recording of each observation. However, if the digital setup is time-consuming to develop, manual angle boards will be used.

3.2. DATA RECORDING (WEATHER, EFFORT, SIGHTINGS)

The Faroese and Icelandic protocols do not include a dedicated recorder, i.e., the observers have to input their sighting information on their own. For maximum efficiency, it would be best either to use a time-stamped audio recording (reduces the need to look down while writing/typing) or a touchpad with pre-defined data categories, where the first touch of the screen records the time of the sighting. Hansen recommended using both systems, as a failsafe. Both countries' protocols include four observers per shift in IO configuration, with 8 observers on board the Icelandic dedicated and non-dedicated vessels and the Faroese dedicated vessel, allowing continuous effort with rotating shifts.

3.3. SAILING PROTOCOLS

For the non-dedicated vessels, the surveys do not stop during bad weather or nighttime. Observers, however, will not be required to remain on-effort at Beaufort sea states >5. Dedicated vessel surveys differ slightly in this respect. SCANS remain on-effort in Beaufort ≤4, going up to 5 if conditions are "patchy" and including Beaufort as a candidate covariate in detection function estimation. Norwegian mosaic surveys also remain on-effort in sea state ≤4, and have found that surveying in rougher conditions is unsuitable for minke whales. NASS have never used data collected above Beaufort 5. It was agreed that observers will only stay on-effort in Beaufort <6, but it remains to be decided whether the dedicated vessels will keep steaming or not in higher sea states; this may depend on the progress of the survey and be decided at sea.

3.4. PROTOCOL FOR NON-TARGET SPECIES

It was recommended by the Working Group on Dolphins that more effort should be made by NASS to record *Lagenorhynchus* dolphin sightings in a robust and consistent manner. It is not logistically advisable to reduce on-effort sailing time to Beaufort ≤4, given the time constraints and the visibility of the target species in higher sea states. As is standard practice, only observations made in Beaufort ≤4 will be included when calculating abundance estimates for smaller/cryptic species.

Questions then arose on the matter of species identification and duplicate sightings. Using *Lagenorhynchus* as a pertinent example, one extreme would be to only include species-level identifications in the analysis and discard "unidentified dolphin" and "*Lagenorhynchus* sp." categories. Previous data entry protocols allow species-level identification with associated uncertainty, allowing less certain identifications to be included in sensitivity analyses. Generic identifications, if allowed, can be allocated *post hoc* to the most likely species, based on the species proportions observed in that area.

Given that IO protocols do not include a person to identify duplicate sightings in the field, duplicates must be identified *post hoc* based on the data. It was recommended that this be done algorithmically based on confluence in space and time, as has been done in Norwegian, American, and other surveys.

3.5. OBSERVER TRAINING BEFORE AND DURING SURVEY

The group considered observer training to be of paramount importance. A full day, minimum, is required prior to the survey start, to go over protocols and equipment as a group, and to ensure that everyone understands the protocol in the same way. Following that, more time should be devoted to training in the field, prior to going on-effort. This training should include practice sightings of targets, such as ships or buoys, at a known distance from the survey vessel. The group emphasized that this would be a training measure, not a way to calibrate field distance measurements. The Icelandic survey

plans to pair experienced observers with inexperienced ones. Hammond suggested using video footage as training material prior to the survey, giving naïve observers an insight into what to expect and how to measure group size. The latter, in particular, has to be clearly defined in the protocol, i.e., the precise definition of a "group", and whether to record min-max-best or just best estimated group size. It was also emphasized that observers should not try to correct their estimates for whales that were underwater and not visible.

3.6. DRONE PROTOCOL FOR PILOT WHALE GROUP SIZE ESTIMATION

The group discussed ways to make use of a drone to improve the accuracy of group size estimation for pilot whales in the Faroese survey. In NASS 2015, several sightings were filmed with the drone, but never incorporated into the group size estimates.

Although it is challenging to track these dark-coloured animals underwater, thus complicating the estimation of group size even from the air, the tentative plan is to film some pilot whale groups during the survey. The NOK 500,000 allocated to improving pilot whale abundance estimation could allow the incorporation of a specifically designed drone experiment in the survey, with which to calibrate group size estimation by observers (as opposed to a few non-systematic flights). This would require considerably more drone effort than could be achieved with a few flights and might require a dedicated drone operator. However, the funds could also be used to increase survey effort of core pilot whale areas. The group **recommended** that an experimental protocol be developed, to determine if it is feasible and an effective allocation of the available funding.

Another method to obtain better group size estimates is closing-mode during surveys. However, this can only be attempted during dedicated vessel effort, and often leads to considerable loss of time, so it was deemed not appropriate for NASS 2024.

The possibility of filming pilot whale groups during Faroese drive hunts was also discussed. The benefit of this would be the ability to validate group size estimated from videos with the reported landings of each event. Moreover, as this footage would be collected before the survey start, it could be used to train observers. However, both benefits are potentially outweighed by the entirely different behaviour of the animals during drives vs during surveys. It was further noted that this species tends to aggregate in super-groups and, therefore, the group stressed the importance of a very clearly defined protocol for measuring group vs super-group size.

3.7. INCLUSION OF MINTAG DEPLOYMENTS

There is a fund of 1.5 million NOK that was initially allocated towards additional survey days that could be used to deploy MINTAGs. During discussions it became apparent that this is not necessarily the best use of funds. The benefit of using NASS vessels as tagging platforms is that the tags can be deployed offshore, which both diversifies the dataset (animals are usually tagged near land) and magnifies the analytical potential (e.g., ability to calibrate abundance estimates based on movement patterns and dive data of the same whales). The drawback is that these funds would only cover two or three days of tagging effort offshore, whereas the same amount could be used to charter smaller vessels for a week or more of nearshore tagging, depending on the country. Additionally, Iceland has the option to add three days of tagging effort to the capelin surveys in the autumn—logistically suitable, as the shooters are already on board that vessel—and/or hire a fishing vessel that has previously been used to tag humpback whales, at minimal cost (NOK 277,000 for two weeks).

The following scenarios were proposed (given the flexibility of reallocating funds as the SpC deems fit):

- For the Faroe Islands, Iceland, and Norwegian dedicated survey: bring tagging equipment and Zodiac on board the survey vessel. If easy opportunities arise during survey, decide *ad hoc* to

attempt tag deployment. (The tagging fund will be used to cover extra time, but no additional days will be planned for the dedicated vessels).
- For Iceland: calculate costs of extending the capelin survey vs chartering the coastal fishing vessel. (Will most likely choose the latter).
- For Norway: use the funds to tag animals close to shore in Lofoten and Finnmark during April/May 2024.

4. SHIPBOARD SURVEY PROTOCOLS FOR NORWAY

The shipboard survey protocols for the dedicated Norwegian mosaic survey targeting minke whales will be the same as in previous years. Øien noted that this will likely be the last such dedicated survey for the foreseeable future. Norway will have to find alternative methods to monitor the minke whale stock. Using fishery survey vessels might be an alternative, but this possibility needs to be investigated further.

5. AERIAL SURVEY PROTOCOLS

The Greenlandic aerial survey protocols will remain largely unchanged from previous years. One notable difference will be the collection of time-in-view data for all species, as opposed to just the target species.

Issues with availability bias remain, as suitable diving data are not available for many species. It was agreed that the circle-back method is not feasible in this case: it is difficult to achieve using a Twin Otter aircraft, which is not as manoeuvrable as a smaller aircraft, requires a large sample size and therefore a large amount of survey time, and does not work well for large group sizes or long-diving species. Tagging data for fin and minke whales, and for other species, will become available from the MINTAG project, which will allow the calculation of suitable corrections which can be applied to this, as well as past, surveys. As to correcting availability of groups with diving behaviour of single individuals, Hammond noted that the method of Laake et al. (1997) could be used to estimate availability of a single animal and that this could readily be extended to apply to groups of known size in which all animals were assumed to surface independently. There is little information on the synchronicity of surfacing in groups of cetaceans, but these calculations provide realistic bounds to availability. Such calculations have previously been made for fin whales and striped dolphins in the Mediterranean.

6. RECORDING ANTHROPOGENIC ACTIVITIES & OTHER DATA

The group discussed the usefulness of recording anthropogenic activities or collecting other *in situ* data along the transect lines, similarly to the efforts of SCANS surveys. The Greenlandic aerial surveys record noteworthy human-made objects, e.g., litter, but this information has never been used post survey. Collecting salinity, chlorophyll, or temperature data is also not necessary, as remote sensing provides fine-scale information that works well in habitat models. The mackerel and redfish survey vessels collect plankton and fish data, and these will be collated and made available by ICES. Finally, it was agreed that systematically recording the presence of other species besides marine mammals falls under the remit of an ecosystem survey, which is beyond the aims of NASS.

7. OUTREACH AND DISSEMINATION

The group discussed the outline of dissemination activities, following the requirements of the Norwegian funding. A preliminary suggestion is to provide live survey updates on a map, so that the

public can follow the progress of each NASS 2024 component. For example, the planned transects can be drawn prior to the survey start, and each cruise leader can provide daily/weekly updates on which transects were "filled in". Additionally, there could be a species sighting counter, tallying the number of observations as the surveys progress. The Icelandic mackerel surveys include a live blog that the crew updates, which could also be incorporated here. It was agreed that Naima El bani Altuna will prepare a schedule and template for updates, to be shared with the cruise leaders in advance of the survey start.

8. LOOSE ENDS FROM PREVIOUS MEETINGS

A point brought up in a previous planning meeting was the hiring of a graduate student to analyse regional abundance and distribution trends in NASS data. Hansen confirmed that she is supervising a PhD student (pending funding approval in December), who will examine such trends in baleen whale data from the 2007, 2015, and 2024 NASS and concurrent fish surveys. In addition to this, Nadya Ramirez-Martinez has investigated changes in habitat use between NASS 1987-89 and NASS 1998-2015 for the most commonly detected species.

9. OTHER ISSUES

9.1. TO-DO LIST

9.1.1. For/during next meeting

- Mikkelsen: determine details of Faroese mackerel survey timing and effort, as well as flexibility around survey conditions—this will decide whether block FC needs to be surveyed by a dedicated vessel or not.
- Mikkelsen, Øien & Sigurðsson: specify number of sailing days available per dedicated vessel.
- Hansen, Sigurðsson, Øien: Write up draft proposal of MINTAG funding allocation.
- All: Stratification decision
- Sigurðsson & Pike: draw transects for the dedicated vessels.
- Mikkelsen & Sigurðsson: Write up detailed protocol for species identification (e.g., uncertainty categories).
- Mikkelsen: follow up on data entry protocol (hardware, software).
- Mikkelsen: determine group size estimation method for pilot whales, design protocol to train observers.
- Mikkelsen: develop a protocol for drone deployment to determine group sizes for pilot whales and other species.

9.1.2. Prior to survey start

- El bani Altuna: send guidelines for outreach activities to cruise leaders.
- Write up guidelines for determining duplicate sightings, algorithmically if possible—this is necessary prior to the survey to ensure that all pertinent data are collected for each sighting.

9.2. NEXT MEETING

The group scheduled a hybrid meeting for 22 January 2024, during the first day of SC30. By that time, the information regarding opportunistic effort will have been finalised, and everything contingent on that can be decided accordingly. The final progress report can thus be presented to the Scientific Committee in the following days. The requirements from each country in order for the report to be complete are the finalised strata and transects (dedicated and opportunistic platforms), planned

survey dates, methodology and survey protocols, and the plans for observer training before and during the surveys.

9.3. PLANNING AHEAD FOR DATA ANALYSIS FOR TARGET AND NON-TARGET SPECIES

This item was not discussed.

REFERENCES

Laake, J. L., Calambokidis, J., Osmek, S. D., & Rugh, D. J. (1997). Probability of Detecting Harbor Porpoise from Aerial Surveys: Estimating g(0). *The Journal of Wildlife Management, 61*(1), 63–75. https://doi.org/10.2307/3802415

APPENDIX 1: DRAFT AGENDA

1. **To-do list follow-up**
   - **1.1.** Combined and proposed transects of mackerel/redfish surveys & dedicated vessels (Pike)
   - **1.2.** Choice of methods for recording angle & distance, ideally digitally (Mikkelsen)
2. **Survey strata & transect design**
   - **2.1.** Target species distribution
     - 2.1.1. Previous NASS data (Pike)
     - 2.1.2. SCANS III/IV, CODA, ObSERVE I/II data (Hammond)
   - **2.2.** Dates of available shipboard effort
     - 2.2.1. Mackerel & redfish surveys
     - 2.2.2. Dedicated vessels
   - **2.3.** Finalise strata and coverage for shipboard surveys FO, IS, NO (All participants)
     - 2.3.1. Mini-SCANS off Scotland
     - 2.3.2. Animal movement
     - 2.3.3. Jan Mayen minke whales
     - 2.3.4. Pilot whale areas
3. **Shipboard survey protocols (FO, IS)**
   - **3.1.** Software, hardware final selection
   - **3.2.** Distance and angle recording
   - **3.3.** Data recording (weather, effort, sightings)
   - **3.4.** Sailing protocols
   - **3.5.** Protocol for non-target species
   - **3.6.** Observer training before and during survey
   - **3.7.** Inclusion of MINTAG deployments
   - **3.8.** Drone protocol for pilot whale group size estimation (Mikkelsen)
4. **Shipboard survey protocols (NO)**
   - **4.1.** Dedicated minke whale survey
   - **4.2.** Four-observer protocol on mackerel survey
5. **Aerial survey protocols (GL)**
6. **Recording anthropogenic activities along the transect line**
7. **Outreach and dissemination: Live survey updates**
   - **7.1.** How best to communicate progression of the survey
   - **7.2.** How best to “communicate” survey work
8. **Loose ends from previous meetings**
   - **8.1.** Hiring MSc/PhD student to analyse regional abundance and distribution trends
   - **8.2.** Presentation to SC 30 on planning progress
9. **Other issues**
   - **9.1.** To-do list
   - **9.2.** Next meeting
   - **9.3.** Planning ahead for data analysis for target and non-target species

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