SCIENTIFIC COMMITTEE WORKING GROUP ON ABUNDANCE ESTIMATES

23–26 September 2025

Greenland Representation, Copenhagen, Denmark (hybrid)

REPORT

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All reports of the AEWG are available at https://nammco.no/abundance_estimates_reports/

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EXECUTIVE SUMMARY

The Working Group on Abundance Estimates (AEWG) met in Copenhagen, Denmark, on 23–26 September 2025, chaired by Daniel Pike. The aim of the meeting was to review and, where possible, finalise estimates of abundance for target and other species from the 2024 NASS project. The meeting Agenda is available in Appendix 1. The full list of participants can be found in Appendix 2.

Aerial surveys in Greenland

Waters up to 100 km from the West Greenland coast and up to 50 km from the East Greenland coast were surveyed using aerial line transect methods during August–September 2024. A total of 291 sightings, representing 11 cetacean species, were recorded. Abundance estimates were corrected for perception and availability bias where possible; different options for corrections were explored.

Minke whale

The AEWG **endorsed** the presented abundance estimates for minke whales, namely, 2,415 (95% CI: 1,266–4,606) in West Greenland and 6,370 (95% CI: 3,490–11,626) in East Greenland.

Fin whale

The AEWG **endorsed** the presented abundance estimates for fin whales, namely, 1,376 (95% CI: 512–3,699) in West Greenland and 5,155 (95% CI: 2,540–10,462) in East Greenland.

Humpback whale

The AEWG **endorsed** the presented abundance estimates for humpback whales, namely, 1,041 (95% CI: 438–2,470) in West Greenland and 3,898 (95% CI: 2.096–7.247) in East Greenland.

Pilot whale

The AEWG took note of the analysis presented for pilot whales and **recommended** further steps for reanalysis before the estimates can be endorsed: i) to conduct a sensitivity analysis for availability bias based on different numbers of animals diving synchronously ii) to calculate abundance for groups of more than 20 animals using a strip census method, rather than distance sampling and iii) (if/as needed by the Pilot Whale Working Group) to include a multiplying factor of the number of animals presumed to have left the study area during the survey based on satellite tracking data.

White-beaked dolphin

The AEWG **endorsed** the at surface estimates (perception-corrected) for white-beaked dolphins, namely, 1,697 in West Greenland and 285 in East Greenland. The availability-corrected estimate was not endorsed, as the available data on diving patterns were considered inadequate.

Harbour porpoise

The AEWG **endorsed** the at-surface (perception-corrected) estimate for harbour porpoise, namely 8,270 for West Greenland—there were no harbour porpoise sightings in East Greenland. The availability-corrected estimate was recognised as being positively biased. Whether the availability bias can be adjusted using time in view data remains to be explored.

Shipboard surveys in Faroe Islands and Iceland

The waters around the Faroe Islands and Iceland were surveyed using dedicated vessels, as well as by placing marine mammal observers on board fishery surveys. Double-platform sampling was conducted (with a few exceptions) throughout the surveys. Due to adverse weather and ice conditions, large parts of the original survey design could not be completed and, therefore, some post-stratification is required. Unfortunately, one of the areas that was not surveyed includes a known high-density area for fin whales.

The analyses presented to the AEWG for minke, fin, and pilot whales were preliminary and must be corrected for perception bias before the estimates can be fully reviewed by the group. The group made a series of **recommendations** to mitigate issues in future ship-based surveys:

i) Development of rapid, automated duplicate identification methods;
ii) Standardised data input, cleanup protocols, and formats between countries; this should include a data validation protocol (and software if needed). Equipment, such as that for GPS logging and the app developed by Iceland for NASS 2024 should be standardised to ensure consistency in collected data;
iii) Early and frequent communication, especially in the case of co-platform surveys, to ensure that the minimum requirements are met to obtain a robust estimate;
iv) Ensuring that protocols are thoroughly understood by both cruise leaders and observers, and plans are already in place in case of unexpected scenarios (e.g., ice cover, observer illness); this could be achieved by having a pilot survey and/or pre-survey meeting involving cruise leaders and available observers.
v) Plans regarding the data analysis must be in place before the survey itself. This includes determining the personnel and time required to complete analyses and allocating funding a priori if necessary.
vi) At a reasonably short time after the survey is completed (e.g., 3 or 4 months), the data handlers and analysts should confer (via correspondence or meetings) to agree that the data have been appropriately handled and formatted, and that the initial analysis is progressing correctly.
vii) Strict adherence to document submission deadlines is necessary to optimise meeting productivity.

Shipboard surveys in Norway

Data from the dedicated component of the Norwegian survey effort in 2024 are still being validated and could not be discussed at this time. Co-platform surveys of cetaceans were conducted using a mackerel survey vessel—due to personnel limitations, double-platform methods were not possible for most of the survey. A preliminary analysis of minke whale data from this non-dedicated survey was presented. As with the Icelandic surveys, the AEWG **recommended** post-stratification to better fit the realised effort. Additionally, a perception bias could be calculated using the initial survey effort that was conducted in double-platform mode. The group will review the abundance estimates once these considerations are taken into account.

Future meetings and plans for publication of results

The AEWG will review (via correspondence and online meetings) the abundance estimates for pilot, fin, and minke whales prior to the upcoming meetings of the Pilot Whale WG and the Large Whale Assessment WG, scheduled for November 2025 and January 2026, respectively.

Abundance estimates for non-target species will be reviewed in late 2026 at an in-person meeting of the AEWG. Any final points of relevance to NASS 2024 will be discussed there.

The WG **recommended** that results from NASS 2024 be published as soon as possible in a themed volume of NAMMCO Scientific Publications, and that the Scientific Committee should appoint a coordinator for this effort.

WS on alternative survey methods for cetaceans

The Scientific Committee recommended a workshop to explore alternative approaches for field data collection and analytical methods for generating absolute abundance estimates of cetaceans. The AEWG discussed the outline of such a workshop, as instructed, and defined the **workshop objective** as to "*assess the status of current development and practicality of novel methods for obtaining robust abundance estimates of cetaceans in the North Atlantic.*"

Desired outcomes are to:

i) Examine the different methods (including both sampling and analysis) and assess the extent to which each method fulfils the needs described and is sufficiently developed to be implemented.
ii) Collate information on projects that are being developed in different places and propose lines of cooperation between groups to streamline testing efforts and more rapid development and deployment of the methods that were seen as the most promising.
iii) Define requirements for method calibration and validation compared to traditional visual methods

A Steering Committee will be responsible for further development of the workshop structure, the agenda, the choice of experts that should be invited for presenting different methods. The AEWG proposed a list of topics to be explored, as well as potential invitees.

IWC ASI Working Group

The Convenor of the IWC Scientific Committee (SC) Subcommittee on Abundance Estimates, Status of Stocks, and International Cruises (ASI), Geof Givens, presented an overview of the ASI's work: reviewing abundance estimates for use by the IWC SC, providing public-facing summaries of stock status assessments, and advising researchers on survey design and statistical analysis. The ASI and IWC SC welcome opportunities for collaboration and data sharing.

Recommendations to scientists

Greenland

Further steps for recalculation of the pilot whale abundance estimates are to:

- conduct a sensitivity analysis for availability bias based on different numbers of animals diving synchronously
- calculate abundance for groups of more than 20 animals using a strip census method, rather than distance sampling, and
- (if/as needed by the Pilot Whale Working Group) include a multiplying factor of the number of animals presumed to have left the study area during the survey based on satellite tracking data.

Faroe Islands/Iceland

- Include correction for perception bias in analysis of abundance for minke, fin, and pilot whales.
- Re-stratify survey blocks to account for areas that were not surveyed, or not surveyed following the original design.

Norway

Regarding the non-dedicated survey effort, the recommendations are to:

- Re-stratify survey blocks to account for areas that were not surveyed; exclude effort that did not follow the original design in those strata.
- Include additional survey effort during transit to and from home port.
- Include correction for perception bias using the double-platform survey effort.

All

Publish results of NASS 2024 as soon as possible, in a themed volume of NAMMCO Scientific Publications

REPORT

The Working Group on Abundance Estimates (AEWG) met in Copenhagen, Denmark, on 23–26 September 2025. The meeting was chaired by Daniel Pike. The full list of participants is available in Appendix 2. The aim of the meeting was to review and, where possible, finalise estimates of abundance for target and other species from the 2024 NASS project.

1. WELCOME FROM THE CHAIR

Pike welcomed all attendees to the meeting. He noted that it was quite different for him to chair this working group when he was not contributing any of the papers: Now he could just listen. The aim of the meeting is primarily to assess the estimates from NASS 2024, the 7th in a series lasting nearly 40 years so far, which gives a temporal cross section, a time series if you will, of abundance and distribution of cetaceans in the North Atlantic.

As Secretary General, Geneviève Desportes commented on the preparation for this meeting and the status of the working documents. She reminded that the NAMMCO rule is that documents to be reviewed at a meeting must be made available two weeks before the start of the meeting, to allow participants and invited experts sufficient time to contribute thorough and informed input. This was not the case here—with the exception of Greenland—even though plans for this meeting were underway before the 2024 survey itself, therefore well over a year ago. Several documents were only made available a few days prior, with some of the analyses in a very preliminary state and lacking important information, and some of the expected analyses were not provided. This is a) not the current NAMMCO standard, b) not the right way to ensure robust abundance estimates—although these are essential to the work of NAMMCO, c) not the right way to conduct good science. Desportes informed the group that, a week ago at their last meeting, the NAMMCO Heads of Delegation had repeated that good science was at the core of NAMMCO processes. The insufficient planning given to the analysis of the 2024 survey data has not followed the established NAMMCO standards nor the recommendations of the NASS planning committee and the AEWG itself, causing delays that could impact plans for upcoming population assessments.

2. ADOPTION OF AGENDA

As the Greenlandic working document included a comparison with previous abundance estimates, an item to discuss possible trends was added to the agenda (Item 5.8). The rest of the agenda was adopted with no further changes, as seen in Appendix 1.

3. APPOINTMENT OF RAPPORTEURS

Deputy Secretary Maria Garagouni was appointed as rapporteur, with support from the Chair and other participants as needed.

4. REVIEW OF AVAILABLE DOCUMENTS

The Chair echoed Desportes' earlier comment about papers coming too late, in a preliminary, bare bones state. Noting the high level of expertise brought together in the room and online, he expressed some disappointment at the early stage of some of the analyses, which will limit what can be achieved at the meeting. Nevertheless, the working documents provided the opportunity for the group to identify issues that needed further exploration or reanalysis. The full list of documents provided before and during the meeting is available in Appendix 3.

5. AERIAL SURVEYS IN GREENLAND

5.1 METHODS

Mads Peter Heide-Jørgensen presented the survey methods and results from an aerial survey of West and East Greenland. The survey effort in East Greenland was made possible thanks to Norway's voluntary contribution of funds to extend the NASS 2024 project.

Summary

An aerial line transect survey of cetaceans was conducted in coastal waters off West and East Greenland during August–September 2024 (Figure 1). The survey aimed to assess whale populations in nearshore and offshore zones, covering areas extending up to 100 km from the West Greenland coast and up to 50 km from the East Greenland coast. A total of 291 sightings, representing 11 cetacean species, were recorded. Abundance estimates were corrected for perception and availability bias where possible, using data from satellite-linked time-depth recorders and observations of cue rates. Options for estimation methods are presented and the preferred estimates are: Minke whales: 2.415 (95% CI: 1.266-4.606) in West Greenland and 6.370 (95% CI: 3.490-11.626) in East Greenland, fin whales: 1.376 (95% CI: 512-3.699) in West Greenland and 5.155 (95% CI: 2.540-10.462) in East Greenland, humpback whales: 1.041 (95% CI: 438-2.470) in West Greenland and 3.898 (95% CI: 2.096-7.247) in East Greenland, harbour porpoise: 43.526 (95% CI: 29.191-64.901) in West Greenland and none in East Greenland, pilot whales: 7.595 (95% CI: 3.084-18.707) in West Greenland and 2.025 (95% CI: 585-7.012) in East Greenland, white-beaked dolphins 9.428 (95% CI: 435-3.313) in West Greenland and 1.583 (95% CI: 435-5.759) in East Greenland. Baleen whale densities were approximately three times higher in East Greenland than in West Greenland. In East Greenland, abundance estimates for minke and pilot whales were higher in 2024 compared to 2015, while estimates for fin and humpback whales remained consistent with 2015 levels. In contrast, all species in West Greenland—except humpback whales—showed a decline in estimated abundance relative to previous surveys. Humpback whale numbers in West Greenland were comparable to 2015 but remained below the levels recorded in 2007. Temporal variation in abundance is likely influenced by differences in whale residency within the survey area during the short survey window. However, the consistently high abundance observed in East Greenland in both 2015 and 2024 suggests a broader, long-term shift in oceanographic conditions and species distribution.

Discussion

Toshihide Kitakado asked for clarification about the left and right truncation levels used in detection functions and inquired if this is in relation to blind spots in the observers' view, depending on their placement and the shape of the aircraft used. Heide-Jørgensen confirmed that there are no blind spots in the given aircraft, however, the observers on each side may overextend their sights on the opposite side of the trackline, which necessitates a truncation on that side. Admittedly, the truncation levels on either side and for the different species are rather arbitrary; Kitakado therefore encouraged clearer documentation of how the truncation levels were selected.

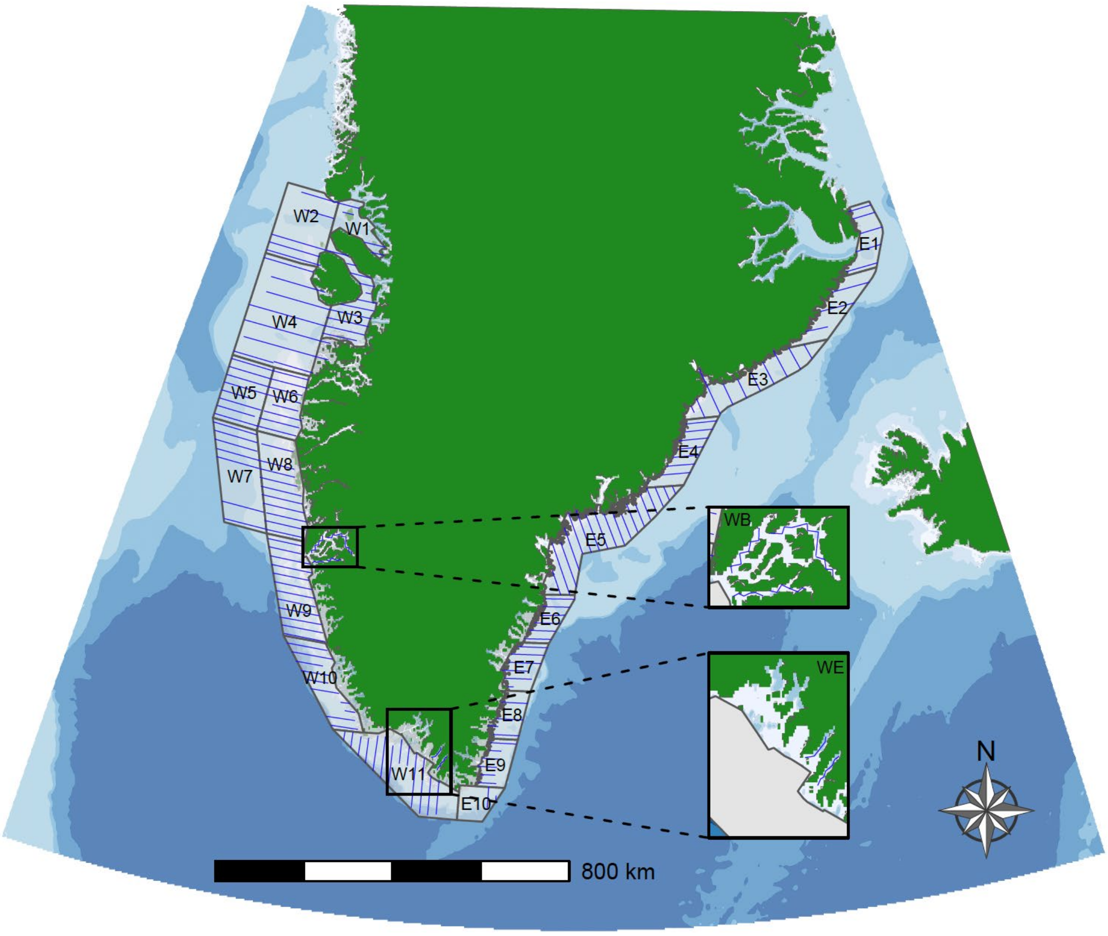

Figure 1. Survey effort in sea state <5 in East and West Greenland with delineation of strata and depth contours indicated (2.000m. 1.000 m. 200m and 100m). No sightings were recorded in stratum WE and it was not included in the analysis.

Takashi Hakamada inquired whether sighting conditions in East and West Greenland are similar, allowing for the detection function to be estimated from observations in both datasets. Heide-Jørgensen noted that, e.g., for minke whales, only the sightings in sea state < 3 were used for the detection function, that is, only effort and sightings that match certain conditions were included in the estimation. To the question on using sighting conditions as a covariate in the detection probability model, Heide-Jørgensen replied that there were too few sightings for that to be useful.

Expanding on this, Kitakado inquired whether observers could be included as a covariate and if data were pooled over surveys. Heide-Jørgensen noted that observers tend to behave differently year by year despite the protocol remaining the same. Kitakado suggested an exercise in pooling data from different years in order to check the robustness of the detection functions particularly for species with small sample sizes where detection might be influenced by sighting conditions—the obvious downside to this approach being that, as new survey data are added and detection functions are improved, the detection functions and concomitant abundance estimates from previous years would need to be updated. Heide-Jørgensen added that, since perception bias is survey-specific and cannot be pooled across years, and that it arguably has much more weight in an abundance estimation than the detection function, it is not an immediate matter of concern.

Other covariates that could potentially affect detection functions were mentioned, including glare, observer experience, differences between platforms, weather conditions, overall visibility. Danielle

Harris pointed out a recent study (added as AEWG/2025-02/FI/12) on pooling robustness, which concluded that unstratified global estimates of abundance can withstand considerable heterogeneity. The paper also looks at potential bias when using pooled detection functions on stratified estimates and also points out that MRDS analyses will require covariates if there is heterogeneity in detectability. So, while pooling robustness properties might be helpful in some cases, for stratified and MRDS estimates covariates are important to consider for various reasons.

Kitakado suggested generating a time series of effective strip width and mean group size, along with the perception bias, for all survey years, in order to check the variation between years and protocols. For this survey, school size was not included in the detection function model for pilot whales, as there were only 22 sightings in total. Martin Biuw suggested pooling covariates such as school size across different survey years, to circumvent the issue of small sample size.

The Working Group discussed how the availability bias correction had been estimated. This correction has a major impact on the abundance estimate; for example, the availability correction for minke whales was estimated at 0.20, which multiplies uncorrected abundance estimates five-fold. It is thus important to ensure that it is estimated in the best way possible. Availability is estimated using the formulation developed by Laake et al. (1997), which uses information on average time at, or close to, the surface, average time beneath the surface (diving), and the "time in view" (the time that animals are available for potential detection ahead of the aircraft). In AEWG/2025-02/04, surface and dive times were estimated from cue rates and telemetry data; the WG had no comments on this. Discussion focused on the calculation of time-in view.

AEWG/2025-02/04 calculated time-in-view by resampling from the time ahead of the aircraft that animals or groups of animals were detected (time elapsed between the observer first detecting the sighting and it passing abeam), with the rationale that the maximum visual range varies with the pattern of sightings, sea conditions and observer behaviour. However, this may result in an underestimate of time-in-view because some animals would have been within the forward field of view searched by observers some time before they were actually detected. Ideally, a value for time-in-view that reflects the maximum detectable range should be used. However, the WG recognised that choosing an appropriate value is challenging because there are no data independent of detections from which this can be determined and because it may vary throughout the survey, as described in AEWG/2025-02/04. After considerable discussion, to approximate time-in-view, the WG agreed to consider the time ahead that encompassed the large majority of detections for each species. Heide-Jørgensen calculated values of maximum time ahead from the shortest 85%, 90% and 95% of detections from the data presented in paper AEWG/2025-02/04; that is, the longest 15%, 10% and 5% of values were excluded. The effect on estimates of availability are shown for minke, fin and humpback whales in Table 1, together with estimates for resampling as done in AEWG/2025-02/04, and the mean and maximum time-in-view.

The WG noted that the availability bias was not sensitive to changes in time in view values, with the exception of using the maximum observed value of time in view. Choosing a cutoff of 90% of the observed values results in an increase of <5% in the availability values for the three species examined. In light of this, the WG agreed the resampling methods used were appropriate.

Particulars for each species were discussed individually, as follows in sections 5.2–5.7.

Table 1. The effects of changes in time-in-view (TIV) thresholds on availability bias ($\hat{a}$) for three baleen whales and at the truncation distances used for the abundance estimations. ***)**: Method used in AEWG/2025-02/04

Species	Threshold	TIV (s)	$\hat{a}$	CV
Minke whale <750 m	None, resampling *)	0-20	0.20	0.25
Minke whale <750 m	95 %	10	0.22	0.19
Minke whale <750 m	90 %	7.4	0.20	0.16
Minke whale <750 m	85 %	7	0.20	0.16
Minke whale <750 m	Max	20	0.27	0.27
Minke whale <750 m	Simple mean	3.6	0.18	0.12
Fin whale 100<p<1000 m	None, resampling *)	0-31	0.29	0.31
Fin whale 100<p<1000 m	95 %	25	0.34	0.24
Fin whale 100<p<1000 m	90 %	17	0.30	0.21
Fin whale 100<p<1000 m	85 %	15	0.29	0.20
Fin 1 whale 00<p<1000 m	Max	31	0.37	0.27
Fin whale 100<p<1000 m	Simple mean	8.6	0.24	0.14
Humpback whale <1000 m	None, resampling *)	0-35	0.42	0.25
Humpback whale <1000 m	95 %	16.7	0.45	0.18
Humpback whale <1000 m	90 %	14	0.44	0.18
Humpback whale <1000 m	85 %	11.05	0.42	0.16
Humpback whale <1000 m	Max	35	0.57	0.23
Humpback whale <1000 m	Simple mean	6.2	0.37	0.14

5.2 MINKE WHALE

The AEWG **endorsed** the abundance estimates presented for minke whales.

5.3 FIN WHALE

Kitakado pointed out that left truncation was used in estimating the detection function for fin whales, suggesting that the robustness of this should be checked, i.e., comparing the estimates with and without left truncation. Pike speculated as to the necessity for such a truncation for fin whales only, e.g., whether they are more often seen far ahead of the aircraft. Biuw hypothesised that, if that were the case, fin whales seen far away *on* the trackline should more often be recorded as unidentified large whales, which would result in a spike of these observations on the trackline—something that is not evident in the presented data. The group agreed that comparing the estimates with and without left truncation would be a useful exercise. This was duly conducted during the course of the meeting and, after viewing the results, the group concurred that a left truncation was appropriate.

Conclusion

The AEWG **endorsed** the abundance estimates for fin whales.

5.4 HUMPBACK WHALE

The AEWG **endorsed** the abundance estimates for humpback whales.

5.5 PILOT WHALE

Anita Gilles requested a clarification on the group size correction that was applied. This refers to the assumption that groups of pilot whales do not dive and surface in a synchronous manner, or rather, that two individuals may be synchronised, but more are not. Tables 2 and 3 in AEWG/2025-02/04 present estimates generated with the assumption that every animal in a given group surfaces asynchronously from the others, presenting an upper bound for the possible abundance estimates. If some or all animals in a group surface asynchronously, availability would be greater which would result in a lower estimate of abundance. There is no information available on synchronicity in diving patterns, so it was **recommended** to conduct a sensitivity analysis for the effect of diving synchronicity (0 vs 2 vs 4 vs 6 animals diving simultaneously) on the estimates. The AEWG will review the results via correspondence.

The group discussed the unique issues that pilot whales present for aerial and ship surveys, due to their large average group size being often spread out over a large area, making it difficult to pick a centre point or measure time in view. Similar issues have been noted for unusually large aggregations of baleen whales around Greenland. Philip Hammond suggested an approach similar to that used in those cases, namely, to exclude the largest groups from the main analysis and conduct a strip census analysis for them instead. The AEWG **recommended** that this reanalysis be conducted, applying the strip census method to groups larger than 20.

Satellite tagging has shown that pilot whales moved in and out of the surveyed strata during the survey; these strata were not optimised for pilot whale movement patterns, and this is highlighted by the number of sightings near the ends of transects. In theory, animals moving out of the East Greenland strata would have been picked up by the shipboard surveys conducted by Iceland. However, the East Greenland strata were covered by ice when those surveys occurred, which could potentially raise an issue of double-counting—although this would not be an issue for West Greenland. It was asked whether the survey strata covered the pilot whale hunting grounds and whether an earlier survey (e.g., in July) would be more optimal. Heide-Jørgensen noted that the coverage of the hunting grounds is quite good, and that an earlier survey would not result in a better estimate, while a later one would be difficult because of deteriorating weather conditions and prolonged darkness. Satellite tag deployments suggest that some of the available animals exited the survey area during the survey and were therefore not counted. The group **recommended** that this factor could be used as a multiplier to generate a new estimate, if the Pilot Whale Working Group (PWWG) deems it necessary when examining stock delineation and movement patterns.

Conclusion

The AEWG took note of the analysis presented for pilot whales, as well as the changes in the estimates that would result from the additional analyses described. These issues will be addressed this by the group prior to the PWWG meeting.

5.6 WHITE-BEAKED DOLPHIN

Gilles pointed out that the availability correction (18%, no CV) for white-beaked dolphins was based on the value from a single short-term tagged individual. However, there are no other tagging data available for this species. In the SCANS surveys, g(0) for delphinid species is estimated using the circle-back method, effectively accounting for both perception and availability bias. However, it is not possible to identify the contribution of each bias to the total. Therefore, if applying the g(0) correction from the SCANS surveys were to be considered, it would need to be applied to the here-presented uncorrected estimate. Gilles suggested to apply accordingly and present the new estimate as an alternative.

Availability was considered instantaneous for this species due to a lack of data on dive and surface time. However, it was recognised that this was not a realistic assumption.

Pike inquired whether synchronised diving would pose an issue for white-beaked dolphins as for pilot whales. This is a potential issue for any species observed in large groups. However, there were no very large groups recorded in this survey, so it was not deemed necessary to conduct an additional strip census analysis as for pilot whales (see section 5.5).

Conclusion

The AEWG **endorsed** the at surface estimate (perception-corrected) for white-beaked dolphins as presented, but not the availability-corrected estimate.

5.7 HARBOUR PORPOISE

The group discussed whether an adjustment for time in view is needed in the availability bias calculation. Heide-Jørgensen noted that it wasn’t included originally because time-in-view for this species is typically very short, and in practice it is difficult to measure accurately the very short interval between detection and the animal passing abeam. In addition, the standard instruments attached to the dorsal fins of harbour porpoises record the depth at 1-second intervals with a resolution of 0.5 m, which is not sufficiently accurate for these data to be used for this species.

Conclusion

The AEWG **endorsed** the at-surface estimate for harbour porpoise. The availability-corrected estimate was recognised as being positively biased. The group encouraged Heide-Jørgensen to investigate the data further to see if any advances can be made in adjusting availability bias using the time in view data.

5.8 TRENDS

It was noted that it cannot be concluded whether the apparent trends are significant without an analysis that incorporated information on variance.

Kitakado inquired whether the proportion of unidentified species has changed over time. If it has, this could also affect observed trends as the proportion of certainly identified animals would also change. Heide-Jørgensen explained that there were more “unidentified” sightings in 2024 than in 2015, but not many of those observations were within the truncation distance and were therefore not included in abundance estimation. Kitakado suggested checking the proportion of “unidentified” records within a truncation of 1000 m (or whatever the common denominator is between all years), especially for

West Greenland, for which more survey years are available; if the proportion varies considerably, this will need to be revisited.

Biuw observed that the eastward shift in minke whales (decline in West vs increase in East Greenland) is congruous with the apparent distribution shift observed in the eastern North Atlantic. Similar shifts could be taking place for other species, as well, with an increased ecosystem favourability northeast rather than northwest. Heide-Jørgensen is aware of very little or no indication that the humpback whales from West Greenland are moving to East Greenland.

The group took note of the apparent changes in abundance and **agreed** that a more in-depth trends analysis should be dealt with by species-specific assessment groups.

6. SHIPBOARD SURVEYS

6.1 FAROE ISLANDS/ICELAND

Gudjón Már Sigurdsson and Bjarni Mikkelsen presented an overview of the shipboard survey methods used by the Faroe Islands and Iceland.

<ins>Summary</ins>

Faroe Islands participated with two survey vessels. Both vessels were operating in double platform mode, with two fully independent platforms located on the bridge roof, at similar height levels. On the dedicated vessel, F/V RAN, eight observers were operating as two teams, each fixed to one of the platforms for the entire cruise. Observers were on duty from 06:00 until 22:00, operating in 2-hour shifts, and swapping sides half-way through each shift. The second, non-dedicated, vessel, R/V Jákup Sverri, combined whale observation effort with mackerel surveying. Four observers, operating as two fixed teams, were on duty during the light hours, and when the vessel was cruising on the transect line, performing echo integration. The vessel performed trawl hauls every 6 hours, and cruised also at night, therefore the observers had a more adaptive effort protocol, optimising time on effort relative to the other activities of the vessel. Sighting angles were measured by fixed angle board and the distance was determined using individually adjusted distance sticks. Sightings and effort were recorded on laptops running the Logger2010 software, with one laptop with synchronised ship time on each platform. Both vessels were cruising at around 10 knots. Data were validated and backed up at the end of the day. The duplicate identifications were done post survey.

Icelandic research vessels Árni Friðriksson and Bjarni Sæmundsson covered the Icelandic part of the survey. Bjarni Sæmundsson covered the dedicated part of the survey, while Árni Friðriksson was also surveying for redfish and mackerel. The survey took place between 4 June and 1 August. Special arrangements to accommodate the whale survey were done onboard Árni Friðriksson during the mackerel survey, where the ship stopped or slowed down at night, while during the redfish survey (Stratum IR, Figure 2) the vessel steamed both day and night, mostly independent of weather conditions; with whale surveying being done between 6:00 and 22:00, when weather conditions allowed. The dedicated vessel stopped during nights, and observers were on effort in the light hours between 6:00 and 22:00, when weather conditions allowed (i.e. Beaufort ≤5, visibility > 1 nm). Both vessels cruised at around 10 knots. Independent double platforms (IO mode) were used on both vessels, and identical equipment and procedures were used on each platform. The platform height was 15.3/7 m for Árni Friðriksson while it was 10.3/5.4 m for Bjarni Sæmundsson. The platforms did not communicate while on effort and were acoustically and visually isolated (two-way fully independent). A minimum of 2 observers were generally on effort on each platform at any time with one exception. One platform was manned by one experienced person onboard Árni Friðriksson for 5 days on the IMN strata until a replacement observer could be brought in, due to a sudden illness of an observer. During these 5 days, the observer tried to cover both sides of the platform. Bjarni Sæmundsson had full crew of two observers per platform for the entire survey. Sightings were recorded on iPads using a specially designed software, distance was estimated using binocular reticules and angle using fixed angle boards.

For minke whales, three levels of species identification certainty were considered and included in the analysis: minke whales, likely minke whale, and minke whale/bottlenose whale. Other possible minke whale sightings, such as unidentified medium whale and minke whale/beaked whale were excluded. Similarly for fin whales two levels of species identification confidence were considered and included in the analysis: fin whales, and likely fin whales (code *BP?* on the Icelandic vessels). Species code BP? was not an option on the Faroese vessels, only *B?*; therefore "likely fin whales" are not included in the Faroese numbers. Other possible fin whale sightings, such as fin whale/blue whale or fin whale/sei whale were excluded.

Duplicates were identified post-survey by similarity of sighting location considering the time interval between the sightings, and similarity of species identification, group size, cue type and whale heading. Sightings were generally classified as non-duplicates if they differed by 10° or more in angle to track when seen within a short interval by the platforms, or the distance between sighting spots was estimated to be over a mile when different dive cycles were observed over several minutes.
Ice caused considerable issues in the Icelandic dedicated blocks, where around 70% of IDW3 was fully covered, and all of IDW4. Large parts of the IR and IDS blocks could not be surveyed due to weather (fog or rough sea state).

Analysis
Density and abundance were estimated in a single-platform analysis (discarding one of each pair of duplicate sightings) that does not correct for perception bias using stratified line transect methods implemented in the R package Distance v 2.01 in R studio (Miller et al. 2019). Distances were truncated such that 5% of the largest distances were discarded. Both hazard rate and half normal models were initially tested, and the final model was chosen by the lowest AIC value. Several covariates were considered but were only retained if the resultant AIC values were lower than for the model without the covariate. Covariates considered were vessel, platform height/platform ID in platform covariate, BSS, weather/cloud cover. Only effort that was conducted in full double platform mode was retained, with the exceptions mentioned above. Since the platforms were completely independent from one another, and did not communicate, they were considered fully independent for the analysis.

Discussion
Concerns about the realised survey effort relative to the planned transect design were raised. In the IDW blocks (Figure 2), large parts of the dedicated Icelandic vessel's path was blocked by ice, and the ice edge protocol could not be followed in some cases. While observations were continued while cruising along the ice edge, these data cannot be used in the design-based estimate as the survey track is very different from the survey design and also parallels a known density gradient for several species (e.g., AEWG/2025-02/FI/06, AEWG/2025-02/FI/08).

Additionally, considerable portions of certain strata could not be covered due to bad weather, requiring a *post hoc* adjustment of the stratum boundaries to avoid extrapolating abundance to large,

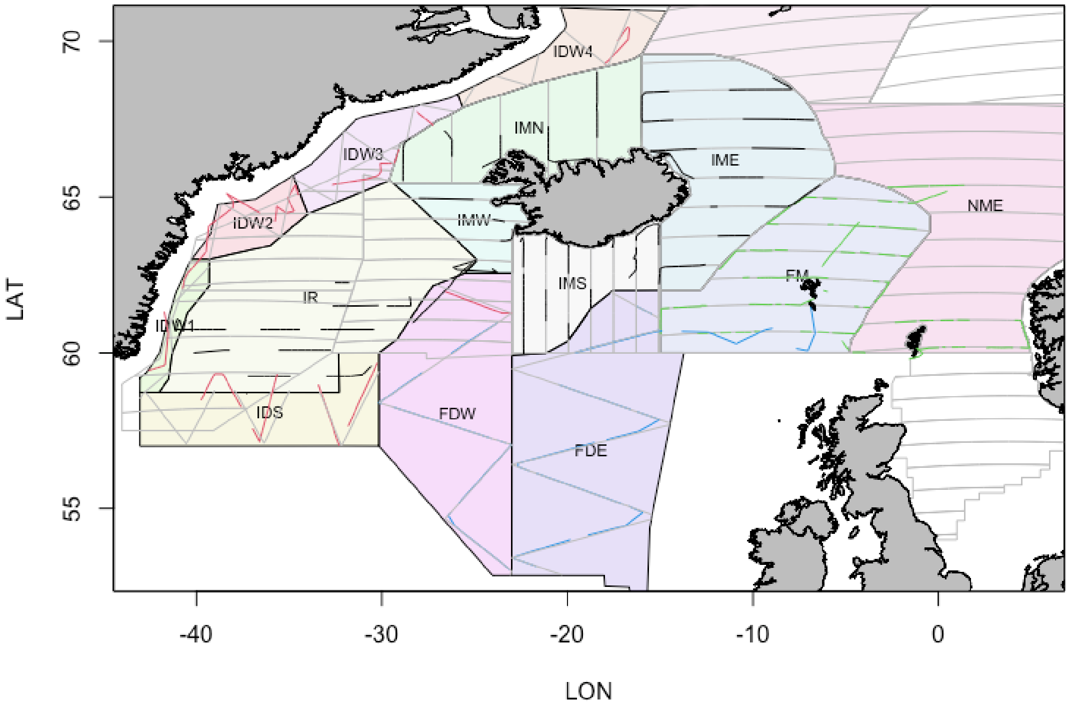

Figure 2. Planned (grey) and realised survey effort by the Faroese and Icelandic vessels. Realised transects are colour-coded: red = dedicated Icelandic survey; black = Icelandic fishery surveys; blue = dedicated Faroese survey; green = Faroese fishery survey. Note the green transects in the Norwegian stratum NME.

un-surveyed areas (Figure 3). Of particular importance, the northern part of the IR block, which has had high densities of fin, minke, and humpback whales in previous surveys, was not covered. Furthermore, the Faroese dedicated vessel conducted some survey effort additional to the original transects during the return transit to port. While sightings from these segments can be used to estimate the detection functions and may, in future, be used for model-based estimates, they must be excluded from estimating encounter rate and group size in the design-based abundance estimation process. Finally, the Faroese mackerel survey vessel covered two of the transects in the Norwegian stratum. This effort cannot be included in the abundance estimation for Faroese waters (although it can be included in the Norwegian estimates, see section 6.2).

A summary of which survey effort can and cannot be used for a design-based estimate is as follows (in most cases, sightings made on these transects can be used to estimate detection functions):

- The so-called “alternative effort” by the dedicated Faroese vessel in block FM cannot be used;
- Blocks IR, IMN, and IDS will need to be reduced in size, because the survey effort was confined to one part of each stratum, leaving large areas with no effort;
- Blocks IDW1 and IDW2 have passable coverage despite some ice interference, and should be included in the estimates. However, off transect effort must be excluded;
- Most of block IDW3 and all of IDW4 must be excluded from the abundance estimates because of ice coverage.

It was noted that, despite the agreement that the Faroese and Icelandic observers would use the same protocols—and species codes in particular—this was not done in practice by the Faroese observers. This is discussed in more detail in section 6.1.2.

Pike raised a point that had been discussed in previous meetings, regarding the development of an algorithmic process to identify likely duplicates. Various existing approaches to duplicate identification

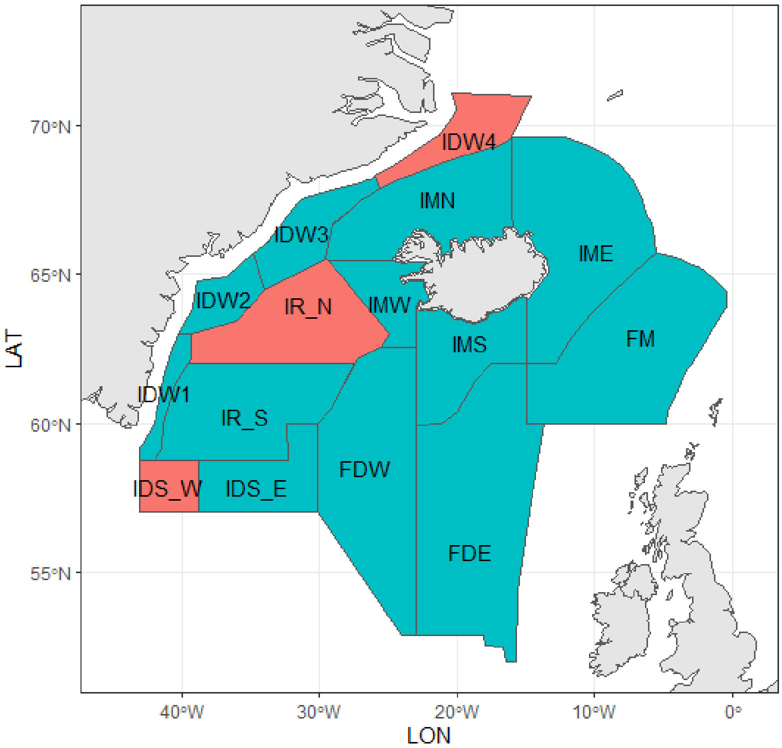

Figure 3. Post-survey stratification of Icelandic survey blocks. Red strata are to be excluded from the analysis due to low effort coverage. The blue IDW blocks have not yet been redrawn to reflect ice cover.

were described, including identifying likely duplicates in the field and validating them post hoc, or projecting the locations of sightings on a screen and marking them with various levels of uncertainty. Hammond informed that the SCANS project is planning a review of how the SCANS ship survey method (double team in tracker mode) is implemented, which will include recommendations for updating data collection equipment and validation software prior to the next survey, which is tentatively planned for 2027. The **consensus** was that a consistent and reliable method must be developed *before* the next NASS (or equivalent) survey.

Kitakado inquired whether distance and angle experiments had been conducted for the observers. None of the Icelandic or Faroese components attempted anything beyond some simple training exercises with objects at known distances. Desportes mentioned that experiments had been conducted during the 2007 NASS, but were considered to be not particularly useful other than for observer training. She also noted that, with limited time and good weather available, there would have to be a trade-off between a (potentially uninformative or biased) exercise and conducting actual survey effort.

As none of the estimates presented had been corrected for perception bias, they could not be endorsed by the AEWG. However, each species estimate was discussed and suggestions for improvement of the analysis were made, as follows.

6.1.1 Minke whales

Sigurdsson presented results from preliminary analysis conducted for minke whales based on the Faroese and Icelandic data.

Discussion

Sightings of species code “minke or bottlenose whale” should not be included in the analysis because there is uncertainty about the species. Sigurdsson noted that there were few such records.

Kitakado suggested checking the difference in shapes (and parameters) of the estimated detection functions between vessels. It may be useful to test if different detection functions (half normal or hazard rate) between vessels can improve the fit. The inclusion of interactions between vessel and sighting conditions might also improve the models.

6.1.2 Fin whales

Sigurdsson presented results from a preliminary analysis conducted for fin whales based on the Faroese and Icelandic data.

Discussion

Regarding the uncertainty about species identification, it was agreed that only species codes *BP* (fin whale) and *BP?* (likely fin whale) should be included from the Icelandic data, and only *BP* from the Faroese data. A separate estimate can be generated for category *B? (*unidentified baleen whales) from the Icelandic and Faroese dataset, for example, adjusting the proportions based on the number of positively identified fin whales compared to all other sightings. This could be done for all large baleen whales.

Conclusion

Both the estimates for minke and fin whales are considered preliminary and will be reviewed again following a more detailed analysis. The AEWG will reevaluate them once post-stratification, acceptable effort restrictions and the corrections for perception bias are added, and the suggestions above have been taken into account. In light of the difficulties in achieving the predetermined survey effort, and the large amount of off-transect effort and sightings, it would be desirable to investigate model-based estimates. The datasets from NASS 2024 will be included as case studies in the Spatial modelling Workshop planned for November 2025.

6.1.3 Pilot whales

Biuw presented a preliminary analysis of pilot whale data from the Faroese and Icelandic components of NASS 2024.

Summary

No pilot whales were observed during the Norwegian survey conducted on the chartered fishing vessel participating in the international mackerel survey. In total, there were 139 sightings, representing an estimated 3041 individual encounters. Average estimated group size was 21.9. The number of encounters varied substantially between survey strata, with greatest numbers in strata surrounding and to the southwest of the Faroe Islands (FM, FDW, and FDE strata) and with fewer encounters in Icelandic waters. Only conventional one-platform distance sampling analyses (CDS) were carried out in preparation for the meeting. We fitted a series of detection functions to the pilot whale data, from simple models without observation covariates to models accounting for various combination of such covariates. Data were truncated so that the 5% of sightings with the greatest perpendicular distance were excluded. The best supported detection function included covariate effects of vessel and platform height, and this model was used to obtain preliminary estimates of abundance. The initial analysis output presented at the meeting indicated an estimated total abundance of 657,015 (CV =

0.35) pilot whales, with over half of these (367,927; CV = 0.58) estimated for the FM stratum surrounding the Faroe islands.

Discussion

An asymmetry in the number of encounters was noted in the data, with a higher number of observations on the starboard side of the vessel. Mikkelsen informed the group that, on vessel RAN, the observers on the starboard side had more closely followed the protocol regarding the definition of pilot whale groups (i.e., splitting them into smaller sub-groups based on the distance between individuals), whereas the observers on the port side had apparently identified fewer, larger groups However, this was not evident from the presented data. Additionally, there were more sightings at wide angles on the starboard side. Data review during the survey would have helped identify data collection issues and correct them in the field.

It was reiterated that some survey blocks will be revised, as described in section 6.1.1. Off-effort sightings, such as some noted in blocks IR and FM, must also be excluded from the calculation of abundance estimates, although they can be included in modelling the detection function. Updated analyses were presented during the meeting that took into account the following modifications:

- Splitting the IR block into IR_N and IR_S, with a split at 62°N
- Splitting the IDS block into IDS_E and IDS_W with a split at 38.8°W
- Excluding non-dedicated transect legs and sightings

Results from these modifications yielded an estimated total abundance of 290,417 (CV = 0.27). The greatest changes were observed in estimates from the FM stratum (from 367,927; CV = 0.58 to 72,819; CV = 0.72) and the IR stratum (from 77,263; CV = 0.92 to 36,816; CV = 1.23).

Estimates from several of the survey strata were associated with very high CVs and thus wide confidence limits. Further changes in terms of e.g. covariate structures and fitting models with interactions between covariates will likely lead to further modifications to these estimates. More importantly, it should be noted that these estimates are still based on primary observations only, and thus makes no corrections for perception or availability bias—analysis of the double platform data is required before estimates can be considered for acceptance. Such analyses will be carried out once further smaller changes have been achieved.

Regarding the detection function models, it would be useful to test models that include vessel, platform height, and Beaufort, as well as interactions between those covariates if the data are sufficient. In the current iteration, Beaufort and other sighting conditions are included as factors, but these can be binned to reduce the number of factor levels and, potentially, provide improved fit. Group size can also be categorised in this way or included as a continuous variable as log(group size).

Conclusion

The analysis presented was preliminary and must be modified and extended following the recommended changes and inclusions before it can be reviewed again by the AEWG.

For future ship-based surveys, the group **recommends**:

i) Development of rapid, automated duplicate identification methods beforehand;
ii) Standardised data input, cleanup protocols, and formats between countries; this should include a data validation protocol (and software if needed). Standardising equipment, such

as for GPS logging and the app developed by Iceland for NASS 2024 would ensure consistency in collected data;

iii) Early and frequent communication in the case of co-platform surveys, to ensure that the minimum requirements are met to obtain a robust estimate;

iv) Ensuring that protocols are thoroughly understood by both cruise leaders and observers, and plans are already in place in case of unexpected scenarios (e.g., ice cover, observer illness); this could be achieved by having a pilot survey and/or pre-survey meeting involving cruise leaders and available observers.

v) Plans regarding the data analysis must be in place before the survey itself. This includes determining the personnel and time required to complete analysis and allocating funding a priori if necessary.

vi) At a reasonably short time after the survey is completed (e.g., 3 or 4 months), the data handlers and analysts should confer (via correspondence or meetings) to agree that the data have been appropriately handled and formatted, and that the initial analysis is progressing correctly.

vii) Strict adherence to document submission deadlines is necessary to optimise meeting productivity.

6.2 NORWAY

Data from the dedicated component of the Norwegian survey effort in 2024 are still being validated and could not be discussed at this time. Biuw presented a preliminary analysis of minke whale data from the non-dedicated survey.

Summary

Norway presented preliminary analyses based on sightings gathered by dedicated whale observers onboard the chartered Norwegian fishing vessel F/V Eros, participating in the International Ecosystem Summer Survey in the Nordic Seas (IESSNS). Observations were carried out by a team of four observers. Two observation platforms were installed, one on top of the wheelhouse (Platform 1) and one on the front deck (Platform 2). During periods of poor weather conditions (Beaufort 5 and above), observations were carried out from inside the wheelhouse (Platform 3). The heights of the three platforms were 17.0, 10.7 and 14.7 meters for platforms 1, 2, and 3 respectively. While attempts were made during the first survey period (covering mostly the NME stratum) to follow a full double platform protocol, this was abandoned for the second survey period due to personnel constraints. Total distance covered by the survey vessel was 2,573.8 and 5,480.1 km in the NME and NMN survey blocks respectively, while the corresponding total observation effort was 1,106.7 and 4,413 km.

There were a total of 195 sightings of seven identified cetacean species (minke, fin, humpback, killer, bottlenose, and sperm whales, plus white beaked dolphins), and additionally 2 unidentified cetacean sightings, 6 unidentified baleen whale sightings and one sighting of a basking shark. Preliminary analyses were presented for minke whales, for which there were 134 sightings (88 primary encounters) of 144 (100 primary) individuals. We fitted a series of detection functions to the minke whale observations, from simple models without observation covariates to models accounting for variations in sea state, weather conditions, visibility and platform height. Data were truncated so that the 5% of sightings with the greatest perpendicular distance were excluded. Only sightings obtained in 'T' mode from either of the outside platforms were included in the analyses (Figure 4). The best supported model in these preliminary analyses was a simple half-normal detection function without covariates.

This model predicted an effective strip halfwidth (ESHW) of 379.3 meters, and an average detection probability of 0.583. Based on this model, we estimated a total abundance of 173,415 (CV=0.27) minke whales in the two strata combined (NME stratum: 78,113; CV=0.53; NMN stratum: 95,302; CV=0.19). It should be noted, that these analyses are based on primary sightings only, and makes no attempts to correct for perception or availability bias.

Discussion

It was clarified that minke whale tracking was carried out during the survey, although this was limited due to the single platform setup.

Regarding the gaps in realised versus planned survey effort, Biuw informed that a repetition of the mackerel survey in 2025 had covered many more transects in Norwegian waters with marine mammal observers on effort, including both survey blocks covered in 2024 as well as additional areas.

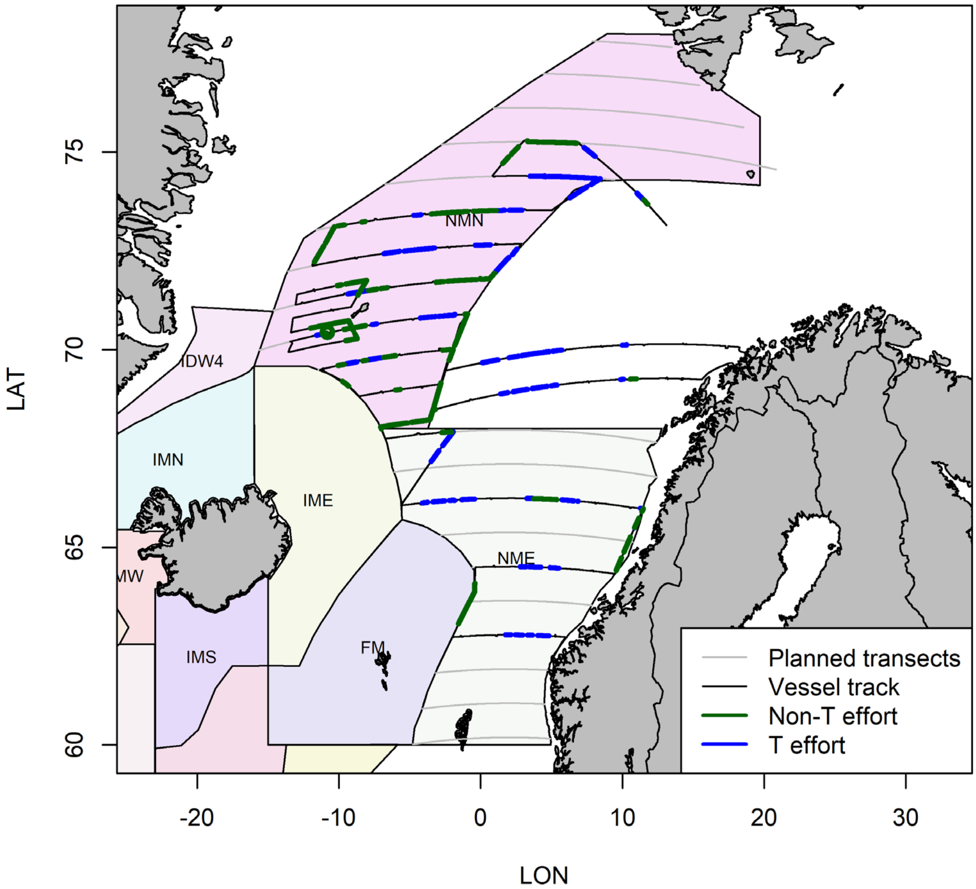

Figure 4. Planned (grey) and realised survey effort for the Norwegian mackerel survey components of NASS 2024. Black sections represent effort in ‘T’ mode (active minke whale tracking), while green sections represent effort in ‘W’ mode (transit) or ‘F’ mode (Beaufort > 3). F mode sightings were carried out from platform 3 (i.e., inside the wheelhouse).

The realised transects (Figure 4) in block NMN did not align with the edge of that stratum as originally designed, so that block will need to be redrawn. Specifically, the southwestern corner should be moved eastward to better align with the western extent of the transects around Jan Mayen. Additionally, some additional transects near the western edge will need to be excluded, as they were not in the approved design; this pertains to additional short transects around Jan Mayen, which were most likely covered in response to higher concentrations of mackerel, following the so-called ‘stratified sampling’ protocol common in fisheries surveys. The northernmost part of NMN stratum was not surveyed; this will need to be redrawn post hoc, as was recommended for the Faroese and Icelandic effort.

In order to maximise available effort data, an additional stratum could be drawn to include the two transit lines between the survey strata and the mainland (north of NME, Figure 5). Additionally, the transects that the Faroese vessel covered in the southern part of NME will be included in the Norwegian estimates.

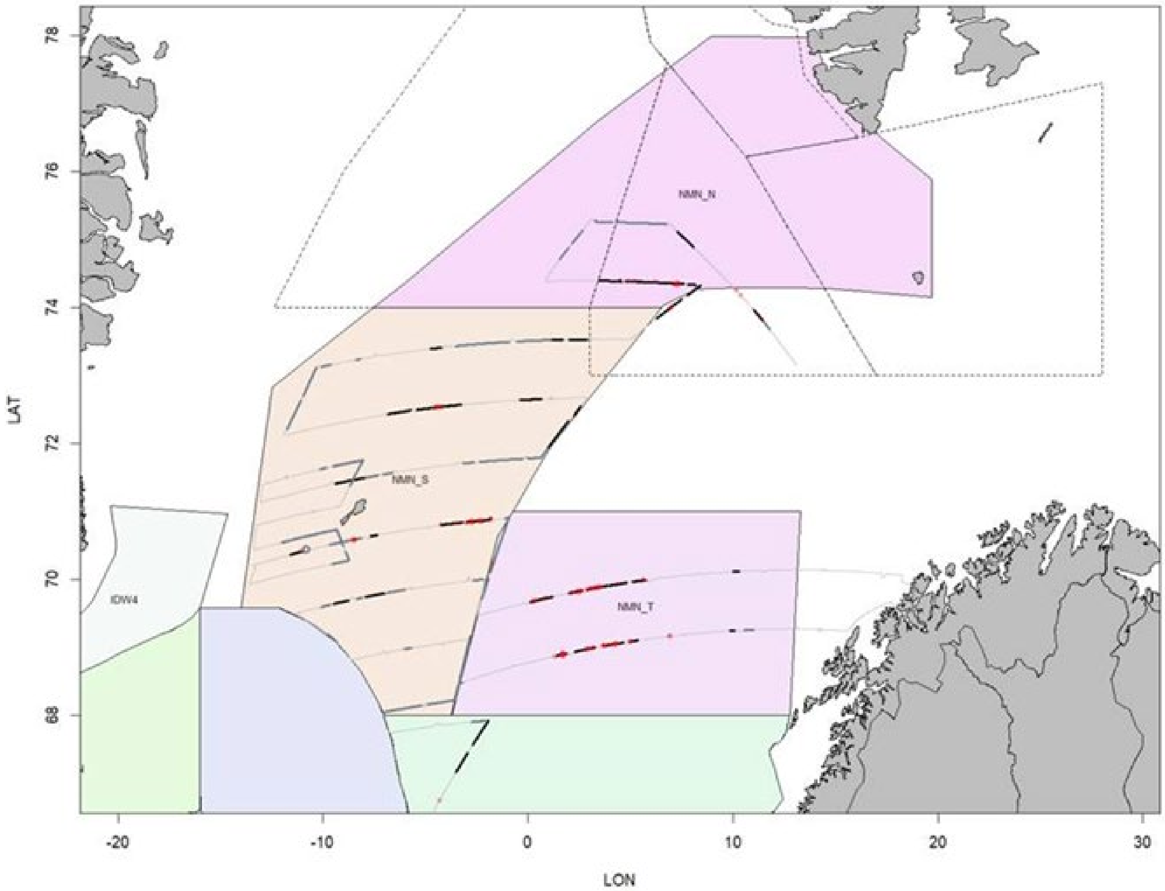

Figure 5. Post-survey stratification of Norwegian mackerel survey blocks. Note the addition of block NMN_T, which includes the effort conducted during transit.

Pike suggested using the (admittedly few) sightings that were made while the observers were still operating in double platform mode to determine a perception bias that could be applied to the entire survey. The Faroese effort in block NME could also potentially be included in this.

The group agreed that limiting the number of observers severely impairs the feasibility of a double platform survey protocol. It was suggested that it might be possible to use an automated optical or acoustic detection system as an additional platform; Biuw informed the group that such systems are under development.

Conclusion

The AEWG will review the abundance estimates for pilot and minke whales once the changes recommended above had been made. The group also concluded that it is not possible to conduct an effective double-platform survey with only four observers on board using standard methods.

7. PLANS FOR PUBLICATION OF RESULTS

At previous meetings of the AEWG and SC, the idea of a themed volume of NAMMCO Scientific Publications was proposed and viewed favourably. The group recommended that this be pursued, with an aim to publish results as soon as possible, and that someone be appointed by the SC to coordinate these efforts. Garagouni highlighted that Guest Editors with relevant expertise would be required for such a volume, to moderate the review process.

8. MODEL-BASED ESTIMATES

Biuw informed briefly that Deanna Leonard and Auriane Virgili are collaborating on generating spatial models for cetaceans in the Northeast Atlantic, using Faroese, Icelandic, and Norwegian survey data. These models will include *inter alia* a series of covariates developed by Virgili for the entire water column, rather than relying solely on satellite data. Ultimately, their aim is to develop a single, one size fits all, form that survey data can be added to and be easily included in spatial analysis of any kind. Their progress will be presented at the upcoming WS on spatial modelling methods in November. Isidora Katara offered to share processed data on fronts from some of the relevant areas, which could be included in these models.

Hammond informed that Nadya Ramirez-Martinez had developed spatial models for baleen whales during her PhD using all previous NASS data, and this could potentially be included in a NASS-themed volume of NSP.

9. PLANS FOR NEXT AEWG MEETING

The abundance estimates for target species from all the shipboard surveys will need to be reviewed again once the changes recommended here are implemented. In particular, the pilot whale estimates will need to be endorsed prior to the meeting of the PWWG in late November 2025. Similarly, the fin and minke whale estimates will need to be endorsed before the meeting of the LWAWG, scheduled for January 2026. These reviews will occur via correspondence and online meetings in the leadup to both assessment meetings.

Abundance estimates for non-target species will need to be generated before the end of 2026. An in-person meeting of the AEWG should be held in autumn of that year to review these analyses and any remaining or additional points of relevance to NASS 2024.

10. PRESENTATION OF THE ASI WORKING GROUP

Geof H. Givens, Convenor of the IWC Scientific Committee (SC) Subcommittee on Abundance Estimates, Status of Stocks, and International Cruises (ASI), provided a brief summary of ASI’s work.

<u>Summary</u>

ASI provides consistent, rigorous reviews of abundance estimates used by the SC for its core work (including management of hunting, stock assessment, and conservation plans). Reviewed estimates may be endorsed in a variety of categories indicating for which types of SC work the estimate may be used. Abundance estimates used for hunting management and formal stock assessments must be endorsed in one of the highest categories.

ASI also prepares public-facing summaries of stock status assessments (abundance, depletion, and trend) through its new Status of Whales project (iwc.int/about-whales/intro-to-population-status). These assessments rely on quantitative modelling when possible, and expert summaries otherwise. The Status of Whales summary page displays intuitive ‘thermometers’ indicating the health of the stock, and other pages provide varying levels of additional detail.

ASI also advises researchers on survey design and statistical analysis, and works to develop Scientific Committee expertise with emerging advances in the field of cetacean abundance estimation.

The IWC SC and the ASI Subcommittee welcome worldwide scientific collaboration and data sharing. The primary avenue for collaboration is through the participation of national delegates, invited participants, and observers, at the SC biennial meetings and at intersessional workshops of SC subgroups. More information is available from national representatives to the IWC SC or from secretariat@iwc.int.

Discussion

The group welcomed this perspective and overview of the processes for abundance estimate endorsement within the IWC. Some clarifications were requested pertaining to the classification of abundance estimates in different categories: regarding the definition of “very small populations”, it was explained that this is relative and defined ad hoc, depending, e.g., on the catches from a particular population; on the use of the term “endorsed”, it was clarified that an unsuitable abundance estimate is not endorsed for use by the IWC SC, although it could have other uses beyond that.

Pike commented that the non-binary system of categorisation for abundance estimates could be interesting for NAMMCO. Givens concurred that the ASI classifications allow for much more flexibility in using estimates for different purposes, where different thresholds and criteria may be considered acceptable. Biuw proposed that this should be brought up for discussion at the next meeting of the NAMMCO SC.

The similar interests of NAMMCO and the IWC have led to several collinearities between the two organisations, including conveying species-specific information via their websites and trying to summarise stock status in a comprehensive and comprehensible way. Each group tries to avoid replicating the work of other organisations operating in the same niche; for example, the IWC Status of Whales initiative uses complex models based on many years of study for each species, while the respective system within NAMMCO will be a more simplified visual representation of abundance, removals, and knowledge pertaining to a population.

Conclusion

The AEWG thanked Givens for his informative presentation and echoed that there is room for inspiration from each other’s initiatives and methods.

11. ALTERNATIVE SURVEY METHODS FOR CETACEANS

Various alternative methods to sightings surveys have emerged in recent years for estimating population abundance. As this is a growing need in NAMMCO countries and beyond, the Scientific Committee, recommended a workshop to explore alternative approaches for field data collection and analytical methods for generating absolute abundance estimates of cetaceans. The AEWG was instructed to propose which alternative methods should be examined, what workshop structure would best fit the purpose, and suggest names of experts to be invited.

The objective of Workshop was defined as:

Assess the status of current development and practicality of novel methods for obtaining robust abundance estimates of cetaceans in the North Atlantic.

Desired outcomes are to:

i) Examine the different methods (including both sampling and analysis) and assess the extent to which each method fulfils the needs described and is sufficiently developed to be implemented.
ii) Collate information on projects that are being developed in different places and propose lines of cooperation between groups to streamline testing efforts and more rapid development and deployment of the methods that were seen as the most promising.
iii) Define requirements for method calibration and validation compared to traditional visual methods

The Chair proposed reviewing the problems that are associated with dedicated visual cetacean surveys, to examine which alternative methods could alleviate those.

Current methods for estimating cetacean abundance in large oceanic areas, e.g., NASS, SCANS:

- May not offer sufficient precision for some purposes;
- May only provide an infrequent snapshot of current abundance, usually not sufficient to assess changes in distribution and abundance at seasonal or shorter time scales;
- Are usually conducted in the summer, and therefore to not capture seasonal dynamics;
- Usually do not cover the entire range of a stock/population, may not relate to specific stocks, in that it is not possible to distinguish stocks visually;
- May be costly, and thus may only be conducted at relatively long time-intervals, which prevent monitoring dynamic events;
- Are labour intensive in planning, conduct and analysis, and can be time consuming;
- Require daylight and acceptable sea state to be conducted.

Ideally, therefore, alternative methods should be robust, more precise, more flexible, easy to deploy, and eventually cheaper, than conventional sightings surveys.

An important point mentioned was that any alternative methods should be calibrated with present methods, so any methodological changes do not preclude comparisons to earlier estimates in the time series.

The workshop should not focus on a specific method but look at pros and cons of different methods/platforms and their complementarity. It would also be important to see which kind of sample size and spatial coverage is needed, and the cost related to the sampling. What is the minimum sampling required for a robust estimate, e.g., for genetic methods how many animals do you need to approach and sample or re-sample, and for genetic markers, can hunts provide samples or do samples need to be collected from live animals?

The following list of alternative methods that should be looked at was proposed (listed by approximate priority):

- Close kin mark recapture (CKMR)
- Co-platform with fishery surveys
- Passive acoustic monitoring using fixed stations or mobile platforms
- Camera systems deployed on opportunistic platforms (ferries, shipping, uncrewed vehicles)
- Use of high-resolution satellite images
- Mark-recapture using photo-id or genetic markers

The WG expressed an interest in the possibility in combining different methods, not necessarily completely replacing the visual surveys (but this would have to come with a concurrent change in analysis methods). Gilles mentioned the necessity to also look at modelling and analytical methods that could combine estimates provided by different methods. Biuw informed that the upcoming modelling WS will look at some integration of different approaches using models, but not in the depth suggested by Gilles, so this could represent a further step.

Workshop Structure

Invited experts would be asked to prepare presentations on the methods of interest. This part would be followed by a plenary or group discussions regarding potentialities and recommendations for further development and ways forward.

The Workshop would be open to SC members, invited experts, and possibly other interested scientists, within a pre-defined maximum number of participants.

The WG recommended that a cooperation with the IWC and other relevant organisations be sought. Givens mentioned that the ASI subcommittee (IWC) would likely be interested in sending some members along. Desportes reminded that decisions on external cooperation should be agreed upon by the Council.

The workshop is envisioned for late 2026 or early 2027, left to the organising committee to decide exacts date and most favourable location.

Steering Committee

It will be responsible for further development of the workshop structure, the agenda, the choice of experts that should be invited for presenting different methods. The Steering Committee should clearly define the framework of the invited experts' presentations, and which questions they have to answer (state of the art, average costs, pros and cons, sample size needed, cost per sample, geographical distribution, considerations on compatibility and feasibility in the North Atlantic, etc.).

Besides SC members and the Secretariat, Harris was invited to the Steering Committee.

A list of potential invitees included Hans Skaug, Mark Bravington, Lotte Kindt-Larsen, Daniel Zitterbart, Olaf Boebel, and Hannah Cubaynes. Biuw and Sigurdsson (SC) were seen as possible co-Chairs.

12. ADOPTION OF REPORT

A draft of the Report, with detailed conclusions and recommendations, was accepted during the meeting. The final report was adopted by correspondence on 15 October.

13. CLOSE OF MEETING

The Chair thanked NAMMCO for inviting him to that role, in light of his particular interest in the group's progress, having worked extensively in the field and contributed to its past findings. He expressed again his disappointment at the poor level of preparedness of some of the analyses, having taken great personal pride in previous years that the AEWG always completed its terms of reference, but observed that the discussions had been fruitful despite this. He thanked the participants, especially those attending online, for their input and patience.

The group applauded the Chair for his excellent work keeping the meeting to task, and his significant effort in the AEWG over many years, and thanked Garagouni for rapporteuring, as well as the Greenland Representation for hosting. The external experts thanked NAMMCO for the invitation to participate.

The meeting concluded at 12:09 on 26 September.

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://www.jstor.org/stable/3802415

Miller, D. L., Rexstad, E., Thomas, L., Marshall, L. & Laake, J. L. (2019). Distance Sampling in R. *Journal of Statistical Software, 89*(1), 1–28. https://doi.org/10.18637/jss.v089.i01

APPENDIX 1: AGENDA

1. **Welcome from the Chair**
2. **Adoption of agenda**
3. **Appointment of rapporteurs**
4. **Review of available documents**
5. **Aerial surveys (Greenland)**
    - 5.1. Methods
    - 5.2. Minke whale
    - 5.3. Fin whale
    - 5.4. Humpback whale
    - 5.5. Pilot whale
    - 5.6. White-beaked dolphin
    - 5.7. Harbour porpoise
    - 5.8. Trends in abundance
6. **Presentation of IWC ASI Working Group**
7. **Shipboard surveys**
    - 7.1. Faroe Islands/Iceland
        - 7.1.1. General methods
            - 7.1.1.1. Dedicated surveys
            - 7.1.1.2. Co-platform surveys
        - 7.1.2. Minke whale
        - 7.1.3. Fin whale
        - 7.1.4. Pilot whale
    - 7.2. Norway
        - 7.2.1. General methods
            - 7.2.1.1. Dedicated survey (2024 coverage)
            - 7.2.1.2. Co-platform surveys
        - 7.2.2. Minke whale
        - 7.2.3. Fin whale
8. **Overall estimates by species**
    - 8.1. Minke whale

8.2. Fin whale

8.3. Pilot whale

9. Plans for publication of results

10. Model-based estimates for non-target species

11. Next AEWG meeting

12. Alternative survey methods for cetaceans – ad hoc WG meeting

12.1. Desired meeting outcomes

12.2. Potential survey methods

12.3. Participants

12.4. Timing/location

13. Report adoption and meeting close

13.1. Review and adoption of report

13.2. Closing remarks

APPENDIX 2: PARTICIPANT LIST

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APPENDIX 3: LIST OF DOCUMENTS

Document Reference	Title	Agenda Item
Working Documents		
AEWG/2025-02/01	Draft Agenda	2
AEWG/2025-02/02	Draft List of Participants	1, 3
AEWG/2025-02/03	Draft List of Documents	4
AEWG/2025-02/04	Greenlandic whale abundance	5
AEWG/2025-02/05	Iceland and Faroe Islands fin and minke whale abundance – *preliminary*	7.1
AEWG/2025-02/06	Iceland and Faroe Islands pilot whale abundance – *preliminary*	7.1.4
AEWG/2025-02/07	ASI presentation to NAMMCO	6
AEWG/2025-02/08	Norwegian minke whale abundance estimate for mackerel survey – *preliminary*	7.2.2
AEWG/2025-02/09	Plans for WS on alternative survey methods for cetacean abundance – *draft*	12
AEWG/2025-02/10	Post hoc stratification for shipboard surveys	7.1, 7.2
For information documents		
AEWG/2025-02/FI/01	Report of the AEWG January 2025 meeting	Several
AEWG/2025-02/FI/02	NASS 2024 Report to SC/31 with Cruise Reports	Several
AEWG/2025-02/FI/03	Report of the AEWG 2019	Several
AEWG/2025-02/FI/04	Abundance of whales in West and East Greenland in summer 2015	5
AEWG/2025-02/FI/05	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	7.1.4
AEWG/2025-02/FI/06	Estimates of the abundance of cetaceans in the central North Atlantic based on the NASS Icelandic and Faroese shipboard surveys conducted in 2015	7.1
AEWG/2025-02/FI/07	Estimates of the abundance of cetaceans in the central North Atlantic from the T-NASS Icelandic and Faroese ship surveys conducted in 2007	7.1
AEWG/2025-02/FI/08	Distribution and abundance of cetaceans in Icelandic waters over 30 years of aerial surveys	7.1

AEWG/2025-02/FI/09	Estimated abundances of cetacean species in the Northeast Atlantic from two multiyear surveys conducted by Norwegian vessels between 2002-2013	7.1
AEWG/2025-02/FI/10	Estimated abundances of cetacean species in the Northeast Atlantic from Norwegian shipboard surveys conducted in 2014-2018	7.2
AEWG/2025-02/FI/11	Distribution and abundance of killer whales in the central North Atlantic, 1987-2015	7
AEWG/2025-02/FI/12	Pooling robustness in distance sampling: Avoiding bias when there is unmodelled heterogeneity	5
AEWG/2025-02/FI/13	A review of unmanned vehicles for the detection and monitoring of marine fauna	12
AEWG/2025-02/FI/14	Bottlenose dolphin abundance in the NW Mediterranean: addressing heterogeneity in distribution	5