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NORWAY - PROGRESS REPORT ON MARINE MAMMALS 2024

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I. INTRODUCTION

This report summarises the bulk of Norwegian research on pinnipeds and cetaceans conducted in 2024 and conveyed to the compilers. The research presented here was conducted at, or by representatives and associated groups of,

- The Institute of Marine Research (IMR): www.hi.no
- The Norwegian Polar Institute (NP): www.npolar.no
- University of Tromsø – The Arctic University of Norway, Department of Arctic and Marine Biology, Research group Arctic Chronobiology & Physiology (UiT-AMB-ACP): http://arcticchronobiologyandphysiology.blogspot.com/
- University of Oslo (UiO): www.uio.no
- Norwegian Orca Survey (NOS): www.norwegianorcasurvey.com
- The University of Agder (UiA): www.uia.no
- Sysselmesteren på Svalbard (SMS): www.sysselmesteren.no/

II. RESEARCH BY SPECIES 2024

PINNIPEDS

In March 2022, reconnaissance and aerial surveys were performed in the Greenland Sea pack-ice (the West Ice), to assess the pup production of the Greenland Sea populations of **harp** and **hooded seals**. One fixed-wing aircraft, stationed in Akureyri (Iceland), was used for reconnaissance flights and photographic surveys along-transects over the whelping areas. A helicopter, operated from the expedition vessel (Research Icebreaker Kronprins Haakon) also flew reconnaissance flights, and was subsequently used for monitoring the distribution of seal patches and age-staging of the pups. Reconnaissance surveys were flown by helicopter and fixed-wing aircraft in an area along the ice edge between 69°30'N and 74°48'N. As was observed in 2018, the ice cover was narrow and the edge closer to the Greenland coast compared to previous survey years. The reconnaissance surveys were adapted to the actual ice configuration, usually flown at altitudes ranging from 160–300 m, depending on weather conditions. Repeated systematic east-west transects with a 10 nm spacing (sometimes 5 nm) were flown from the eastern ice edge and usually 20–30 nautical miles (sometimes longer) over the drift ice to the west.

On 28 March, two photographic surveys were flown to cover the entire whelping patch area which was a little more than 86 nm in south-north direction. The spacing between transect lines was ~3nm. In total, 2463 photos were taken during the surveys. All images were analyzed in 2023, both manually (by two experienced readers) and with the help of and automatic image reading system using deep learning. For harp seals the pup production estimates were calculated at 92,769 (CV = 0.20) based on the manual analyses, whereas the automatic reading system gave the number as 88.253 (CV = 0.13). These estimates are very close to estimates from similar surveys in 2002, 2007 and 2012, but considerably higher than in 2018. For hooded seals, the 2022 estimate based on manual analyses was 13,509 (CV = 0.13), the corresponding number from the automatic analyses was 11.044 (CV = 0.14). This is slightly but not significantly higher than the 2018 estimate. Results from manual and automatic reading are quite close, and work is now in progress to improve and refine the automatic based method which will probably be the method used in the future. (IMR, NCC)

Data for assessment of biological parameters (growth, condition, age at maturity, fertility) were collected from 176 **harp seal** females during Norwegian commercial sealing in the West Ice in 2019. Preliminary results show that mean age at maturity (MAM) for this sample was estimated at 6.4 years, which was almost identical to the MAM of 6.2 (±0.3 SD) years estimated for the previous sample collected in 2014. The pregnancy rate estimated for the 2019 sample was 0.85 (0.04 SD) and thus nominally a bit lower than the 2014 estimate of 0.91 (0.03 SD). (IMR)

In March-April 2024, we carried out a similar data collection from **harp seals** during the commercial sealing period in the West ice. This material will provide additional information on age, age at maturity, body condition, size distribution as well as more time-resolved information on diet (stable isotope analyzes of different tissues with different time resolutions throughout the year, as well as fatty acid analyses). This data will be processed and analyzed during autumn 2024 and early 2025.(IMR)

Data for assessment of biological parameters (growth, condition, age at maturity, fertility) were collected from 306 **harp seal** females during Norwegian commercial sealing in the East Ice in 2021. Preliminary information shows that mean age at maturity (MAM) for this sample was estimated at 6.6 years, which was close to the MAM of 6.9 (±0.5 SD) years estimated for the previous sample collected in 2018. The pregnancy rate estimated for the 2021 sample was 0.72 (0.03 SD), which was significantly lower than the 2018 estimate of 0.91 (0.03 SD) ($P<0.01$). (IMR)

A recent study aimed to investigate the relationship between shooting angle to the head and animal welfare outcomes in the hunt of young **harp seals**. The study population consisted of young harp seals belonging to the Greenland Sea harp seal population. A sample of 171, 2–7 weeks old, weaned harp seals of both sexes were included. The study was conducted as an open, randomised parallel group designed trial during the regular hunt. The animals were allocated into four groups, A–D, according to the observed shooting angle to the head, defined as the angle between the direction of the shot and the longitudinal axis of the animal's head: (A) directly from the front; (B) obliquely from the front; (C) directly from the side; and (D) obliquely or directly from behind. Instantaneous death rate (IDR) and time to death (TTD) were the main variables. The mean IDR differed significantly between groups and was highest in group B (96.8%) and lowest in group C (66.7%). For all groups combined it was 84.2%. The mean TTD for seals not rendered instantaneously unconscious or dead (n = 27) differed significantly between groups and was shortest in group A (16 s) and longest in group C (85 s). However, the number of animals included in the TTD analysis was limited. In conclusion, based on the significantly higher IDR, the shooting angle obliquely from the front is recommended to help achieve the best animal welfare outcomes during the hunt of young harp seals. (IMR)

Harbour seal assessments have been conducted along the entire mainland Norwegian coast in 1996-1999, 2003-2006, 2008-2015 and 2016-2021. New counts in 2022-2024, covered the coast from Skagerrak to the north boarder of Trøndelag County. Norwegian authorities decided in 2010 that 7000 harbour seals should be the target level (TL) for the management in Norway. TL was approximately the average of the total assessments in 1996-1999 and 2003-2006. It was decided to use the counties along the coast as management units. Catch quotas based on assessments in each county should be used to keep the seal abundance around TL. In north Skagerrak, a total of 350 harbour seals were counted in the counties Østfold, Vestfold and Telemark in 1996-1999. In the following years the abundance was stable in Østfold but since 2008 the abundance increased, mainly in Vestfold and Telemark to a total of c. 790 seals in north Skagerrak in 2016. In 2022, the total abundance had increased to c.1590 seals in Østfold, Vestfold and Telemark. In Agder, the abundance was c.100 seals. Tagging experiments in Vestfold and Telemark showed harbour seal migrations between Norwegian Skagerrak to Sweden and Denmark. The large increase in seal numbers in Norwegian Skagerrak is probably due to both population growth and migrations from Swedish Skagerrak, where the harbour seal abundance is decreasing. On the Norwegian west-coast the harbour seal abundance in Rogaland County was slightly below TL of 480 seals in the period 2003-2016 but had increased to above TL in 2023. In Vestland County, the harbour seal abundance was at a low level in 2003-2015, but increased to c. 600 seals in 2022, which was 13% below TL. In Møre og Romsdal County, the harbour seal abundance increased from a low level in 2003-2006 to 820 seals in 2024, about 18 % below TL. In Trøndelag County the harbour seal abundance was at a high level in 2003-2006 when c.1660 seals were counted. In 2008-2015 the abundance had reduced to c. 730 seals. The abundance increased to c.1200 seals in 2024, which is c.12 % below the TL. In Nordland the harbour seal abundance decreased by 37 % from 2012 to 2020, which was 23% below TL. In Troms, the numbers increased from c.560 in 1996-1999 to c. 990 in 2013 but had reduced to 760 seals in 2020. In Finnmark, the total harbour seal numbers had increased by 14% from 2008-2015 to 1120 seals in 2021. The total harbour seal abundance was c. 6960 animals along the Norwegian coast in 2016-2021, which was close to the Target Level of 7000 seals in Norway. (IMR).

Incidental capture of non-target species by fisheries, also referred to as bycatch, is a major concern for the management of marine megafauna species. In Norway, it has been estimated that around 555 **harbour seals** get entangled and drown in gillnets every year. Most of these bycatch events occur in large-mesh gillnet fisheries targeting cod and monkfish. Young-of-the-year individuals represent the largest proportion of bycaught harbour seals. To increase our understanding of harbour seal bycatch events along the Norwegian coast, times and areas of potential bycatch risk were identified. Seasonal variation in the at-sea distribution of harbour seals was simulated based on movements from their haul-out sites to predicted at-sea locations. Relative age-specific bycatch abundances were used to weigh the different seasons (times of the year) based on harbour seal age. The over-lap in the distribution of harbour seals and the documented distribution of fishing effort was then used to estimate the relative bycatch risks between harbour seals and fisheries in defined Statistical Sea Locations (SSLs) in each of the four seasons. The method used here provides a general framework for understanding temporal and spatial interaction between harbour seals and coastal gillnet fisheries. The times and areas of high interaction risk that were identified can be used in management practices to increase our understanding of bycatch events, and to ultimately reduce unwanted bycatch of harbour seals in coastal fisheries along the Norwegian coast. (IMR, UiO)

In a study of **harbour seals**, a research group used time-lapse camera surveys to monitor the haulout patterns of the species at two selected sites in the Norwegian Skagerrak, Lyngør and Østre Bolæren, over 12 and 4 months, respectively. The goal was to investigate how the number of seals hauling out on land varied seasonally and how it was influenced by environmental parameters (wind speed, air temperature, and water level), the time of the day, and anthropogenic disturbances. As expected, the number of seals hauled out increased with increasing air temperature and decreased with increasing wind speed and water level. Clear circadian patterns in the seal haulout behaviour were identified during autumn and winter when a significantly higher number of seals were observed on land at night. Moreover, haulout patterns showed significant seasonal variation, with a peak in haul outs being observed during the moulting season in August. Despite an expected high usage of land during the breeding season in early summer, the number of seals hauled out at the Lyngør study site was low during this period, especially during weekends and summer holidays, maybe due to increased disturbance from boats. This study provides valuable insights into the factors influencing the haulout behaviour of the species in the region and suggests possible effects of human disturbance on harbour seal behaviour in the area. (UiA, IMR)

Grey seal pup production was estimated in the counties Troms and Finnmark in November-December 2021. It was a reduction of pups born in Troms by ca 25% from 65 pups in 2016 to 49 pups in 2021. Grey seal pup production in Finnmark increased by ca 10% from 206 pups in 2015 to 226 pups in 2021. In 2022, 37 grey seal pups were born in Rogaland County. Pup counts were carried out in the counties Trøndelag and Nordland in October/November 2023-2024. In Trøndelag, pup production has gradually reduced from 272 pups born in 2007-2008 to 83 pups in 2023. Also, pup production along the mainland coast in Nordland was reduced from 487 pups in 2007-2008 to 119 pups in 2023. In Lofoten (Nordland), pup production was reduced from 122 pups in 2020 to 87 pups in 2024. A total production of 601 grey seal pups in Norway was estimated in 2021-2024. The politically decided target level is a production of 1200 pups. It should be noted that no catch quotas on grey seals have been given in the counties Møre og Romsdal, Trøndelag and Nordland in the period 2016-2024. Using multipliers of 4,0-4,7 between pup production and total population, suggests a total population of about 2400-2800 grey seals (1+ animals) in Norway. (IMR)

Natural mortality, such as predation by killer whales, could contribute to this population decline. Another factor may be mortality due to incidental bycatch of **grey seals** in gillnet fisheries. The extent of this bycatch and its distribution in time and space are currently highly uncertain, because of uncertainties in the only bycatch data we have for the relevant fisheries, i.e. bycatch data collected by IMR's reference fleet. The two main causes of uncertainty are 1) uncertain species ids and 2) missed animals/dropouts – seals that fall out of the nets as they emerge from the water, without being registered by the fishers. IMR plans to start addressing these issues in 2025 by equipping 2-7 vessels with an electronic monitoring system. This system can be used to check and validate species ids and may detect animals that would otherwise be missed by the fishers. Validating species ids and estimating dropout rates are expected to improve grey seal bycatch estimates. (IMR)

Ringed seals in all ice-covered areas in Kongsfjorden, Isfjorden and Van Mijenfjorden Svalbard, were surveyed with drones in May/June for hauled-out ringed seals (and any other marine mammals hauled out here). This is part of a new time series to monitor ringed seal population trends in selected fjords in the archipelago. (NP).

In addition, 25 **ringed seals** were collected from the Isfjorden area, Svalbard, to the Norwegian Environmental Specimen Bank. Data on morphometrics, age, sex and various tissue are delivered to this Specimen Bank. (NP).

Harbour seals (N=5) in Kongsfjorden, Svalbard, were instrumented with dataloggers that collect high resolution behavioural data for foraging studies. (NP and Japanese Institutions

No UiT research cruise was conducted in 2024. However, research on the physiology of **hooded seals** from the Greenland Sea stock has continued based on samples collected in previous years (UiT-AMB-ACP).

CETACEANS

An account of the historical, current and possible future management of **common minke whales** in Norway is presented in a review paper. The current management is based on an approach very similar to the International Whaling Commission's Revised Management Procedure (RMP) and requires historical and current catch statistics, together with new abundance estimates with associated variance estimates every six years. The abundance estimates are based on visual sampling online-transect sighting surveys with two independent observer platforms. These surveys are no longer economically viable with the current limited commercial harvest. Alternative methods for obtaining abundance estimates are discussed, including a simpler sighting survey design and genetic mark-recapture methods. The RMP requires Implementation Reviews desirably every six years, which take into account all new information available. The associated simulation trials are very technical and complex, and few experts have the insight to run these simulation tests. Simpler alternatives to the current Implementation Reviews are discussed. The objective is to develop more economically viable methods for abundance estimation and a simpler procedure for catch limit calculation without compromising the sustainability of the harvest. Any new procedure for abundance estimation and catch limit calculations will be submitted to the International Whaling Commission Scientific Committee for discussion. (IMR)

Global warming is causing rapid change in marine food webs, particularly at northern latitudes where temperatures are increasing most rapidly. In this study, the diet of **common minke whales** was assessed both in terms of short-term (morphological analyses of digestive tract contents) and longer-term (tissue chemical markers: fatty acids and stable isotopes) prey use in the northern Barents Sea to see if they are prey shifting. Samples (blubber cores, muscle, and stomach contents) were obtained from 158 common minke whales taken during Norwegian commercial whaling operations during summer over the period 2016–2020. Two prey items, capelin and krill (primarily *Thysanoessa* sp.) dominated the stomach contents in the entire period of investigation, which included sampling both in June and in August, similar to findings from earlier studies. A few gadoids were also observed in the whale stomachs. Lower blubber fatty acid (FA) contents in 2016/2017 as compared with 2018/2019 were observed. This is most likely explained by differences in sampling time (June in 2016/2017 vs August in 2018/2019, i.e., after a longer feeding period during the summer in the latter case). This explanation also fits with the fact that FA profiles of the 2018/2019 whales were more similar to the FA profiles of the potential prey, presumably reflecting the two months longer assimilation time for these whales. Multidimensional mixing models based on carbon and nitrogen isotope composition of the most likely prey groups suggested that the whales ate mostly krill in four of the five sampling years. In 2018 there were indications of a higher proportion of gadoid fish, showing some dietary flexibility. The trophic level of the whales' feeding, as interpreted from the nitrogen isotope values, was positively correlated with blubber thickness suggesting that fish-eaters tended to assimilate more energy than whales that focused more exclusively on lower trophic prey. The variation suggested by different dietary analyses methods − stomach contents, fatty acids, and stable isotopes – most likely reflects different turnover times, with muscle stable isotopes likely representing several months of dietary integration, while lipid stores are more dynamic and may represent weeks, and stomach contents represent feeding events during the last few hours. The change in diet of minke whales from small pelagic fishes (in the past) to a greater quantity of krill and demersal fish (seen in this study) suggests that the whales are responding to the ongoing borealization of the Barents Sea ecosystem. (IMR, NP)

Studying movement patterns of individual animals over time can give insight into how they interact with the environment and optimize foraging strategies. **Humpback whales** undertake long seasonal migrations between feeding areas in polar regions and breeding grounds in tropical areas. During the last decade, several individuals have had up to a 3-month stop-over period around specific fjord-areas in Northern Norway to feed on Norwegian spring-spawning (NSS-) herring. Their behavioral patterns during this period are not well understood, including why some whales seemingly leave the fjords and then later return within the same season. To investigate whale behavior during this seasonal stopover, humpback whale tracks were classified into five distinct movement modes; ranging, encamped, nomadic, roundtrip and semi-roundtrip. A behavioral change point analysis (BCPA) was used to select homogeneous segments based on persistence velocity. Then, net squared displacement (NSD) over time was modeled to differentiate movement modes. This study also manually identified longer roundtrips away from the fjords that lasted several days and examined movement modes within these.Inside the fjord systems, encamped mode was most prevalent in December–January, suggesting the whales were mainly foraging on overwintering NSS-herring in this area. During the same winter seasons, half of the whales left the fjords and then returned. It was hypothesized that these trips serve as 'searching trips' during which the whales seek better feeding opportunities outside the fjords. If better foraging conditions are not found, they return to the fjords to continue their feeding. The overall most common mode was ranging (54%), particularly seen during the start of their southwards migration and in areas outside the fjord systems, indicating that the whales mainly moved over larger distances in the offshore habitat. This study serves as a baseline for future studies investigating both the searching trip theory and humpback whale behavior in general, and confirms that this method could be useful to analyze local scale movement patterns of satellite tagged whales. (UiT, IMR)

Short-, medium-, and long-chain chlorinated paraffins (CPs) (SCCPs, MCCPs, and LCCPs) and dechloranes are chemicals of emerging concern; however, little is known of their bioaccumulative potential compared to legacy contaminants in marine mammals. A recent study analyzed SCCPs, MCCPs, LCCPs, 7 dechloranes, 4 emerging brominated flame retardants, and 64 legacy contaminants, including polychlorinated biphenyls (PCBs), in the blubber of 46 individual marine mammals, representing 10 species, from Norway. Dietary niche was modelled based on stable isotopes of nitrogen and carbon in the skin/muscle to assess the contaminant accumulation in relation to diet. SCCPs and dechlorane-602 were strongly positively correlated with legacy contaminants and highest in **killer** and **sperm whales** (median SCCPs: 160 ng/g lw; 230 ng/g lw and median dechlorane-602: 3.8 ng/g lw; 2.0 ng/g lw, respectively). In contrast, MCCPs and LCCPs were only weakly correlated to recalcitrant legacy contaminants and were highest in **common minke whales;** median MCCPs: 480 ng/g lw and LCCPs: 240 ng/g lw). The total contaminant load in all species was dominated by PCBs and legacy chlorinated pesticides (63–98%), and MCCPs dominated the total CP load (42–68%, except 11% in the long-finned **pilot whale**). Surprisingly, no relation was found between contaminant concentrations and dietary niche, suggesting that other large species differences may be masking effects of diet such as lifespan or biotransformation and elimination capacities. CP and dechlorane concentrations were higher than in other marine mammals from the (sub)Arctic, and they were present in a killer whale neonate, indicating bioaccumulative properties and a potential for maternal transfer in these predominantly unregulated chemicals. (UiO, IMR)

Understanding and predicting interactions between predators and prey and their environment are fundamental for understanding food web structure, dynamics, and ecosystem function in both terrestrial and marine ecosystems. Thus, estimating the conditional associations between species and their environments is important for exploring connections or cooperative links in the ecosystem, which in turn can help to clarify such directional relationships. For this purpose, a relevant and practical statistical method is required to link presence/absence observations with biomass, abundance, and physical quantities obtained as continuous real values. These data are sometimes sparse in oceanic space and too short as time series data. To meet this challenge, a recent study provides an approach based on applying categorical data analysis to present/absent observations and real-number data. The real-number data used as explanatory variables for the present/absent response variable are discretized based on the optimal detection of thresholds without any prior biological/ecological information. These discretized data express two different levels, such as large/small or high/low, which give experts a simple interpretation for investigating complicated associations in marine ecosystems. This approach is implemented in the previous statistical method called CATDAP developed by Sakamoto and Akaike in 1979. The proposed approach consists of a two-step procedure for categorical data analysis: (1) finding the appropriate threshold to discretize the real-number data for applying an independent test; and (2) identifying the best conditional probability model to investigate the possible associations among the data based on a statistical information criterion. The investigation perform a simulation study to validate the proposed approach and investigate whether the method's observation includes many zeros (zero-inflated data), which can often occur in practical situations. Furthermore, the approach is applied to two datasets: (1) one collected during an international synoptic krill survey in the Scotia Sea west of the Antarctic Peninsula to investigate associations among krill, **fin whale**, surface temperature, depth, slope in depth (flatter or steeper terrain), and temperature gradient (slope in temperature); (2) the other collected by ecosystem surveys conducted during August–September in 2014–2017 to investigate associations among **common minke whales**, the predatory fish Atlantic cod, and their main prey groups (zooplankton, 0-group fish) in Arctic Ocean waters to the west and north of Svalbard, Norway.(IMR)

Among large cetaceans in the Southern Hemisphere, **fin whales** were the most heavily exploited in terms of numbers taken during the period of intense industrial whaling. Recent studies suggest that, whilst some humpback whale populations in the Southern Hemisphere appears to have almost completely recovered to their estimated pre-whaling abundance, much less is known about the status of Southern Hemisphere fin whales. Circumpolar estimates in the 1990s suggest an abundance of about 5500 animals south of 60° S, while the IDCR/SOWER-2000 survey for the Scotia Sea and Antarctic Peninsula areas estimated 4670 fin whales within this region in the year 2000. More recent studies in smaller regions indicate higher densities, suggesting that previous estimates are overly conservative and/or that fin whales are undergoing a substantial increase. Here we report findings from a recent multi-vessel single-platform sightings survey carried out as part of the 2019 Area 48 Survey for

Antarctic krill. While fin whales were encountered throughout the entire survey area, which covered the majority of CCAMLR Management Area 48, they were particularly abundant around the South Orkney Islands and the eastern Bransfield Strait. Large feeding aggregations were also encountered within the central Scotia Sea between South Orkney Islands and South Georgia. Distance sampling analyses suggest an average fin whale density throughout the Scotia Sea of 0.0256 (CV=0.149) whales per km^2, which agrees well with recent density estimates reported from smaller sub-regions within the Scotia Sea. Design-based distance sampling analyses resulted in an estimated total fin whale abundance of 53,873 (CV = 0.15, 95% CI 40,233–72,138), while a density surface model resulted in a slightly lower estimate of 50,837 (CV: 0.136, 95% CI 38,966–66,324). These estimates are at least an order of magnitude greater than the previous estimate from the same region based on the IDCR/SOWER-2000 data, suggesting that fin whales are undergoing a substantial abundance increase in the South Atlantic. This may have important implications for the assessment of cetacean population trends, but also for CCAMLRs spatial overlap analysis process and efforts to implement a Feedback Management system for Antarctic krill. Our abundance estimate suggests an annual summer krill consumption by fin whales in the Antarctic Peninsula and Scotia Sea area of 7.97 (95% CI 4.94–11.91) million tonnes, which would represent around 20 times the total krill catch taken by the commercial fishery in Area 48 in the same season, or about 12.7% of the 2019 summer krill standing stock estimated from data collected during the same survey. This highlights the crucial importance of including cetacean krill predators in assessment and management efforts for living marine resources in the Southern Ocean and particularly stresses the urgent need for a re-appraisal of abundance, distribution and ecological role of Southern Hemisphere fin whales. (IMR)

During the period June 19 to August 14 2024, a double-platform sighting surveys was conducted with the chartered vessel M/S Stålbas, following a mosaic design to cover the five small areas (EB, EN, ES, EW, CM) over a period of 6 years. The main purpose of this dedicated national survey is to gather data for estimating the size of the minke whale population in the Northeast Atlantic, while also collecting observation data on other whale species. In 2024, the survey covered the Svalbard area with coverage planned for the Norwegian zones of the Barents Sea (EB) to expand on sighting data for this area. Approximately 2700 nautical miles of transects (primary effort) were completed in management area ES. Combined for the two platforms on Stålbas (preliminary figures), 303 minke whale sightings were recorded in ES. Other species included fin whales (334 sightings), humpback whales (132 sightings), blue whales (35 sightings), sei whales (12 sightings), sperm whales (14 sightings), belugas (567 sightings), beaked whales (4 sightings), and porpoises (4 sightings). Additionally, on August 13th, a fjord survey for porpoises was conducted in Balsfjord. (IMR)

From 2025, Norway's sighting survey program (NILS) for estimating abundance of **minke whales** (ongoing since 1995) will no longer be carried out from dedicated charter vessels; thus, IMR is exploring multiple different methods for estimating the abundance of minke whales for the purpose of managing the minke whale stock in accordance with the Revised Management Procedure (RMP) of the International Whaling Commission. New methods are currently being developed/tested in collaboration with one of IMR's innovation projects, NEMO (NEw MOnitoring Methodology). The new method that have been explored in 2024 are described below. (IMR)

Experimental sighting surveys were conducted on a mackerel survey vessel, Eros, to test the feasibility of conducting dedicated sighting surveys on vessels involved in other non-dedicated surveys. Additionally, this survey provided added coverage for NASS-2024 (North Atlantic Sighting Survey – coordination of synoptic whale surveys in the North Atlantic through NAMMCO) to fill the coverage gap between the Icelandic whale survey and the Norwegian survey blocks around Svalbard. The results revealed some key challenges with this approach. First, the mackerel survey protocol, which is not hindered by most weather conditions, presented large variations in observation conditions and dramatically reducing the transect coverage possible for whale sightings. This is a known issue with other non-dedicated sighting surveys, such as ecosystem surveys in the Barents Sea. Second, the limited cabin space for additional persons onboard prevented the use of a two-platform setup on Eros, thus, only single-platform setup with two observers was feasible. This limitation prevents the use of the current analysis methods for abundance estimation, which accounts for missed observations through mark-recapture methods. (IMR)

A relatively new method for stock estimation being explored for **minke whale** abundance estimation is known as CKMR (Close-Kin Mark-Recapture). The main idea is that genetic relationships between individuals caught in the hunt, or from dedicated tagging surveys, can be determined genetically. All individuals caught in the minke whale hunt are included in a DNA registry which includes 15,168 individuals caught between 1997-2024. The Institute of Marine Research has an ongoing larger CKMR project on coastal cod, and the expertise gained from it can be transferred to marine mammals. The number of samples required depends on stock size, but as a general rule, 50 related individuals are needed in the sample to achieve a reasonable precision in stock estimates. (IMR)

In addition to the novel CKMR method described above, standard mark-recapture methods are also being tested through a biopsy sampling program. The goal is to collect 300 minke whale DNA samples from wild **minke whales** to serve as the initial “mark”. Then, through the collection of DNA samples from the minke whale catch registry, we will “recapture” previously sampled animals allowing an estimate of the population to be made. This study will provide new information on stock distinctiveness and stock mixing, through comparison of the location of marking and recapture, as we currently know very little about the movement pattern of minke whales. (IMR)

Alongside the biopsy sampling program, and in collaboration with eWHALE, alternative means of collecting DNA samples are being explored. Once a biopsy is extracted, water samples are also taken in the vicinity of the whale (both **minke** and **fin whales**) to extract for eDNA (environmental DNA). The aim is to obtain eDNA alongside paired biopsy samples to validate the eDNA-based individual identification for population genetic analyses. In 2024, biopsy samples were collected alongside satellite tagging, using a modified carrier with an embedded biopsy tip. This method proved challenging as the carrier often remained attached to the whale longer, making the carrier and biopsy more difficult to recover. Methods were modified to instead utilize separate tagging biopsy guns, deployed simultaneously. This method has proven successful for fin whales but has not been tested for minke whales. Results are preliminary, but the analyses show that water samples taken near surfacing fin whales yields eDNA sufficient for individual identification. (IMR)

IMR is testing innovative methods such as UAVs (Unmanned Aerial Vehicles) or drones. Preliminary tests with a Vertical Take-Off and Landing (VTOL) drone were conducted on the research vessel Prinsesse Ingrid Alexandra in Kvænangen in November 2024, which showed that it is entirely possible to operate such large machines also from a relatively small vessel. These activities were done in collaboration with NORCE and NTNU, under the newly formed

Norwegian Autonomous Systems Consortium (NASC), as well as a collaborative partner from the UK (O3ST). Whether drones are a good option for whale surveys requires further testing, which will constitute an important activity during a dedicated method development cruise in July 2025, for which IMR has acquired two long-distance drone systems. (IMR)

There have also been innovative developments in the use of drones for satellite tagging and biological sample collection of whales. Integration of drones with specially designed payload packages are being developed specifically for use in whale research and monitoring, pioneered by Ocean Alliance. Such tools would enable these activities to occur directly from survey vessels, without the need to stop and launch a small vessel to approach whales, thereby greatly increasing our ability to collect critically important data aside from counts, to improve population assessments for a range of cetaceans in Norwegian waters. IMR and O3ST are now collaborating on a system for deploying satellite tags and other data loggers for testing in 2025. The intent is for this system to be further developed to allow sample collection with retrieval, for instance biopsy sampling for DNA and stable isotope analyses. (IMR)

Fixed automated systems that can be installed on existing research vessels and other 'platforms of opportunity' are also being explored for detection and counting of whales. IMR is in close dialogue with Kongsberg, which has developed a system for 'situational awareness', based on a regular camera as well infrared sensor. Similar systems have been developed for whale detection, but the advantage of Kongsberg's system is that it can be easily integrated with existing navigation systems on IMR's research vessels to provide integrated data streams with position, course, the vessel's movements etc. This could provide significant operational advantages and more systematic and integrated data and will in a longer perspective be able to be installed on a majority of vessels to improve coverage in space and time. (IMR)

The Barents Sea Ecosystem Survey (BESS) continued in 2024. Data from this year's (2024) survey is still being summarized with preliminary results presented here. During the ecosystem survey in the Barents Sea in August-October 2024, the research vessels G.O. Sars, Kronprins Haakon, and Johan Hjort participated. Ecosystem surveys present highly variable observation conditions regarding whales and are conducted with two fixed observers following a standard line transect setup with mode one platform. In dedicated counts, we have an upper limit of Beaufort 4 for primary transects, but in ecosystem surveys, we often extend this to Beaufort 5-6 to provide more survey coverage. In total, including all observation conditions, **minke whales** (98 sightings), **fin whales** (39 sightings), **humpback whales** (133 sightings), **blue whales** (2 sightings), **belugas** (1 sighting with 12 individuals), **sperm whales** (4 sightings), **beaked whales** (2 sightings), and **killer whales** (3 sightings with 26 individuals) were recorded. At this time of year, we find the largest concentrations of whales on the east side of Svalbard. (IMR)

Through a collaboration coordinated by NAMMCO, a new type of satellite tag has been developed to study cetacean migration patterns and changes in distribution over time. The new Mintag brands are specially adapted for use with species that are difficult to get close to, such as **minke whales** and **fin whales**, or species with a smaller body size, such as e.g. pilot whale. Based on experiences from initial pilot test in 2023, the tags were modified by the manufacturer (Wildlife Computers) in consultation with the steering group, composed of representatives from all NAMMCO countries plus Japan. For Norway's part, 10 Mintag tags were delivered, with the aim of attaching minke whales and fin whales in Norwegian waters. Fieldwork was carried out in three periods; 1) on a dedicated 2-week cruise in Lofoten/Vestfjorden in May-June, 2) during the first part of the dedicated counting survey in

June-July, as well as 3) in connection with field work related to testing mitigation measures for interactions between large whale and herring fishing in Kvænangen in November. A total of 9 tags were affixed, of which 3 were on Minke whales and 6 on fin whales. Of the three tags on minke whales, one mark gave regular and satisfactory data over a period from marking at Stamsund 27 May 2024 until the marking ended to give positions on June 25 (28 days). In total, only 2 of the 3 minke whales and 4 of the 6 fin whales tagged sent position data. The variable functionality is probably partly due to the position of the mark on the animal, as well as how deep the marks have gone. Minor modifications to the tags will be made this winter, before a larger number of tags will be tested on minke whales in July 2025. (IMR)

Experiments were carried out in October/November 2024, continuing to test acoustic deterrent devices (ADDs) to minimise the risk of **humpback** and **killer whales** becoming entangled in herring purse seine nets. Together with colleagues at the University of St Andrews (UK), The IMR and UiT have carried out tests of a novel acoustic deterrent device (ADD), meant to scare whales away from the immediate vicinity of the nets. These new ADDs are designed to elicit an acoustic startle response (ASR), mediated by an autonomous reflex in the brainstem, thereby avoiding problems with habituation and loss of deterrence effects over time. Fieldwork carried out in the Kvænangen area in 2021 and 2022 showed that this technology has great potential for deterring killer whales. However, the behavioural response of humpback whales was much more subtle, and further developments and testing was conducted in 2024 in Kvænangen Fjord in Oct-Nov). The objectives of this year’s experiments were to 1) modify the deterrent signals to achieve a stronger response by humpback whales, 2) test the modified system during controlled experiments as well as during active fishing operations, and 3) to test system configurations and methods for simple implementation by fishermen during active operations. (IMR). This year the use of infrared (IR) camera systems to detect and position whales in relation to active fishing vessels, allowed for observations during the dark phase of the fishery (before deck lights are turned on). This project also allowed IMR to test IR cameras for detected whales as a means to substitute the dedicated whale surveys. The results of this project are being processed and analysed. (IMR, UiT)

Material collected from the Norwegian **minke whale** hunt between 2016-2020 was used to investigate the whales' feeding on various prey in the northern Barents Sea in summer (June in three of the years, August in the other two). The analyses covered stomach contents providing a snapshot, fatty acids in blubber showing feeding over the preceding weeks, and stable isotopes in muscle tissue offering insight into feeding months before the hunt. Stomach analyses showed that capelin dominated the whales’ diet from 2017-2020, while krill dominated in 2016. Fatty acid profiles from whales captured in August were a better match with prey compared to those from animals captured in June, reflecting that the August animals had more time to build up their blubber layer in feeding areas than the June animals, which had significantly thinner blubber. Stable isotope analyses also confirmed the importance of krill as prey for the whales, as well as the fact that animals eating more fatty fish (like capelin) were fatter than those eating krill. The observed diet aligns well with earlier studies in the same area and season from 1992-2011. Such multi-method diet studies form a useful basis for future monitoring, which may possibly be based solely on biopsies and analysis of fatty acids and/or stable isotopes. (IMR)

Data on body condition (i.e., measures of blubber thickness, length, and girth) were collected during the 2024 **minke whale** hunt, from April to August. The average blubber thickness (measured on the back behind the blowhole) was higher for 2024 than for 2023, and there has been an increasing trend in average blubber thickness since 2021. This trend may correlate with a reduction in the cod stock and a change in the spatial distribution of minke whales. Taken together, this could indicate that minke whales have altered their feeding habits. (IMR)

Whale and plankton biologists at IMR, together with colleagues from Iceland, have initiated a study to investigate the potential of baleen whales in the Northeast Atlantic to influence primary production and the carbon cycle in the region. The basis for these investigations are analyses of faces and urine from **minke whales** and **fin whales** taken during hunting in Norway and Iceland in recent years. Results from these studies will likely be available in 2025. (IMR)

Multivariate observational data used for understanding spatial distributions and relationships between zooplankton and fish species are often collected over too short a period for time series analysis or are too sparse for applying spatial statistical models. To meet this challenge, a new approach based on categorical data analysis applied to presence/absence observations and continuous data has been proposed based on the statistical method called CATDAP, developed by Sakamoto and Akaike in 1979.The proposed method consists of a two-step procedure for categorical data analysis: (1) identifying the appropriate threshold to discretize the continuous data for applying an independent test, and (2) selecting the best conditional probability model to examine the potential associations between the data based on a statistical information criterion. A simulation study was done to validate the approach and investigated whether the method's observations include many zeros (zero-inflated data), which can often occur in practical situations. We applied this method to data collected during the SI-ARCTIC surveys conducted west and north of Svalbard between 2014 and 2017 to investigate directional associations between common **minke whales**, predatory fish like Atlantic cod, and their primary prey groups (zooplankton, 0-group fish). The simulation found that the proposed approach is promising, showing directional associations consistent with other findings and known ecological relationships. (IMR)

Sample data from 134 **harbour porpoises** accidentally caught in Norwegian gillnet fisheries in 2016-2017 was used to explore the effects of methodological choices and differences on estimating and biologically interpreting age, growth, and reproductive parameters. It was found that small differences in the application of generally accepted methods for age estimation and reproductive status can lead to significantly different estimates and results. The study also reviewed other literature related to life history parameters for harbour porpoises and found that methodological differences could affect comparability between different studies. It was noted, for example, that the source of the carcass (whether it was bycatch or not) had a significant effect, which could influence estimated effects of explanatory variables such as ship noise and diet on pregnancy rates. The study considers regional differences in life history parameters for harbor porpoises in light of these findings. It was suggested that the risk of calf loss during the lactation period may be higher in habitats where mothers must forage at greater depths, which could increase the likelihood of annual pregnancies in such habitats. This may be relevant for Norwegian harbor porpoises, and the high reproductive rates estimated from the latest dataset should therefore be interpreted with caution regarding the population's actual productivity. A greater focus on studying diet status in future research could shed more light on these issues. (IMR)

Harbour porpoise: In November, the IMR deployed hydrophones (F-PODs) in the Hardanger fjord (6 F-PODs) and in the Tromsø region, around the Rebbenes and Nordkvaløy islands (5 F-PODs), to acoustically monitor the presence and activity of harbour porpoises in those areas. The Hardanger deployment is a continuation of earlier monitoring using C-PODs in 2020-2021 and is executed in collaboration with a local community through Hardanger Produksjonsskole. The Troms deployment is a collaboration between IMR, NINA and UIT, the latter of which has also deployed 4 F-PODs in the same general area for increased coverage. The purpose of this monitoring is to improve the current understanding of porpoise habitat use in Norwegian coastal waters, and to eventually be able to relate measures of harbour porpoise presence to relevant biotic and abiotic variables. To this end, the IMR plans to increase its overall use of passive acoustic monitoring in the Tromsø region. There are several ongoing and planned research initiatives and proposals at the IMR that incorporate F-PODs extensively, so it is expected that many more F-PODs (and other types hydrophones) may be deployed in the coming years. (IMR)

In collaboration with 12 fishers, the IMR conducted new field trials to test acoustic alarms (pingers) to reduce **harbour porpoise** bycatch in commercial gillnet fisheries, as a follow-up study to similar trials conducted in 2018-2020. From January to April 2024, 308 fishing trips were conducted, of which 129 used pingers. The total bycatch was 34 harbour porpoises, most of which (25 animals, or 73%) were taken in gillnets without pingers. The estimated harbour porpoise bycatch rate, adjusted for vessel effects and fishing effort (measured as the product of the length of the gillnets and the fishing time) was 0.056 porpoises per net-km-day (95% CI 0.040 - 0.085) in gillnets without pingers and 0.026 porpoises per net-km-day (95% CI 0.012 - 0.057) in gillnets with pingers. This indicates that the harbour porpoise bycatch rate was 54% (94% CI 33 - 70%) lower in gillnets with pingers than in gillnets without pingers. This estimate of the effect of pingers on harbour porpoise bycatch rates is substantially lower than the previously reported estimate from the earlier trials. Possible explanations include the following: too little data, the use of bait bags to attach pingers, reporting biases and/or habituation/desensitization of the porpoises to pinger sounds. Extra time use due to pingers was low, about 2 minutes per haul. The use of bait bags seems to have mitigated some practical challenges with pinger use, but several fishers experienced issues with the pingers, such as mechanical damage and entanglement of the pinger in the gillnet mesh. (IMR)

The project MULTIWHALE aims at quantifying the cumulative effects of multiple stressors on the health and development of the Norwegian **killer whale** population, while accounting for inter-individual variations in behavioral ecology. A combined analysis of social and genetic structure of a large network of photo-identified killer whales with various diets was completed and published this year (Jourdain et al. 2024). Results show that killer whales with different feeding ecologies are part of a unique network and form a single genetic population, with no segregation between diet groups. An extension of this work led to a meta-analysis of killer whale genetic structure across the North Atlantic, which revealed an ecologically diverse, yet interconnected metapopulation distributed from southern Greenland to Norway. Genetic connectivity across regions is mediated by variations in feeding ecology and dynamic distributions of prey resources. Northeastern Atlantic herring stocks were identified as key drivers of the observed genetic patterns, reflective of various time scales (Baumgartner et al. 2025). Publications related to dietary markers, hormones, contaminants and gene expression are currently in preparation. (UiO, NOS)

Funding was received from Klima- og miljødepartementet (Arktisk 2030) in 2018 to sample stranded cetaceans all over Norway and to conduct a comprehensive screening of contaminants in blubber and various organs (UiO/NOS). Results on emerging (chlorinated paraffins, dechlorane) and legacy contaminants measured in 10 whale species were compiled in the most comprehensive study for Norway to date, which was published this year (Andvik et al. 2024a). Another publication compiling results on phthalate contamination in marine mammals in Norway was also published this year (Andvik et al. 2024b). A publication related to PFAS and mercury levels in these same whales is currently being prepared. (UiO, NOS)

UiO and NOS provided samples for the Screening Programme 2023, conducted by NIVA on commission from the Environment Agency. This year, the screening programme comprised top predators, more specifically whales and sharks, in addition to samples from a wastewater treatment plant, indoor dust, agricultural soils and consumer products. Very high concentrations of legacy persistent organic pollutants were observed in a young killer whale individual (‘Elida’), that drew much attention. Further investigation is ongoing. (UiO, NOS)

Fieldwork to feed further data/samples to the long-term killer whale project was conducted throughout 2024 by NOS. (UiO, NOS)

An attempt to tag **narwhals** in the Arctic Ocean from helicopter failed. Mainly because weather conditions (constant fog) prevented flying. Narwhals were observed during one flight, but none were tagged (NP).

As part of NAMMCO’s MINTAG project two blue whales were equipped with prototype tracking devices in north of Svalbard (NP)

Seven acoustic recorders (AURALs) listening for **bowhead whales, white whales and narwhals** (but also other species- and anthropogenic sounds) were served and redeployed during 2024 at various locations in the Svalbard area. (NP).

In addition, a sound trap to record cetaceans (most likely **white whales**) and underwater noise (mainly underwater vessel noise) was served and redeployed close to the entrance of Adventfjorden (Svalbard’s busiest location wrt boat traffic) (NP).

PINNIPEDS AND CETACEANS

The Norwegian and Barents Seas host large commercial fish populations that interact with each other, as well as marine mammal populations that feed on plankton and fish. Quantifying the past dynamics of these interacting species, and of the associated fisheries in the Norwegian and Barents Sea is of high relevance to support ecosystem-based management. The purpose of this work is to develop a food-web model of intermediate complexity and perform a quantitative assessment of the Norwegian and Barents Sea ecosystems in the period 1988–2021 in a manner that is consistent with existing data and expert knowledge, and that is internally coherent. For this purpose, the study uses the modelling framework of chance and necessity (CaN). The model construction follows an iterative process that allows to confront, discuss, and resolve multiple issues as well as to recognise uncertainties in expert knowledge, data, and input parameters. It is shown that it is possible to reconstruct the past dynamics of the food-web only if recognising that some data and assumptions are more uncertain than originally thought. According to this assessment, consumption by commercial fish and catch by fisheries jointly increased until the early 2010s, after which consumption by fish declined and catches by fisheries stabilised. On an annual basis, fish have consumed an average of 135.5 million tonnes of resources (including 9.5 million tonnes of fish), marine mammals have consumed an average of 22 million tonnes of which 50 % (11 million tonnes) were fish.

Fisheries and hunting have captured an average of 4.4 million tonnes of fish and 7 thousand tonnes of marine mammals. (IMR, NP, UiT)

Increased knowledge about marine mammal seasonal distribution and species assemblage from the South Orkney Islands waters (Antarctica) is needed for the development of management regulations of the commercial fishery for Antarctic krill (*Euphausia superba*) in this region. Passive acoustic monitoring (PAM) data were collected during the autumn and winter seasons in two consecutive years (2016, 2017), which represented highly contrasting environmental conditions due to the 2016 El Niño event. The study explored differences in seasonal patterns in marine mammal acoustic presence between the two years in context of environmental cues and climate variability. Acoustic signals from five baleen whale species, two pinniped species and odontocete species were detected and separated into guilds. Although species diversity remained stable over time, the ice-avoiding and ice-affiliated species dominated before and after the onset of winter, respectively, and thus demonstrating a shift in guild composition related to season. Herein, the study provide novel information about local marine mammal species diversity, community structure and residency times in a krill hotspot. The study also demonstrates the utility of PAM data and its usefulness in providing new insights into the marine mammal habitat use and responses to environmental conditions, which are essential knowledge for the future development of a sustainable fishery management in a changing ecosystem. (NP, IMR)

III. ONGOING (CURRENT) RESEARCH

PINNIPEDS

Publication of **hooded seal** demographic and reproduction data (historical as well as new, sampled in 2008 and 2010) from the Greenland Sea (West Ice) are in progress. (IMR)

Collection of material to assess the status of condition and life history parameters of **harp seals** will be attempted in the Greenland Sea (West Ice) during the commercial hunt in 2025. (IMR)

Development of a close-kin mark-recapture (CKMR) model and an epigenetic clock for ageing by tissue for **harp seals** in the West Ice, based on genetic samples from commercial harvest in 2024 and 2025, is due in 2025.

Collection of material to assess efficiency and animal welfare issues in the Norwegian commercial sealing of **harp seals** in the Greenland Sea in April/May was conducted in 2013 and 2014 – publication of the data is in progress. (IMR)

Tagging with sattellite based tags, **harp seals** in the White Sea - will be attempted by Russian colleagues in April/May 2025. (IMR)

A new aerial survey to assess the pup production of **harp** and **hooded** seals was conducted in the Greenland Sea in 2022; publication of the results is in progress. (IMR)

Fixed whole brain (visual cortex) tissue samples from **hooded seals**, collected during previous years, were used in immunohistochemical studies of the distribution of membrane-bound monocarboxylate transporter (MCT) proteins in neurons vs astrocytes. These studies support the notion that seal brain astrocytes have a high capacity to import and metabolize lactate, which may allow seal neurons to survive severely hypoxic conditions through a combination of hypometabolism and anaerobic glycolysis (UiT-AMB-ACP).

Mathematical analyses of the efficiency of heat and water exchange mechanisms in the nose of the **bearded seal** (*Erignathus barbatus*) have been further developed and published, in a collaboration between NTNU, UiO, University of Cambridge and UiT (UiT-AMB-ACP).

Ship based counting of **harbour seals**, using electronic helicopter drones with camera, will be conducted in North Norway in September 2025. (IMR)

Sampling of DNA from **harbor seal** pups will be carried out in Finnmark in June, publication of the results are in progress. (IMR)

Publication of results from population studies of **harbour** and **grey seals** is in progress. (IMR)

Total **grey seal** population modelling is planned to be carried out in 2025. (IMR)

CETACEANS

Publication of results from studies of the feeding ecology, life history and ecological role of **harbour porpoises** is in progress. (IMR, UiT)

Experiments with tagging of **minke whales** with a new type of electronic tags will be carried out in Norwegian coastal areas in May-August on the Norwegian coast and in Svalbard waters in August/September. (IMR)

Experiments aimed to test methods to avoid whales (**humpback** and **killer** whales) in purse seine fisheries were conducted in Troms in late autumn in 2022 and 2023. Late in 2024, further tests of ADDs operated onboard fishing vessels will be done. In addition, results from the first field seasons will be analysed. (IMR, UiT)

Biopsies will be sampled from minke whales to support a database for mark-recapture estimates and CKMR methods based on use of the DNA register on caught **minke whales** (IMR).

Satellite tagging of **minke whales** (modified for 2025) will continue as part of the ongoing development project MinTag under NAMMCO. (IMR)

Whale sighting surveys will be conducted on two mackerel survey vessels using a single platform configuration. (IMR)

The collection of data on incidental observation of marine mammals will be continued. (IMR)

Participation of marine mammal observers on the annual ecosystem surveys in the Barents Sea has been established as part of the general survey procedure and will continue. (IMR).

New methodologies for abundance estimation, including infrared scanning and use of drones, will be investigated during a dedicated cruise in July 2025. The cruise will operate along the coast from Vestfjorden to Varanger. (IMR).

Fresh-frozen blubber samples from adult narwhal, collected by Dr. Mads Peter Heide-Jørgensen at Greenland Institute of Natural Resources, are being analyzed in terms of blubber thermal conductivity and chemical composition, to assess thermal adaptations to cold waters in a high-Arctic odontocete species (UiT-AMB-ACP).

IV. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

SEALING

Harp and hooded seals

The Joint ICES/NAFO/NAMMCO Working Group of **Harp** and **Hooded Seals** met during 21-25 August 2023 at IMR in the Fram Centre in Tromsø, Norway, to assess the status and harvest potential of stocks of Greenland Sea harp and hooded seals. This Working Group on Seals used the report from this meeting as background for their discussions aimed to develop and establish management advice for 2025 to the JNRFC. On the 23. September 2024 the two parties met digitally in a bilateral meeting to have an initial discussion of the advice.

A precautionary harvest strategy has been developed for the management of harp and hooded seals. The strategy includes two precautionary and one conservation (limit) reference levels. The reference levels relate to the pristine population size, which is the population that would be present on average in the absence of exploitation, or a proxy of the pristine population (which in practical terms is referred to as the maximum population size historically observed, N_{max}). A conservation, or lower limit reference point, N_{lim}, identifies the lowest population size which should be avoided with high probability. The first precautionary reference level is established at 70% (N_{70}) of N_{max}.When the population is between N_{70} and N_{max}, harvest levels may be decided that stabilise, reduce or increase the population, so long as the population remains above the N_{70} level. It has been suggested that this could be done by designing the TAC to satisfy a specific risk criterion which implicate 80% probability of remaining above N_{70} over a 15-year period. When a population falls below the N_{70} level, conservation objectives are required to allow the population to recover to above the precautionary (N_{70}) reference level. N_{50} is a second precautionary reference point where more strictly control rules must be implemented, whereas the N_{lim} reference point (set at 30% (N_{30}) of N_{max}) is the ultimate limit point at which all harvest must be stopped.

Current management of harp and hooded seals require that the populations in question are defined as “data rich”. Data rich stocks should have data available for estimating abundance where a time series of at least three abundance estimates should be available spanning a period of 10-15 years with surveys separated by 2-5 years, the most recent abundance estimates should be prepared from surveys and supporting data (e.g., birth and mortality estimates) that are no more than 5 years old. Stocks whose abundance estimates do not meet all these criteria are considered “data poor” and should be managed more conservatively.

Population assessments were based on a population model that estimates the current total population size, incorporating historical catch data, estimates of pup production and historical values of reproductive rates, and environmental variables related to resource and competitor dynamics impacting cumulative mortality of pup prior to the surveys (called “abortion rate”) and which contribute to modulating the impact of fecundity rates on the estimated pup production in the model. Note that these environmental data are included for the models of the two harp seal stocks (WS/BS and GS), but not for the GS hooded seals. The modelled abundance is projected into the future to provide a future population size for which statistical uncertainty could be provided for various sets of catch options. In case of “data poor” populations, catch limits are estimated using the more conservative Potential Biological Removal (PBR) approach, if nothing else is mentioned. However, these assessment models have now been retired, since the models are not identifiable in the sense that there is not enough data to inform the parameters in the model and the models produce highly unrealistic population sizes. Hence, the models are not capable of scaling up from pup estimates to population size (i.e. provides a pup – adult ratio of 1:22).

The 2022 pup production estimate for **Greenland Sea harp seals** is higher than the previous survey estimate from 2018, which is uncertain due to sub-optimal surveys, but at the same level as those in precious surveys (2012 and earlier).

In ICES terminology the Greenland Sea harp seal population is data rich, but on the verge of data poor with regards to reproductive data. Since the population model cannot be used to assess catch options, two alternative methods were used, both deemed sustainable, to assess harvest quotas; 1) based on pup production estimates, which have been quite stable, and 2) based on the harvest records in the period 20-10 years before present, as these would have been the harvest levels that would have affected the current harvested population. These two methods provided sustainable quotas of 5.875 and 7.397 seals. Additionally, WGHARP had suggested that a carry-over approach could be applied where seals not taken from the quota in 2024 could be added to the 2025 quota.

WGHARP had recommended that the quota in 2024 and onwards should not exceed 7.397 seals. Only 2.069 seals were taken in 2024, thus giving a carry-over number of 5.328 that can be added to the quota in 2025: 7.397 + 5.328 = 12.575 seals of all ages. WGHARP recommended that this advice is implemented as a basis for the determination of a TAC for harp seals in the Greenland Sea in 2025. Removals should not exceed 12.575 seals. Using a multiplier to convert age 1+ animals to pups is inappropriate.

Recent Russian aerial surveys of the **White Sea/Barents Sea harp** seal stock suggest that there may have been a sudden reduction in pup production after 2003. As a result of the 2009 and 2010 surveys, considered by WGHARP to be of high quality, the Working Group feel that the reduced pup production observed since 2004 does not appear to be a result of poor survey timing, poor counting of imagery, disappearance/mortality of pups prior to the survey or increased adult mortality. Preliminary and very uncertain results from a Russian drone aerial survey indicate that the estimated pup production in 2024 may have been slightly higher than the last aircraft aerial survey in 2013, which was conducted using the same technology, but slightly lower than estimates of pup production from the early 2000’s. However, since the new estimate is acquired by means of drone surveys, it is especially important to review and assess how this new estimate compares to previous pup production estimates (reviewed and accepted), conducted by means of surveys using manned aircraft. The new, but not approved, model that resulted from the benchmark-process and WGHARP in 2023, shows that a likely explanation for the change in pup production is a decline in the reproductive state of females, potentially driven by changes in resource availability. While this new model variant shows a very good fit to the pup production estimates, as opposed to the previous assessment model, the model is not able to, as already stated, scale up from pups to total population size. Hence, the modelled estimate of total population size is highly uncertain and potentially severely biased. Hence, the working group highlight the need for a thorough revision of the new estimate together with a model revision process to arrive at a new assessment model.

The last available information about the reproductive potential for the Barents Sea / White Sea harp seal population is based on data from 2018, but estimates derived from new data collected in 2021 are ready to be implemented in the model. However, the last reviewed and accepted pup production estimate is from 2013, i.e., more than 10 years old, and the population is considered “data poor”. However, once the 2024 pup production estimate has been reviewed and accepted, this situation is likely to change. Hence, it is recommended that harvest is stopped until new pup production estimates are available and have been reviewed, and that a reliable increase in pup production and population size is evident. Moreover, if this happens, the working group recommend a new assessment and potentially a new benchmark to assess potentially new model variants. Given the preliminary results from the 2024 survey, it appears the pup production remains low in comparison with estimates from early 2000’s, and on a level similar to previous surveys after 2003. However, how the new estimate compares to the older estimates needs to be assessed properly, as they are acquired from different survey methods. Based on the result from the Russian drone aerial survey, calculation of harp seal abundance was made with using cohort analyzes that take into account mortality by year (the first year = 20%; the second year = 9%; the third year = 6%; the fourth and the fifth years = 5%; and remaining years = 7.5%. This resulted in an estimated population size of 1.548.840 seals. From this, calculation of the catch level was made by means of the PBR approach, and this resulted in 49.738 seals of all ages. It is important to note that the assessment model for harp seals in the White Sea is not approved and estimates from this model are deemed unreliable.

During negotiations in the Joint Norwegian-Russian Fisheries Commission it proved impossible to reach an agreement on the advice for this population. The Russian part recommends that the above mentioned PBR of 49 738 specimens can be applied as a basis for harvest of harp seals in 2025. However, the Norwegian Part recommends that harvest should be stopped until the new and old pup production estimates are discussed, reviewed, and compared, such that the result of the drone aerial survey can be considered used in the assessment model. In such a case a benchmark process is required to establish the best assessment model. However, the Russian delegation insisted on ending the collaboration with Norway, including ICES and NAMMCO, regarding this stock. Thus, the practical implications of this regarding the assessment and management of this stock is highly uncertain.

Results from the most recent (2022) pup survey suggest that current **Greenland Sea hooded seal** pup production remains at similarly low level as in 2018, and lower than observed in comparable surveys in 1997, 2005, 2007 and 2012. Even though there is some uncertainty regarding the historical data on pregnancy rates, previous assessments have run the population model for a range of pregnancy rates (assuming 50%, 70% or 90% of the mature females produced offspring, respectively). All model runs have indicated a population currently well below N30 (30% of largest observed population size). Recent analyses have indicated that pregnancy rates have remained rather constant around 70% in the period 1958 – 1999. Hence, in the recent assessment only a pregnancy rate of 0.7 has been applied. Using this scenario, the model estimates a 2023 total population of 76,832 (95% C.I. 60,262-98,009). Following the Precautionary harvest strategy and the fact that the population is below N_{lim} (currently at 5.7% of N_{max}), WGHARP suggest that no harvest be allowed for Greenland Sea hooded seals at this time.

Traditionally, both Russia and Norway have participated in the sealing operations in the West Ice and the East Ice and have, therefore, allocated quotas on a bilateral basis in negotiations in the Joint Norwegian-Russian Fisheries Commission. However, the Russians cancelled their sealing operations in the West Ice in 2001. The Norwegian shares of the 2025 quotas would be the total TAC of harp seals in the West Ice. In the East Ice, the Norwegian quota was set at 7,000 harp seals but it was agreed that this should remain untaken as long as the recommended stop in harvest in the area prevail.

Coastal seals

A new management system for coastal seals was introduced in 1996. Hunting quotas on **harbor** and **grey seals** were set based on best available information on seal abundance along the coast. The regulations also included catch reports. The new management regime required increased survey effort along the Norwegian coast to be able to give advice on catch levels. In 2003, quotas were increased substantially compared to the recommendations based on scientific advice, when they were set at 1186 grey seals (25% of the abundance estimate) and 949 harbor seals (13% of the abundance estimate). Also, compensation paid for shot seals, which included sampling of age and body condition data, were introduced and lasted until 2014 (except in 2011). In 2010, management plans for harbor and grey seals were implemented, aimed to ensure sustainable populations of both species within their natural distribution areas. Regulating measures should be designed to ensure that they have the greatest impact in areas where there is documented significant damage to the fishing industry caused by seals. Target population sizes were decided to be 7000 harbor seals counted during moult and a grey seal population producing 1200 pups annually along the Norwegian coast. Hunting quotas should be set to regulate the seal populations in relation to the target levels. Target levels can be adjusted based on new knowledge on seal populations.

Suggested quotas in 2025 for **harbor seals** in Norway are 446 animals. For **grey seals** a quota of 60 animals in Finnmark (northern Norway), is recommended. Due to a severe reduction in pup production in recent years, no grey seal hunt is allowed in Rogaland, Trøndelag, Nordland and Troms in 2025.

Seals in Svalbard

Since the main purpose of managing animal species in Svalbard is to protect naturally occurring species, hunting must not affect the stocks. Controlled and limited hunting is allowed for some species, including **ringed** and **bearded seals**. To hunt in Svalbard, documentation of an accepted big-game-proficiency test (annual rifle shooting test) is required. The two seal species cannot be hunted in national parks / nature reserves. They are also protected during the darkest period (December-January) and in the breeding period. Catch reports are mandatory.

WHALING

At the IWC Annual Meeting in 1992 Norway stated that it intended to reopen the traditional **minke** whaling in 1993. So far, IWC has accepted the RMP developed by its Scientific Committee as a basis for future management decisions but has not implemented the procedure in lieu of the current Moratorium. The Norwegian Government therefore decided to set quotas for the 1993 and following seasons based on RMP, with parameters tuned to the cautious approach level as expressed by the Commission and using the best current abundance estimates as judged by the IWC Scientific Committee. In the Norwegian application of the RMP, a tuning level (long-term target) of 0.60 has been used in recent years.

At, in principle, regular intervals an *Implementation Review* of the RMP for a specific species and management area is conducted. During such reviews, the input data as well as biological information including genetics are critically evaluated and conditioned for simulation trials of management scenarios. The most recent review for the North Atlantic common minke whales was conducted in 2022. The review concluded that there is one single panmictic minke whale population in the Northeast Atlantic and new abundance estimates for the region have been approved for use in RMP. From the 2014-2019 period, the total estimate for the areas surveyed by Norway is 149 722 (cv 0.152), of which 104 692 (cv 0.172) animals are in the Eastern area. (IMR).

After the end of the quota period 2016-2021, a new six-year block quota was calculated which included the new abundance estimates based on the survey period 2014-2019. The annual total catch quota 2022-2027 was estimated as 917 animals of which 664 animals can be taken within the **Northeastern stock area** (the Medium E Small Areas, i.e. the EW, EN, ES and EB Small Areas) and 253 within the CM Small Area of the Central **minke whale** stock. The catch quotas are set for each of the five small management areas, however, the E Medium Area is treated as a merged area in the quota handling. Unused quotas can be transferred to following years within the period which the block quota is set for.

The total catch in the Medium Area E in 2024 was 415 animals, leaving a rest quota of 249 animals for transfer. With addition of the rest quotas of 157 animals from 2023 and 83 animals from 2022, the total transfer will be 489 animals in Medium Area E. No catches were taken in the Jan Mayen area (CM) in 2024.

Thus, for 2025 the total catch quota, including transfers, will be set to 1406 minke whales of which 1153 animals can be taken in area E and 253 animals in area CM (the Jan Mayen block).

The catching season opens April 1 and closes mid-September.

V. PUBLICATIONS AND DOCUMENTS

Peer reviewed

Aarflot, J.M, Bjørdal, V.R., Dunlop, K.M., Espinasse, M., Husson, B., Lindstrøm, U., Keulder-Stenevik, F., Ono, K., Siwertsson, A. & Skern-Mauritzen, M. 2024. Ecosystem risk from human use of ocean space and resources: A case study from the Norwegian coast. Ocean and Coastal Management 256: 107299. https://doi.org/10.1016/j.ocecoaman.2024.107299

Andvik, C., Jourdain, E., Borgen, A., Lyche, J.L., Karoliussen, R., Haug, T. & Borgå, K. 2024a. Intercorrelations of chlorinated paraffins, dechloranes, and legacy persistent organic pollutants in 10 species of marine mammals from Norway, in light of dietary niche. Environmental Science & Technology 58: 14797-14811. https://doi.org/10.1021/acs.est.4c02625

Andvik, C., Bories, P., Harju, M., Borgå, K., Jourdain, E., Karoliussen, R., Rikardsen, A., Routti, H. and Blévin, P. 2024b. Phthalate contamination in marine mammals off the Norwegian coast.Marine Pollution Bulletin, 199. https://doi.org/10.1016/j.marpolbul.2023.115936.

Baumgartner, C.D., Jourdain, E., Bonhoeffer, S. *et al.* 2025. Kinship clustering within an ecologically diverse killer whale metapopulation. *Heredity*. https://doi.org/10.1038/s41437-024-00740-y

Biuw, M., Lindstrøm, U., Jackson, J.A., Baines, M., Kelly, N., McCallum, G., Skaret, G. & Krafft, B.A. 2024. Estimated summer abundance and krill consumption of fin whales throughout the Scotia Sea during the 2018/2019 summer season. Scientific Reports 14:7493 https://doi.org/10.1038/s41598-024-57378-3

Ciccone C, Kante F, Folkow LP, Hazlerigg DG, West AC, Wood SH (2024) Circadian coupling of mitochondria in a deep-diving mammal. J Exp Biol 227 (7): jeb246990. https://doi.org/10.1242/jeb.246990

Cheon H, Kizilova N, Flekkoy EG, Folkow LP, Mason MJ, Kjelstrup S (2024) The nasal cavity of the bearded seal: An effective and robust organ for retaining body heat and water. J. Theor. Biol. 111933 https://doi.org/10.1016/j.jtbi.2024.111933

Cubaynes, H. C., Forcada, J., Kovacs, K. M., Lydersen, C., Downie, R. and Fretwell, P. T. 2024. Walruses from space: walrus counts in simultaneous remotely piloted aircraft system (RPAS) vs very high-resolution (VHR) satellite imagery. Remote Sens. Ecol. Conserv. 10: 584-596.

Frie, A.K. & Lindstrøm, U. 2024. Exploring the effects of methodological choices on the estimation and biological interpretation of life history parameters for harbour porpoises in Norway and beyond. PLoS ONE 19(7): e0301427. https://doi.org/10.1371/journal.pone.0301427

Haug, T., Biuw, M., Kovacs, K.M., Lindblom, L., Lindstrøm, U., Lydersen, C., MacKenzie, K.M., & Meier, S. 2024. Trophic interactions between common minke whales (*Balaenoptera acutorostrata*) and their prey during summer in the northern Barents Sea. Progress in Oceanography 224: 103267. https://doi.org/10.1016/j.pocean.2024.103267

Jossey, S., Haddrath, O., Loureiro, L., Weir, J. T., Lim, B. K., Miller, J., Scherer, S. W., Goksøyr, A., Lille-Langøy, R., Kovacs, K. M., Lydersen, C. Routti, H. and Engstrom, M. D. 2024. Population structure and history of North Atlantic blue whales (*Balaenoptera musculus musculus*) inferred from whole genome analysis. Conserv. Genet. 25: 357-371.

Jourdain, E., Karoliussen, R., Fordyce, M.S.L., Langangen, Ø., Robeck, T., Borgå, K., Ruus, A. and Foote, A.D. 2024. Social and genetic connectivity despite ecological variation in a killer whale networkProc. R. Soc. B.29120240524. http://doi.org/10.1098/rspb.2024.0524

Kovacs, K. M., Liston, G. E., Reinking, A. K., Gerland, S. and Lydersen, C. 2024. Climate warming impacts on ringed seal breeding habitat in Svalbard. Ecol. Model. 495, art. no 110790: 1-12. doi: 10.1016/j.ecolmodel.2024.110790.

Kuletz, K. J., Ferguson, S. H., Frederiksen, M., Gallagher, C. P., Hauser, D. D. W., Hop, H., Kovacs, K. M., Lydersen, C., Mosbech, A. and Seitz, A.C. 2024. A review of climate change impacts on migration patterns of marine vertebrates in Arctic and Subarctic ecosystems. Front. Environ. Sci. 12, art. no. 1434549: 1-24. doi: 10.3389/fenvs.2024.1434549

Lacy, R. C., Kovacs, K. M., Lydersen, C. and Aars, J. 2024. Linking PVA models into metamodels to explore impacts of declining sea ice on ice-dependent species in the Arctic: the ringed seal, bearded seal, polar bear complex. Front. Conserv. Sci. 5, art. No. 1439386: 1-18. doi: 10.3389/fcosc.2024.1439386.

Mikkelsen, L., Kovacs, K. M., Blanchet, M.-A., Brodin, G. and Lydersen, C. 2024. Interannual site fidelity by Svalbard walruses. Sci. Rep. 14, art. no. 15822: 1-17. doi: 10.1038/s41598-024-66370-w

Nater, C. R., Lydersen, C., Andersen, M. and Kovacs, K. M. 2024. Harvest sustainability assessments need rethinking under climate change: a ringed seal case study from Svalbard, Norway. Ecosphere 15, art. e70020: 1-20. doi: 10.1002/ecs2.70020

Planque, B., Bas, L., Biuw, M., Blanchet, M.A., Bogstad, B., Eriksen, E., Droineau, H., Hansen, C., Husson, B., Mousing, E.A., Mullon, C., Pedersen, T., Skogen, M.D., Slotte, A., Staby, A. & Lindstrøm, U. 2024. A food-web based model for marine mammals, fish, and fisheries in the Norwegian and Barents Seas. Progress in Oceanography 229: 103361. https://doi.org/10.1016/j.pocean.2024.103361

Pöyhönen, V., Thomisch, K., Kovacs, K. M., Lydersen, C. And Ahonen, H. 2024. High Arctic "hotspots" for sperm whales (*Physeter macrocephalus*) off western and northern Svalbard, Norway, revealed by multi-year Passive Acoustic Monitoring (PAM). Sci. Rep. 14, 5825: 1-14, doi: 10.1038/s41598-024-56287-9.

Ryeng, K.A. & Larsen, S.E. 2024. The significance of shooting angle in seal shooting. Animal Welfare, 33, e5, 1–9 https://doi.org/10.1017/awf.2024.8

Solvang, H.K. & Arneberg. P. 2024. Flagged observation analyses as a tool for scoping and communication in integrated ecosystem assessments. PLoS ONE 19(9): e0305716. https://doi.org/10.1371/journal.pone.0305716

Solvang, H. K., Imori, S., Biuw, M., Lindstrøm, U. & Haug, T. 2024. Categorical data analysis using discretization of continuous variables to investigate associations in marine ecosystems. Environmetrics, 35: e2867. https://doi.org/10.1002/env.2867

van Meurs, E., Moland, E., Bjørge, A. & Freitas, C. 2024. Haulout patterns of harbour seal colonies in the Norwegian Skagerrak, as monitored through time-lapse camera surveys. Diversity 16: 38. https://doi.org/10.3390/d16010038

Vacquie-Garcia, J., Spitz, J., Hammill, M., Stenson, G. B., Kovacs, K. M., Lydersen, C., Chimienti, M., Renaud, M., Fernandez, P. M. and Dot, T. J. de. 2024. Foraging habits of Northwest Atlantic hooded seals over the past 30 years: future habitat suitability under global warming. Glob. Change Biol. 30, e17186: 1-21, doi: 10.1111/gcb.17186.

Vazquez, J. M., Khudyakov, J. I., Madelaire, C. B., Godard-Codding, C. A., Routti, H., Lam, E. K., Piotrowski, E. R., Merrill, G. B., Wisse, J. H., Allen, K. N., Conner, J., Blevin, P., Spyrpoulus, D. D., Goksøyr, A., Vazquez-Medina, J. P. 2024. *Ex vivo* and i*n vitro* methods as a platform for studying anthropogenic effects on marine mammals: four challenges and how to meet them. Front. Mar. Sci. **11**, art. no. 1466968.

Vogel, E. F., Rikardsen, A. H., Blanchet, M.-A., Blevin, P. and Biuw, M. 2024. Norwegian killer whale movements reflect their different prey types. Polar. Res. 43, art. no. 9840.

Ytterhus Utengen, I., Vogel, E.F., Biuw, M., van Ruiten, M. & Rikardsen, A.H. 2024. Characterizing humpback whale behavior along the North-Norwegian coast. Animal Biotelemetry 12: 29. https://doi.org/10.1186/s40317-024-00384-z

Øien, N., Biuw, M., Bjørge, A., Haug, T., Nilssen, K. T., Skaug, H. J., & Solvang, H. K. (2024). Previous, current and future monitoring and management of common minke whales in Norway. NAMMCO Scientific Publications 13. https://doi.org/10.7557/3.7426

Åsvestad, L., Ahonen, H., Menze, S., Lowther, A., Lindstrøm, U. & Krafft, B.A. 2024. Seasonal acoustic presence of marine mammals at the South Orkney Islands, Scotia Sea. Royal Society Open Science 11: 230233. https://doi.org/10.1098/rsos.230233

Others

Ahonen, H., Lydersen, C., Pöyhönen, V., Llobet, S. M., Thomisch, K., Wams, L., Tollefsen, D. and Kovacs, K. M. 2024. Arctic endemics vs boreal migrants – current status of cetacean distribution in Svalbard, Norway, explored through acoustic data. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Bengtsson, O., Lydersen, C., Fisk, A. and Kovacs, K. M. 2024. Stable isotope signatures reveal differences in foraging strategies and niche overlap between Arctic endemic ringed seals (*Pusa hispida*) and harbour seals (*Phoca vitulina*) in a High Arctic fjord, Kongsfjorden, Svalbard (Norway). 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Blanchet, M.-A., Vogel, E., Pedersen, O., Morange, Z., Similä, T., Rikardsen, A., Freitas, C., Kovacs, K. M. and Lydersen, C. 2024. Migration of male sperm whales in the Northeast Atlantic. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Cubaynes, H., Forcada, J., Kovacs, K. M., Lydersen, C. and Fretwell, P. 2024. Walruses from Space: walrus counts from simultaneously captured remotely piloted aircraft system imagery vs very high-resolution satellite imagery. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Ciccone, C (2024) Molecular adaptations to diving-induced hypoxia – diurnal variations in cellular and mitochondrial hypoxia tolerance in the hooded seal (*Cystophora cristata*). PhD-thesis, UiT – the Arctic University of Norway, 120 pp.

Jensen, SV (2024) Characterization of monocarboxylate transporters in the brain of the hooded seal (*Cystophora cristata*) reveals possible biochemical adaptation to diving. MSc-thesis, UiT - the Arctic University of Norway, 132 pp.

Frie, A.K. 2024. Effects of methodological choices on the estimation of harbour porpoise life history parameters and their sensitivity to anthropogenic stressors in Norway and beyond. Arctic Frontiers, Tromsø, Norway, January 29-February 1, 2024. Oral presentation.

Lindstrøm, U., André, C.S. & MacKenzie, K. 2024: Feeding ecology of harbour porpoise in Norwegian coastal communities. 19th Russian-Norwegian Symposium ("Multispecies management: species interactions and trade-offs, environmental changes and multiple stressors"), Digital Meeting, June 4-5, 2024. Oral presentation.

Louis, M., Skovrind, M., Iglesia, A. R. de la, Vicari, D., Costa, A., Castruita, A. S., Routledge, J., Garde, E., Heide-Jørgensen, M. P., Postma, L., Ferguson, S. Kovacs, K. M., Lydersen, C., Szpak, P., Gopalakrishnan, S. and Lorenzen, E. D. 2024. The evolutionary ecology and demographic history of narwhals. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Lowther, A. D., Rios, M. R. I., Kovacs, K. M. and Lydersen, C. 2024. Mind the (two decade) gap: deploying new technology to improve the frequency of ringed seal abundance estimation in the High Arctic archipelago of Svalbard, Norway, to support their management. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Lydersen, C. and Kovacs, K. M. 2024. Klimaendringer og Svalbards seler og hvaler. Polarboken 2023-2024: 5-15 Utgitt av Norsk Polarklubb, Oslo.

Moan, A., Bjørge, A. & Biuw, M. 2024. Incidental catches of harbour porpoise, *Phocoena phocoena*, by the Norwegian gillnet fleet. 19th Russian-Norwegian Symposium ("Multispecies management: species interactions and trade-offs, environmental changes and multiple stressors"), Digital Meeting, June 4-5, 2024. Oral presentation.

Mendez-Bye, A., Joy, R., Vacquie-Garcia, J., Hammill, M., Hamilton, C. Stenson, G., Folkow, L., Blix, A., Kovacs, K., Lydersen, C. and Doy, J. de. 2024. Tides of change: Hooded seal diving behaviours over the past 30 years under pressures of climate change. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Mikkelsen, L., Lydersen, C. and Kovacs, K. M. 2024. Are temperate newcomers outcompeting Arctic endemic seal species in Svalbard? 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Nowak, B. V. R., Lydersen, C., Heide-Jørgensen, M. P., Trites, A. W. and Kovacs, K. M. 2024. The influence of permanent and dynamic environmental conditions on the movement patterns of East Greenland-Svalbard-Barents Sea bowhead whales in a changing Arctic. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024

Rodriguez, A. M., Ferguson, S. H., Blevin, P., Budge, S., Frasier, T., Gero, S., Hussey, N., Johnson, K., Kovacs, K. M., Lawson, J., Lefort, K., Lydersen, C., Madigan, D. J., Rikardsen, A., Storrie, L. and McKinney, M. A. 2024. Inferences on the trophic ecology of North Atlantic sperm whales (*Physeter macrocephalus*) based on stable isotopes and fatty acids. 25th Bien. Conf. Biol. Mar. Mammals, Perth, Australia, 11-15 Nov. 2024.

Rodriguez, A. M., Ferguson, S. H., Blévin, P., Budge, S. M., Gero, S., Guinet, C., Hussey, N. E., Johnson, K. F., Kovacs, K. M., Lawson, J., Lefort, K. J., Lydersen, C., Madigan, D. J., Rikardsen, A., Storrie, L., Tixier, P. and
McKinney, M. A. 2024.Trophic ecology of sperm whales (*Physeter macrocephalus*) of the Atlantic based on stable isotopes and fatty acid profiles. Arcticnet's Arctic Change Conference, Ottawa, Canada, 9-12 Dec. 2024.

Planque, B, Bas, L., Biuw, M., Blanchet, M.A., Bogstad, B., Eriksen, E., Drouineau, H., Hansen, C., Husson, B., Mousing, E.A., Mullon, C., Pedersen, T., Skogen, M.D., Slotte, A., Staby, A. & Lindstrøm, U. 2024. A food-web assessment model for marine mammals, fish, and fisheries in the Norwegian and Barents Seas. 19th Russian-Norwegian Symposium ("Multispecies management: species interactions and trade-offs, environmental changes and multiple stressors"), Digital Meeting, June 4-5, 2024. Oral presentation.

Steur, L. de, Dodd, P. A., Granskog, M. A., Divine, D. V., Gerland, S., Fransson, A., Sumata, H., Kovacs, K. M., Lydersen, C., Ahonen, H., Chierici, M., Stedmon, C. A., Karcher, M., Kauker, F. and Østerhus, S. 2024. Taking the pulse of change in the Arctic Ocean for more than 30 years. Fram Forum 2024. Research Note: 70-77.

Øien, N. & Bøhm, F. 2024. Report of the Norwegian 2023 survey for minke whales in the Small Management Area EN – the North Sea. SC/69B/ASI/02. 6 pp.

Øien, N., Leonard, D. & Bøhm, F. 2024. Report of the Norwegian 2022 survey for minke whales in the Small Management Area EB – the Barents Sea and adjacent areas in the Svalbard area ES. SC/69B/ASI/06. 10 pp.

Skaug, H.J. 2024. An update of the Norwegian minke whale DNA register (April 2024). IWC SC/69B/SD-DNA/WP03. 1p.

Solvang, H.K., Haug, T., Øien, N., Biuw, M., Lindstrøm, U., Gjøsæter, H. & Knutsen, T. 2024. Inference for causal relationships among balaenopterids and their prey using categorical data analyses. 19th Russian-Norwegian Symposium ("Multispecies management: species interactions and trade-offs, environmental changes and multiple stressors"), Digital Meeting, June 4-5, 2024.Oral presentation.

VI. DATA REPORTING TO NAMMCO COMMITTEES

SEALING

Harp and hooded seals

Norwegian catches in the Greenland Sea (West Ice) in 2024 was taken by three vessels, whereas no Russian seal vessels participated in the area. Due to the uncertain status for Greenland Sea hooded seals, no animals of the species were permitted taken in the ordinary hunt operations in 2024. The 2024 catch volume for harp seals in the Greenland Sea was set at 7,397 animals of all ages. The total catch in 2024 was 2,069 harp seals (including 1,533 pups) (Table VI.I).

Uncertainty related both to up-dated pup production of harp seals in White Sea (last estimate from 2013, population data-poor) and subsequent modelling and forward projection of the total stock resulted in a recommendation that harvest should be stopped until a new pup production estimate is available. The 53rd Joint Norwegian Russian Fisheries Commission (JNRFC) supported this recommendation for 2024. Nevertheless, Russia allocated 7,000 harp seals to Norway, but no harvest was conducted. A ban implemented on all pup catches prevented Russian hunt in the White Sea during the period 2009-2013. Despite this ban being removed before the 2014 season, there have been no commercial Russian harp seal catches in the White Sea in 2015-2023. And in 2024 there was no harvest at all in the area.

Table VI.1. Norwegian catches of harp and hooded seals in 2024. 1+ denote one year old or older seals.

Catching area:	*The West Ice*			*The East Ice*		
Species	Pups	1+	Total	Pups	1+	Total
Harp seals	2069	536	1533	0	0	0
Hooded seals	0	0	0			

Coastal seals

In 2003-2009, total annual **harbor seal** hunting quotas ranged between 704 and 989 animals, while annual catches were 538-905 harbor seals. In 2010-2020, annual harbor seal quotas ranged between 425 and 485 animals, while annual catches were 159-511 harbor seals. In 2021, 2022, 2023 and 2024, the quotas were reduced to 257, 268, 346 and 380 harbor seals, respectively. 238 were taken in the hunt in 2021, 251 in 2022, 316 in 2023 and 354 in 2024.

In 2003-2011, recommended quotas on **grey seals** were 355-460 animals but set annual quotas were 1040-1536. Annual catches ranged between 111 and 516 grey seals in that period. Set grey seals quotas were 460 animals in 2012-2014, but due to observations of declines in grey seal pup production the quotas were reduced to 315 grey seals in 2015, 210 animals in 2016-2017 and 200 animals in 2018-2024. Annual catches were 19-216 grey seals in 2012-2023. In 2024, a catch of 81 grey seals were taken.

Additional hunt on the Norwegian coast in 2024 include 7 ringed seals and one harp seal, all shot in North Norway.

Seals in Svalbard

In 2003-2023, total annual **ringed seal** catches in Svalbard ranged between 15 and 78 animals. In 2024, 38 ringed seals were taken in the hunt.

The number of **bearded seals** taken annually in Svalbard in 2003-2023 ranged between 2 and 34 animals, and the number taken in the 2024 hunt was 11 bearded seals.

WHALING

Minke whale

After a temporary suspension, the traditional small type Norwegian **minke whaling** was again permitted in 1993 and quotas were implemented based on the Revised Management Procedure (RMP) developed by the International Whaling Commission's (IWC) Scientific Committee. The RMP allocates catch quotas to specific *Small Management Areas (SMA)*. There are five such management areas within the region of interest to Norwegian whalers. The present areas are a revision of the original implementation and introduced by the IWC/SC at their Implementation Review of North Atlantic minke whales conducted at the 2003 Annual Meeting and later kept at the Implementation Reviews made in 2008, 2014-2017 and 2022. The areas are (1) the Svalbard-Bear Island area (coded ES), (2) the eastern Barents Sea (EB), (3) the Norwegian Sea and coastal zones off North Norway, including the Lofoten area (EW), (4) the North Sea (EN) and (5) the western Norwegian Sea-Jan Mayen area (CM).

In total, 11 vessels participated in the 2024 season of whaling and the catching period was 1 April to medio September. Table VI.2 shows the number of minke whales taken by area in the 2024 season. The quotas are given as annual catches in six-year block quotas but is not fully utilised in all areas and years. There are several reasons for that, including problems with processing the catches and accessing remote areas like the Jan Mayen area and the eastern Barents Sea. Unused quotas can be transferred to the following year. The present quota period is 2022-2027. The calculated annual basic quota for this period is 664 animals within Medium Area E and 253 whales within the Small Area CM, giving a total of 917 minke whales. The total catch in the 2024 season was 415 whales while the total quota including transfers was set to 1157 minke whales for 2024.

Table VI.2. Quotas and catches of minke whales in 2024 by management area as defined in RMP.

2024	Management area					
Small-type whaling	EB	EN	ES	EW	CM	Total
Catch	268	2	71	74	0	**415**
Quota	904				253	1157
Stock area	Eastern				Central	