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30 Years: 1992 - 2022

SCIENTIFIC COMMITTEE WORKING GROUP ON COASTAL SEALS

8-11 May 2023

Greenland Representation, Copenhagen, Denmark

REPORT

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EXECUTIVE SUMMARY

The NAMMCO Working Group on Coastal Seals met at the Greenland Representation in Copenhagen (Denmark) 8-11 May 2023. The meeting was chaired by Kjell T. Nilssen (NO). This meeting was the fourth of the working group (WG) and updates on the recommendations from the last two WG meetings were provided.

The *Terms of Reference* for this meeting were:

a) To provide a new assessment for grey and harbour seals throughout the North Atlantic.

b) To provide guidelines for responsible removals from small coastal seal stocks.

Summary of previous recommendations

The recommendations for Norway, Greenland and the Faroe Islands made at the 2021 CSWG meeting, and recommendations for Iceland made at the 2016 CSWG meeting were reviewed. Updates on the status of the previous recommendations for research and recommendations for conservation and management of coastal seals in the NAMMCO countries are provided in the main report (item 4.2).

Current research and population status of harbour seals in the North Atlantic

Norway

Stock identity, movements and diet

The current management units for Norwegian harbour seals are defined by county limits. However, genetic evidence suggests that there are differences among the North, Central, and Southern coastal areas that do not align with these management units. Tracking studies on harbour seals have been conducted in different regions to monitor their movements and foraging areas. The results indicate that seals move within and between counties, and also between colonies in Norway, Sweden, and Denmark. These findings suggest the need to revise the current harbour seal management units, as hunting activities may involve seals from neighbouring counties or even from Sweden or Denmark. Further genetic sampling and analysis in Sweden are also needed to understand the stock identity of seals in Southern Norway.

Norwegian harbour seals have a diverse diet consisting of about 20 different species of fish. They interact with cod and monkfish fisheries in the North and West of Norway. However, Atlantic cod is not a significant prey item in some areas, rarely appearing in diet samples.

Abundance and removals

Survey counts conducted from 2016 to 2021 in mainland Norway estimated a minimum total of 6,857 harbour seals. Ongoing work is being conducted to better understand the uncertainties surrounding the survey counts and to develop models for assessing the total population size of harbour seals in Norway.

Harbour seal quotas in Norway have been recommended at a level of 5% of the total counts in each county. In 2010, the Norwegian Parliament approved a target level (TL) of 7,000 harbour seals for the country, which can be adjusted based on new knowledge. If the counts show numbers at or below 50% of the TL, the hunt is halted. Since the implementation of the Management plan in 2011, the recommended quotas have been adhered to, with catches mostly staying below or within the quota levels.

From 2006 to 2020, the average yearly anthropogenic removals of harbour seals through hunting and by-catch were 458,394 seals. This translates to an average anthropogenic mortality rate of 10-15%. However, despite the high mortality rates, surveys indicate that the total abundance of harbour seals has remained stable during this period. This stability may be due to a potential proportion of by-

caught animals being young and immature individuals or compensatory immigrations from neighbouring regions, such as seals from the Swedish west coast.

Iceland

Abundance and removals

Regular surveys of harbour seals conducted in Iceland indicate a significant decline in the population, from 33,000 animals in 1980 to 10,300 in 2020. This decline has led to the classification of the Icelandic harbour seal population as endangered on the national red list. The management objective is to maintain the population above 12,000 individuals and to implement measures if the number falls below that threshold. However, specific measures have not yet been identified in a management plan. In 2019, a ban on seal hunting was enacted, although permits for traditional seal hunts can be obtained, resulting in few seals being hunted since the ban. The closure of areas with high by-catch has been tested, although no results are available yet. In 2023, monitoring of by-catch has been intensified with the help of inspectors.

Other anthropogenic impacts

The WG was informed that the effects of growing tourism on land during seal pupping and moulting/mating periods and the management of seal watching activities were currently being monitored in various locations in Iceland.

Greenland

The harbour seal population in West Greenland had been severely depleted and faced near extinction, leading to a hunting ban in 2010. Currently, three small populations have been identified in breeding and moulting areas, but sporadic observations suggest the presence of additional undiscovered or forming populations. Breeding areas such as Kangerlussuaq and Majorariaq, are characterized by accessible mud/sand deltas or fjords. Qeqertat, an archipelago, serves as a moulting area, with females spreading out in breeding clusters across the region. The WG was informed of a tagging study revealing the northward migration of some seals from Qetertat to give birth in another coastal location, highlighting the complex dynamics of that harbour seal population.

Despite the spread of harbour seals across Greenland, their population has remained at low levels for decades. Currently, there is no reporting of harbour seal catches, although occasional catches may occur due to misidentification or by-catch. The WG was informed that local hunters had expressed interest in hunting harbour seals in the Majorariaq area, but the population, currently protected, consists of no more than 50 individuals.

Other areas in the North Atlantic

Updates on current research and population status of harbour seals in the UK, Sweden and Eastern USA were presented at the meeting and are provided in the main report (item 5.4). It was noted that, while the population in the Swedish Skagerrak had declined recently, for reasons unknown, the number of harbour seals in the Norwegian Skagerrak had doubled, possibly indicating a migration of Swedish seals to Norway.

Current research and population status of grey seals in the North Atlantic

Norway

Abundance and removals

Pup counts performed along the Norwegian coast revealed an increase in the grey seal population from the period 2001-2003 to 2006-2008, with an estimated annual pup production of around 1,200 pups. However, a significant decline in pup production occurred in middle Norway (Trøndelag-Nordland region,) from 2014 to 2018, resulting in an estimated total population (including pups) of

3,850 grey seals in 2018. In other areas of Norway, pup numbers have increased or remained stable in recent years.

During the period of 2007-2011, a bounty system was introduced by the Norwegian Directory of Fisheries, resulting in a rise in seal catches. However, after the implementation of a management plan for grey seals in 2011, the quotas were reduced to align with seal abundance estimates. When pup production declined by over 50% in 2014-2015 in middle Norway, hunting stopped in that area.

By-catch in the monkfish fishery is believed to be a significant driver of population declines in middle Norway, which is also the main area for this fishery. Such decline seems unlikely to be caused by a lack of food, as potential prey for grey seals (e.g., cod, saithe, wolffish, and herring) are locally abundant. Despite a regional hunting ban since 2015, by-catch continues to be a concern for the grey seal population and a tagging study resulted in all tagged pups caught in gillnets shortly after tagging. Reports from the coastal reference fleet also indicate a high level of grey seal by-catch, with an average annual estimate of 363 animals.

Current research

Ongoing work involves the development of a grey seal population model that incorporates by-catch estimates and utilises catch data on monkfish as a driver. This research aims to refine the understanding of the grey seal population dynamics and the factors that contribute to its fluctuations along the Norwegian coast.

Iceland

Abundance and removals

Regular population estimates for Icelandic grey seals have been conducted since 1982, with counts carried out during the pupping period in October and November. The latest estimate from 2017 indicates a population size of 6,300 animals, showing a decline over the past decades. The population is currently classified as vulnerable on the national red list. A new count was conducted in 2022 and new population estimates are expected in 2023.

In 2006, a management objective was established to maintain the Icelandic grey seal population above 4,100 animals, triggering intervention measures if the population drops below this threshold. However, specific measures for achieving this objective have not been outlined in a management plan. Hunting of grey seals has been minimal since the hunting ban was implemented in 2019. Efforts have been made to increase monitoring of grey seal by-catch through inspectors, and the closure of areas with high by-catch has been tested, although no results are available yet.

Current research

The WG was informed that a pilot study using satellite tags on grey seal pups had been conducted in Iceland, aiming to gain insights into the important habitats of grey seals, and that there were plans to continue this research.

Faroe Islands

Updates were provided on the survey efforts to count grey seals in the Faroe Islands, with a minimum estimate of 661 animals based on the highest counts from surveys conducted on 18 islands in 2018, 2019, and 2021. The harvest of grey seals, averaging 130 seals per year from 2010 to 2021, has been discontinued due to a new law prohibiting intentional killing around fish farms since January 2021. Tracking data from 13 individuals suggest that seals remain close to the shore and favour specific haul-out sites, and plans are in place to track more seals and monitor haul-out behaviour using cameras.

Currently, there is no management objective for grey seals in the Faroes and based on the current minimum estimate, the population is still below the population level of 3,000 seals estimated in the 1960's. It was noted that the grey seal population in the Faroes may not experience exponential

growth due to potential high pup mortality and space-dependence factors. However, the ban on hunting is expected to facilitate population recovery.

Other areas in the North Atlantic

Updates on current research and population status of grey seals in the UK, Sweden and Eastern USA are provided in the main report (item 6.4).

Population assessment of harbour and grey seals throughout the North Atlantic

The WG considered that the available information on harbour and grey seals in the NAMMCO countries and neighbouring areas did not fulfil the data nor the methodological requirements to produce a large-scale population assessment for both species in the North Atlantic. The WG **recommended** planning an international workshop to achieve a modelling framework for future assessments (see below).

Guidelines for responsible removals from small coastal seal stocks

The WG follows the principles for the precautionary management of marine mammal stocks within the remit of NAMMCO, adopted at the 30th Annual Meeting of the Council (March 2023), acknowledging that long-term abundance records or reliable historical information on abundance are lacking for many seal stocks in the NAMMCO countries. Guidelines for responsible removals from small coastal seal stocks in Greenland are provided under Recommendations (see below).

General Recommendations for harbour and grey seals

ALL COUNTRIES

- To complete an assessment for coastal seals in each of the NAMMCO member countries as soon as the necessary data are available.
- To plan a joint international workshop to discuss methods of data collection and ways forward to utilise the data for North Atlantic population models of coastal seals in the future.

NORWAY

Recommendations for research

- Improve knowledge on by-catches by collecting data on species, genetics and age by collecting jaws from by-caught seals in the reference fleet.
- Collect data on by-catches in recreational fisheries.
- Use reference fleet data to investigate by-catch levels in other fishing gears (e.g., fish traps).
- Conduct further tracking studies of coastal seals along the Norwegian coast to obtain better knowledge on seal movements.
- Continue efforts to implement the Remote Electronic Monitoring (REM) system on Norwegian vessels to estimate drop-out rates and supplement existing by-catch data.

Recommendations for conservation and management

- Management plans should take total anthropogenic removals into account.

ICELAND

Recommendations for research

- Continue efforts to develop population models for both species, assess whether data on biological parameters from other areas can be used for this, and collect data on biological parameters from Icelandic seals to the extent that it is necessary.
- Continue investigating habitat use of both species using satellite telemetry to help evaluate co-occurrence with fisheries and risk of by-catch.

Recommendations for conservation and management

- Put forward a management plan for both harbour and grey seals, which should include:
    - Re-evaluation of the target population level objective with the new level being based on biological criteria.
    - When setting catch levels, consider total anthropogenic removals (including direct hunt and by-catch).
    - Biennial surveys for both species.
- Make legislation on seal hunting species-specific.
- Continue efforts to reduce by-catch.

Specific Recommendations for harbour seals

NORWAY

Recommendations for research

- Continue the modelling efforts to estimate uncertainty around survey methods and incorporate both previous data (back to 2010) and the data being collected during the current survey period, 2022-2027.
- Complete the analysis of DNA samples from harbour seal pups in Norway to help determine stock structure and propose more scientifically based management units.

ICELAND

Recommendations for conservation and management

- Further develop mitigation measures to reduce anthropogenic disturbances from tourists on harbour seals. Consider restricting access to people in important areas for harbour seals during the breeding period.

GREENLAND

Recommendations for research

- Continue monitoring of the three known harbour seal populations in cooperation with local hunters.
- Regularly check on previously used breeding/moulting sites.
- Improve current knowledge on by-catch of harbour seals and its impact on known populations.

Recommendations for conservation and management

- All known harbour seal populations should be allowed to increase.
- According to NAMMCO principles, stocks should be at least at 60% of the equilibrium level before any hunting can take place. As the equilibrium level is unknown for all Greenland populations the MSY-level could be used, as it is a close proxy to 60+% that can be achieved in a shorter term than the equilibrium level.
- If a colony is the closest neighbour to a formerly significant but now abandoned breeding/moulting site, no hunting should be allowed until the neighbouring breeding/moulting site has been recolonised and an assessment can show a sustainable catch.

Specific Recommendations for grey seals

ALL COUNTRIES

- Support the development of a Europe wide population model for grey seals through data provision and cooperation. A first step towards this goal should be to plan a joint international workshop to discuss methods and data to develop models for coastal seals in the North Atlantic.

- Support a joint effort to deliver samples for genetic analysis of grey seals, to improve knowledge on population structure and status.

NORWAY

Recommendations for research

- Improve population modelling of grey seals and incorporate both the by-catch and catch (total anthropogenic removals) in the models.

ICELAND

Recommendations for research

- Carry out biannual abundance surveys of grey seals.

FAROE ISLANDS

Recommendations for research

- Continue the summer counts for abundance estimation and conduct monitoring of haul-out and breeding sites, as well as additional tracking.

Recommendations for conservation and management

- Determine management objectives for the population in line with the NAMMCO precautionary principles

MAIN REPORT

The NAMMCO Scientific Committee Working Group on Coastal seals (CSWG) held its fourth meeting at the Greenland Representation, in Copenhagen (Denmark), from 8-11 May 2023. The Working Group (WG) was chaired by Kjell Tormod Nilssen (NO). The list of participants and the agenda are available in Appendix 1 and 2 respectively.

1 WELCOME FROM THE CHAIR AND OPENING REMARKS

Chair Nilssen welcomed participants to the meeting and a round of introductions was made. The Chair informed that this was his last CSWG meeting as Chair and suggested that Sandra Granquist, current Vice-Chair of the NAMMCO Scientific Committee, could be chairing future meetings of the CSWG.

2 ADOPTION OF AGENDA

The agenda was adopted. However, for this report, some changes have been made in the numbering and naming of agenda items, to present the information grouped by countries.

3 APPOINTMENT OF RAPPORTEURS

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

4 REVIEW OF TERMS OF REFERENCE, AVAILABLE DOCUMENTS AND REPORTS

At the 29th meeting of the Scientific Committee (SC), the following Terms of Reference of the 2023 CSWG meeting were defined:

a) To provide a new assessment for grey and harbour seals throughout the North Atlantic.

b) To provide guidelines for responsible removals from small coastal seal stocks.

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

4.1 COASTAL SEALS WORKING GROUP MEETINGS OF 2016 AND 2021

Nilssen noted that reports from these meetings were available to the group as For Information (FI) documents SC/30/CSWG/FI01 and SC/30/CSWG/FI02.

4.2 SUMMARY OF PREVIOUS RECOMMENDATIONS

The most recent previous recommendations for research, conservation and management of harbour and grey seals in the NAMMCO countries were reviewed: these corresponded to recommendations to Norway, Greenland and the Faroe Islands made at the last 2021 meeting, and recommendations to Iceland formulated at the 2016 meeting (the last one with Icelandic participation). Updates from both the WG and member countries were provided.

Previous recommendations to all countries (2021):

- "Support the development of a Europe wide population model for grey seals through data provision and cooperation."

- "Complete an assessment for coastal seals in each of the NAMMCO member countries as soon as the necessary data is available."

Updates from the WG (2023):

The WG noted that to achieve the first recommendation, a previous step, in the form of an international workshop to discuss data and methods to achieve a modelling framework for coastal seals in the North Atlantic would be necessary. Various approaches to model grey seal populations on both sides of the Atlantic were discussed in a 2020 online workshop (Smout et al. 2021), and an international workshop for coastal seals would build on these efforts. The WG reiterates the second recommendation (see also section 7.1).

Previous recommendations to Norway (2021):

- "Complete the collection and analysis of DNA samples from harbour seal pups in Norway to help determine stock structure and propose more scientifically based management units."
- "Re-evaluate the robustness of currently assumed immigration rates of grey seals to Norway (e.g., by reviewing recent literature and the telemetry data from the UK and Russia, performing DNA analysis on pups, sensitivity testing)."

Updates from Norway (2023):

The required DNA samples from harbour seal pups have already been collected and are currently being analysed. Immigration rates have not been re-evaluated, but a better understanding of distribution/migration of coastal seals is expected with future/ongoing research (tracking, genetic analyses).

Previous recommendations to Iceland (2016):

- "An assessment survey of the entire population of harbour seals should be conducted as soon as possible. Surveys should then be conducted every 2 years while the population is lower than the target level. All removals should be reported (e.g., hunting, by-catch, etc.)."
- "A Management Plan for harbour seals should be developed including outlining the frequency of surveys and legislation of seal hunting. The target population level objective should be re-evaluated and be based on biological criteria. Reproductive rates should be collected."
- "The effects of disturbance from tourism on harbour seals should continue to be investigated. Develop mitigation measures."
- "The method of catching harbour seal pups in nets should be investigated. In NAMMCO, killing methods should be immediate. This issue should be referred to the NAMMCO Hunting Committee."
- "A Management Plan for grey seals should be developed including: the frequency of surveys, legislation of seal hunting, and re-evaluation of the target population level objective with the new level being based on biological criteria."
- "A complete survey of grey seals should be conducted to obtain a full, reliable abundance estimate, including reporting of all removals (e.g., by-catches, hunted seals, any other removals). Pup production surveys at least 3 times to make sure that the peak pupping period is covered."
- "Iceland should also consider tagging grey seal pups for staging and should also investigate whether the peaks in pupping differ in different areas around the country. Genetics samples should be collected and analysed to explore stock structure."

Updates from Iceland (2023):

Iceland now aims to survey both grey seals and harbour seals bi-annually. The most recent surveys for harbour seals were completed in 2020 and grey seals were surveyed in 2022, however analysis is still ongoing. Iceland reiterates the recommendation to put forward a management plan for both

harbour and grey seals in the country, including frequency of surveys, re-evaluation of target levels and legislation on seal hunting. In 2019, a new hunting legislation was enacted in Iceland, where seal hunting was banned, although it is possible to apply for permits for traditional hunting. In these cases, it is necessary to report hunt statistics and send biological samples for research. The method of catching harbour seal pups in nets is currently being investigated in terms of seal welfare and legal aspects. In 2023, Iceland also increased the effort in monitoring by-catch through inspectors and a code of conduct for tourist has been elaborated to mitigate disturbance to coastal seals. Genetic analysis of both grey seals and harbour seals has been conducted and analyses continue. More updates on coastal seal research and management in Iceland are provided in sections 5 and 6 of the report.

Previous recommendations to Greenland (2021):

- "Enhance efforts to identify new breeding and moulting sites for harbour seals in Greenland (particularly in West Greenland) using methods that are most feasible in the different areas, including interviews with local hunters, follow up explorations on foot or with drones, etc. In some cases, tagging studies may be used to identify new moulting and breeding sites."
- "Discuss the proposal that all catch statistics for harbour seals in Greenland be removed from the NAMMCO website due to known errors and a lack of validation."

Updates from Greenland (2023):

A harbour seal survey is planned for summer 2023. Catch statistics of harbour seals in Greenland have been removed from the NAMMCO website.

Previous recommendations to the Faroe Islands (2021):

- "Continue the work to provide total summer counts in the Faroe Islands and conduct ongoing monitoring of the breeding sites as well as higher resolution tracking of grey seals."

Updates from the Faroe Islands (2023):

The Faroese grey seal stock has been counted, for the first time ever, based on haul-out and shoreline counts during summer (see more details under item 6.3). The future plan is to repeat the counts to monitor the development of the stock. There are also plans to track more seals in the coming years and to monitor haul-out sites with cameras, to investigate haul-out variability and behaviour.

5 STATUS OF HARBOUR SEAL POPULATIONS IN THE NORTHEAST ATLANTIC

5.1 NORWAY

5.1.1 Current research

Nilssen presented current knowledge on stock identity, distribution, movements and trophic ecology of harbour seals (*Phoca vitulina*) in Norway.

Stock identity

The current management units for Norwegian harbour seals are defined by county limits (see also item 5.2.1), but genetic evidence points to differences among the North, Central, and Southern coastal areas that do not always correspond to those management units. For example, Nordland county, with its long coast, may contain 3 different genetic groups. In addition, there are indications of further genetic structure within Finnmark County, due to seals in local fjords that probably don't interact with seals from other areas due to long distances between the fjords. Further genetic sampling and analysis in Sweden are needed to investigate the stock identity of seals in Southern Norway, as tracking studies show individuals moving between Norway, Sweden and Denmark (see below).

Distribution and movements

In Norway, harbour seals are resident along the entire mainland coast occurring in three distinct types of habitats: open rocky coasts, deep fjords and estuarine sandbanks (Bjørge 1991). Tracking studies on harbour seals have earlier been conducted in northern part of Nordland county (Vesterålen) and in the Porsanger fjord (Finnmark) and a new study was conducted in the southern Skagerrak-Oslo fjord area (information available as document SC/30/CSWG/04). Such studies were aimed at monitoring the post-moulting movements and foraging areas of the species in a region where its abundance has increased in recent years (see item 5.2.1). Between 2017 and 2022, a total of 28 harbour seals were tagged with GPS-phone tags in the study area, with tags providing data for up to 178 days, and a total of 98 864 GPS positions. Results indicated that seals moved both within and between counties, swimming between all five counties in Norwegian Skagerrak: Østfold, Vestfold, Telemark, Aust-Agder and Vest-Agder (Figure 2). In addition, movement connectivity was found between colonies in Norway, Sweden and Denmark. Given the observed movements, it is possible that hunting activities take seals from neighbouring counties or even from Sweden or Denmark, indicating the need to revise current harbour seal management units.

Trophic ecology

Norwegian harbour seals feed on about 20 different species of fish, especially gadoids (codfish family) and other small species. Harbour seals interact with the important cod and monkfish fisheries in the North and West of Norway. However, there are regional variations in the diet of harbour seals and Atlantic cod is not the main prey item, almost not appearing in the diet samples from some areas. Young, small cod might be targeted in some areas during a good spawning year.

5.1.2 Abundance estimation

Nilssen presented information on harbour seal abundance in Norway (available in document SC/30/CSWG/06).

Summary:

Survey counts in 2016-2021 resulted in an estimated total minimum of **6,857** harbour seals in mainland Norway. In Nordland, the most abundant harbour seal area, the seal numbers were the lowest since the counts started in 1996-1999 (figure 1). In the north, Troms and Finnmark, the harbour seal numbers were above the target level. Along the west coast (Trøndelag-Rogaland) the seal abundance was below the target level. In Norwegian Skagerrak, the seal numbers were above the target level. In 2022, the numbers in Østfold and Vestfold had doubled since 2016, which could be due to some migration of seals from Swedish Skagerrak.

It is ongoing work to describe uncertainties around the counts and some modelling to assess total population size.

Discussion:

Even though recent surveys have shown an increase in harbour seal abundance in the Norwegian Skagerrak, the group was informed that in the Swedish Skagerrak and Kattegat areas, numbers had been decreasing recently. Between 2016 and 2017, a drop from 5000 to 3500 seals had been reported in the Swedish Skagerrak, where seals seemed to be abandoning traditional sites (see also item 5.3.2).

Regarding the methodology for abundance estimation, Nilssen clarified that the survey counts in 2016-2021 were made in August, with 3 counts conducted in 3 different days at each colony. The highest number of these 3 counts was used as a minimum abundance estimate for that location. Nilssen further informed that no reliable data on age structure of harbour seals in Norway, nor pup production estimates, were available. It was noted that a high number of pups were reported in the harbour seal by-catch data, but that such sample was not considered representative of the population.

John-André Henden informed the group of ongoing work with admixture models using the replicated count data from Norway, to obtain unbiased abundance estimates of harbour seals at each sampling location. Preliminary results of this work in progress show higher abundance estimates, corrected for detection probability. However, despite bias in abundance estimates, it was agreed that by using the same method over the years, reliable trends in abundance along the Norwegian coast could be obtained.

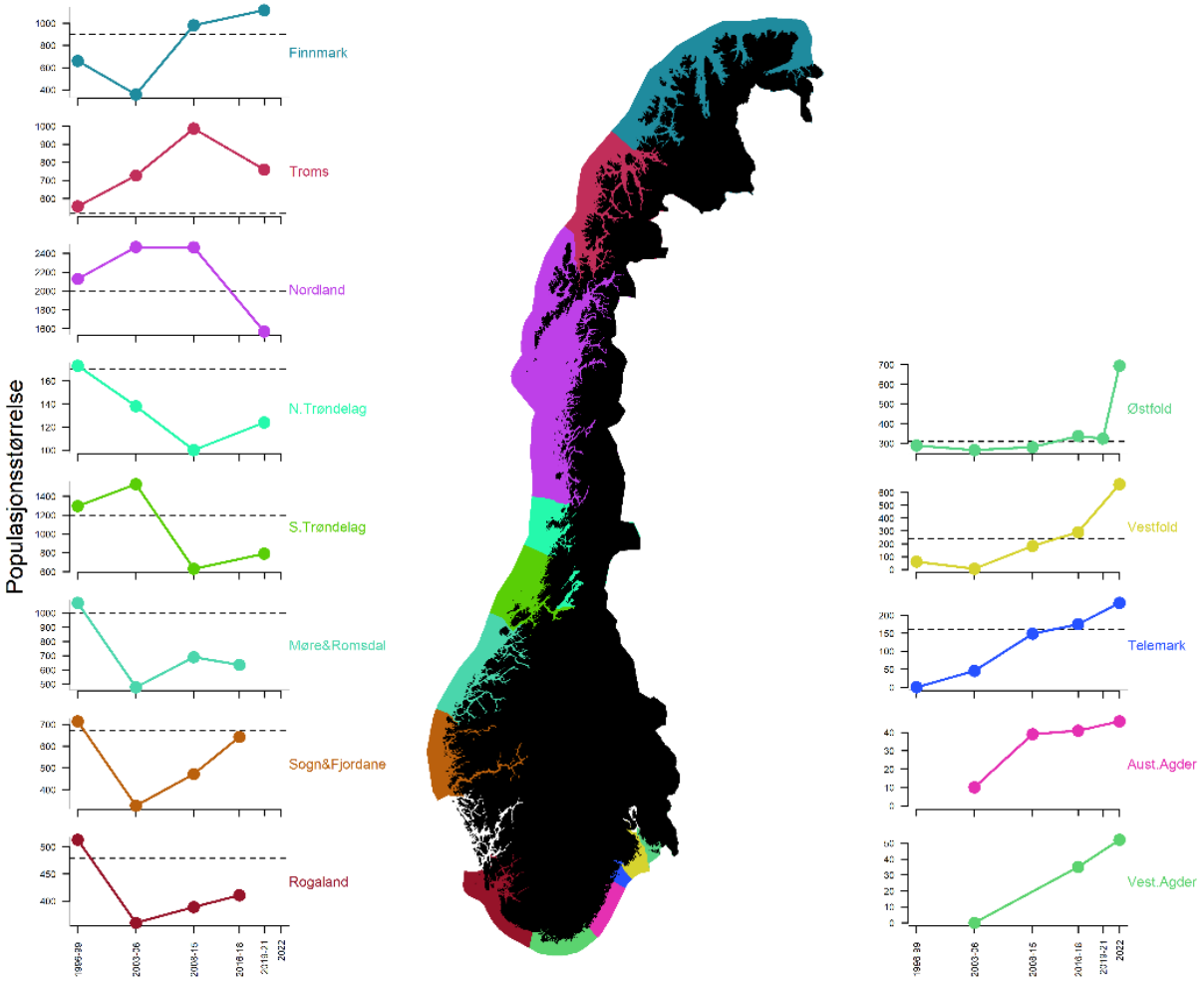

Figure 1. Variation in harbour seal abundances in the management areas (counties) along the Norwegian coast for the period 1995-2022. The target levels are indicated by the dashed line.

The Group was informed that a similar methodology was used in Sweden for counting harbour seals, also involving 3 repeated coastal surveys per year within one week, from which a minimum abundance estimate per site (the highest number of the 3 replicates) was obtained. However, in Iceland, average count values were the numbers used, as more time was needed to complete the surveys due to meteorological challenges.

Russell informed the group that in Scotland the proportions of hauled-out seals during the moult were used for population estimates, whereas for trends only counts (highest number) were used. It was noted that the proportion of hauled-out seals could change over time during the moult, and that this could affect population trends, if proportions were used.

It was noted that the proportion of hauled-out seals did not provide information about seal behaviour during moulting, as the tags used to infer haul-out proportions only gave the position of the seal when hauled-out. Russell indicated that electronic flipper tags could be useful for estimating

both survival and proportion of hauled-out seals, but because of their poor retention rate and association with higher by-catch risk, tattoos were preferred over tags instead.

The WG **recommended** to continue the modelling efforts to estimate uncertainty around survey methods in Norway and incorporate both previous data (back to 2010) and the data being collected during the current survey period, 2022-2027.

5.1.3 Removals (Catch and By-catch)

Nilssen presented information on harbour seal catches in Norway (available in document SC/30/CSWG/06).

Summary:

Harbour seal quotas have been recommended at a level of 5% of the total counts in each county. A target level (TL) of **7,000** harbour seals in Norway was approved by the Norwegian Parliament in 2010, which was based on the available counts in 2010. The TL can be adjusted due to new knowledge and the quotas can be increased/reduced when the seal numbers increase/decrease. If the counts show numbers of 50% of the TL or lower, the hunt is stopped. After the Management Plan was implemented in 2011, the recommended quotas have been followed. The catches have mostly been lower or within the quota levels. In some areas, a few seals above the quota levels have been taken (see figure 2).

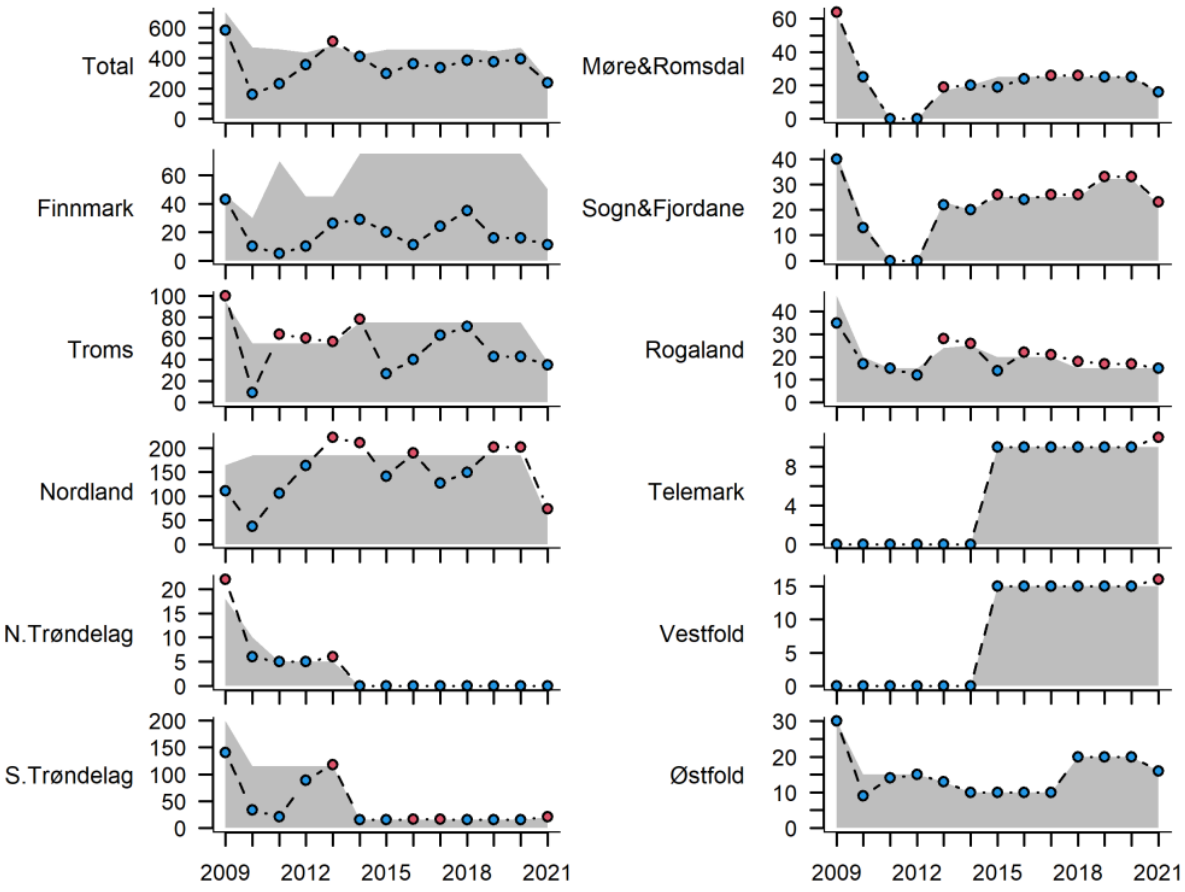

Figure 2. Quotas (grey) and catches in blue and red (higher than quota) of harbour seals in Norway in 2009-2021.

Moan provided a summary of the current knowledge state of by-catches of coastal seals in Norwegian fisheries (documents SC/30/CSWG/FI11 and SC/30/CSWG/09)

Summary:

By-catch rates and total by-catches for harbour and grey seals caught in Norwegian commercial gillnet fisheries have previously been estimated using a stratified ratio estimator, with number of hauls as a proxy for fishing effort. Estimates were derived from data collected with a contracted reference fleet of small coastal vessels (less than 15 meters length overall) and scaled up to the whole fleet using data from national landing statistics. To address species misidentifications, by-catch data for both harbour and grey seals were pooled before by-catch estimates were calculated. The relative abundances of each seal species in different coastal regions were then used to apportion total estimates into species-specific estimates (table 1). Average yearly by-catch was estimated to **757** seals (coefficient of variation CV 0.12), of which harbour seals comprised **394** (95% confidence interval CI 303 - 479) and grey seals comprised **363** (95% CI 298 – 474). These estimates, which were first reported in SC/28/BYCWG/04 (and at the current meeting, SC/30/CSWG/FI11) were endorsed by BYGWG in 2021, but it was noted by the WG that this was not an ideal way to address the species misidentification issue.

Table 4: Average total yearly harbour and grey seal mortality in all regions and all fisheries, including bycatches and direct takes. CVs refer to the coefficient of variation of bycatch estimates. All values (except CVs) rounded to nearest integer (for more details, see document SC/30/CSWG/FI11).

Year	CV	Harbour seal		Grey seal	
		Bycatch estimate (95% CI)	Direct takes	Bycatch estimate (95% CI)	Direct takes
2006	0.17	411 (297 – 567)	538	436 (316 – 602)	272
2007	0.17	437 (312 - 614)	905	480 (342 – 674)	456
2008	0.19	432 (301 – 620)	900	473 (330 – 678)	452
2009	0.23	303 (194 – 472)	585	334 (214 – 522)	516
2010	0.28	373 (219 – 637)	159	402 (236 – 687)	363
2011	0.29	371 (213 – 644)	230	392 (226 – 682)	111
2012	0.24	420 (262 – 673)	355	426 (266 – 682)	64
2013	0.25	378 (235 – 609)	511	359 (223 – 579)	194
2014	0.23	292 (188 – 453)	409	268 (173 – 415)	216
2015	0.21	268 (180 – 401)	297	238 (160 – 356)	83
2016	0.20	273 (185 – 405)	362	239 (161 – 353)	33
2017	0.20	275 (188 – 404)	338	240 (164 – 352)	81
2018	0.23	606 (389 – 946)	385	423 (271 – 660)	66
2019	0.21	563 (373 – 850)	448	381 (252 – 576)	62
2020	0.23	506 (327 – 783)	-	351 (227 – 543)	-
Average	0.12	394 (316 – 491)	458	363 (286 – 461)	212

One potential way forward that was discussed at the 2021 BYCWG meeting, was the use of a habitat suitability model developed by researchers at the University of St. Andrews (Carter et al. 2020; available as document SC/30/CSWG/FI10) to reclassify/relabel species in Norwegian by-catch data based on by-catch locations and spatially explicit model predictions of the at-sea distribution of each seal species. Moan reported that substantial progress has been made on this work, and that preliminary estimates of the relative at-sea densities of harbour and grey seals are now available (see document SC/30/CSWG/09). Moan presented results from using at-sea densities in a simple classification model to predict species in seal by-catch data. The classification model increased the number of grey seals in by-catch data by 93 (table 2), thereby more than doubling the total number of grey seals in the by-catch data. This included relabeling 60 harbour seals as grey seals.

Table 2: Total body counts in by-catch data from the Norwegian reference fleet, by species before and after reclassification using predictions from habitat models. Numbers in parentheses indicate the difference between the original and the reclassified count.

Species	**Original count**	**Body counts after reclassification (change)**		
		A	**B**	**AB**
Harbour seal	333	189 (-144)	296 (-37)	273 (-60)
Grey seal	58	238 (+180)	131 (+73)	151 (+93)
Harp seal	10	0 (-10)	0 (-10)	1 (-9)
Ringed seal	3	0 (-3)	0 (-3)	1 (-2)
Unknown	31	8 (-23)	8 (-23)	9 (-22)

This result supports our hypothesis that young grey seals may be misidentified as harbour seals by fishers when the latter report by-catches of the former. Moan emphasized that these are preliminary results that should be used with caution, and that the approach still needs to be further validated and refined. The habitat models gave reasonable predictions when applied to Norwegian environmental data, but there was evidence of problematic predictions for specific grid cells, possibly reflecting the fact that this application of the models entailed some degree of extrapolation outside the range of the originally fitted data. Even so, these results represent an important step forward in understanding and ultimately mitigating by-catch risk for harbour and grey seals in Norwegian waters.

Discussion:

Based on reported direct takes in the quota-regulated hunt and by-catch estimates, the average yearly anthropogenic removals from 2006 to 2020 were **458**+**394** harbour seals (hunt+by-catch) and **212**+**363** grey seals. This corresponds to an average anthropogenic mortality of about 10-15% for both species. Even so, surveys show that the total abundance of harbour seals has been stable in this period. Grey seals, however, have declined in some regions (see section 6.1). The apparent stability of the harbour seal population despite the high anthropogenic mortality rates, may suggest that an unknown proportion of by-caught animals are young and immature individuals, or that by-catches are compensated by immigrations from neighbouring regions (e.g., grey seals from Russia or the British Isles and harbour seals from the Swedish west coast in Skagerrak)

According to reclassification results, there were more grey seals in by-catch data from the south and southwest, than what would have been expected from the relative abundances of grey and harbour seals in that region. It is possible that some of the grey seal by-catches in this region may originate from young migrants visiting from the British Isles.

It was noted that it had been observed that by-caught animals may drop out of the nets when the nets are hauled and emerge from the water. Dropouts like these often go unnoticed by the fishers, and so, are not registered or reflected in the by-catch data. This is known to occur for harbour porpoises in similar fisheries in other regions, e.g., the UK, the USA, the Netherlands and Denmark. Dropouts have also been observed for seals in Icelandic gillnet fisheries. It is not known to what extent dropouts occur in Norwegian gillnet fisheries, but it is reasonable to expect that the dropout rate is not zero. This suggests that by-catch estimates derived from reference fleet data may be negatively biased.

Moan informed that the next step was to simplify the models and refit them focusing on the importance of bathymetry (e.g., removing the bathymetry covariate from the models). The group agreed that it was sure that harbour seals would not use deeper waters, but that grey seals would potentially use the deeper waters at the edge of the continental shelf.

Nilssen informed that, in Norway, the U.S. Marine Mammal Protection Act (MMPA) has had effect on some fishers, who now worry about by-catch, but that the majority of them still never report by-caught seals. There are indications that Norwegian fisheries are taking large numbers of seals as by-catch, but this is hard to confirm and the only reliable data on seal by-catch in Norway is the one provided by the Reference Fleet (RF). However, it is unknown when that by-catch happens, as this is not reflected in the RF data, although some fishermen have noticed differences from year to year.

It was said that by-catch of pups was potentially less problematic for the population, but that the by-catch of older seals, in particular females, was. In other areas, older animals observed living with net entanglements (an eventual mortality) indicate that animals other than pups are also by-caught and may be under-represented in the estimated by-catch.

5.1.4 Impact of other anthropogenic stressors

Nilssen informed the group that tourism seemed to be affecting harbour seals in the inner part of Sognefjord (Western Norway) and in Lysefjord (Southwest), with seals at both sites being affected by kayaking and other boat disturbances during the breeding period. A reduction in the number of harbour seal pups born in Lysefjord has been observed since the 1990s and now seals are moving out of the fjord for breeding.

5.2 ICELAND

Granquist presented available information on the abundance, removals and impacts from other anthropogenic stressors on harbour seals in Iceland.

5.2.1 Abundance estimation and removals (Catch and By-Catch)

Regular surveys and population estimate of harbour seals have been carried out in Iceland since 1980. The count is carried out during the moulting season at the end of the summer where the whole coastline is covered at least once. The results show that the population has declined from **33,000** animals in 1980 to **10,300** in 2020 when the newest estimate was made available (table 3). The observed decline has led to the Icelandic harbour seal population being defined as endangered on the national red list for threatened populations. In 2006, a management objective was put forward stating that the Icelandic harbour seal population should be kept above **12,000** animals and if the population drops below that number, measures should be taken. However, these measures have not

been identified in a management plan. Iceland has however recently increased the effort in seal management and seal research to deal with the sensitive population status.

Table 3: Estimated population size from 1980 to 2020 and the governmentally issued management objective (M.o). The probability of the current population size being lower than previous estimates P(pop2020<popyearX). Exponential growth rate (Rest), with the linear percent change (Δ (%)) and annual discrete time per capita growth rate (λ (%)) from the relevant year compared to 2020 (see also document SC/30/CSWG/FI05).

Survey year	Est. pop.	P(pop2020<popyearX)	Rest	Δ (%)	λ (%)
1980	33,327	100%	-0.03	-69.04%	-2.89%
1985	27,871	100%	-0.03	-62.98%	-2.80%
1989	15,298	100%	-0.01	-32.55%	-1.26%
1990	17,026	100%	-0.02	-39.39%	-1.66%
1992	15,731	100%	-0.02	-34.40%	-1.49%
1995	13,578	96%	-0.01	-24.00%	-1.09%
1998	13,887	97%	-0.01	-25.69%	-1.34%
2003	9,972	42%	0.002	3.48%	0.20%
2006	12,122	84%	-0.01	-14.87%	-1.14%
2011	11,272	70%	-0.01	-8.45%	-0.98%
2016	7,652	7%	0.08	34.85%	7.76%
2018	9,434	31%	0.05	9.38%	4.59%
2020	10,319	-			
M.o.	12,000	82%			

In 2019, a new seal hunting regulation was enacted, where all seal hunting in Iceland was banned. It is possible to apply for a permit for traditional seal hunt, however only few seals have been hunted since the ban was enacted. The seal hunting ban applies to all seal species and is not species specific. Furthermore, the aerial survey frequency has been increased and Iceland is currently aiming for bi-annual estimates. In 2023, Iceland also increased the effort in monitoring by-catch through inspectors. Closures of areas with high by-catch has also been tested, however no results are ready yet. Recent by-catch estimates of harbour seals in Iceland are shown in table 4.

Table 4: By-catch estimates of harbour seals by gear type based on data from 2014-2018 (lumpfish gillnets) and 2015-2019 (other gillnets). The estimate from the lumpfish fishery is stratified by lumpfish management area which roughly correspond to the seal counting areas (see also SC/30/CSWG/FI05). Number of observed animals is the total number of animals observed by onboard inspectors or MFRI scientists. Raised estimate is those observed animals raised by total fishing effort in that fishery.

Fishery	Observed animals	Raised estimate	CV	Average inspector coverage
Lumpfish gillnets	138	1389	35	1.7%
Other gillnets	2	18	102	3.7%
Total	140	1407	-	

Discussion:

Granquist clarified that the management objective of 12,000 harbour seals was based on the estimated population size when the management objective was set, but it was not a reflection of how large the population should be based on biological parameters. Granquist further informed that the estimate of 12,000 individuals is based on counted animals, where a correction factor has been applied to correct for submerged animals and animals missed by the observer.

The WG **recommended as a priority** to put together a management plan for harbour seals in Iceland, which should include a) Biannual surveys, b) Re-evaluation of the target population level objective with the new level being based on biological criteria, and c) consideration of total anthropogenic removals (hunt and by-catch) when setting catch levels.

5.2.2 Impacts from other anthropogenic stressors

Granquist underlined the importance of taking anthropogenic disturbance, such as to the one caused by tourism, into consideration in management plans for coastal seals. This applies to both disturbance in the waterand land-based disturbance. The main reason is that these seals spend a lot of time on the land during biologically important periods, such as pupping and moulting/mating. Effects of increasing tourism and seal watching management is currently monitored in several areas in Iceland.

Discussion:

Similar to Iceland, tourism was also considered a growing problem in Norway. It was noted that both tourism and people walking on coastal areas could disturb seals if they came close enough.

5.3 GREENLAND

5.3.1 Population status

Rosing-Asvid informed about differences in habitat and behaviour of the three known harbour seal populations in Greenland and discussed these differences in the context of monitoring the populations (working document SC/30/CSWG/08).

Summary:

The harbour seal had been hunted to near extinction in West Greenland, when a hunting ban was implemented in December 2010. Since then, only three small populations have been identified (places where the seals reoccur during the breeding period in June and during the moulting period in late August). Sporadic observations of harbour seals in other areas indicate that there might be additional small populations that still haven't been discovered or are forming.

Some of the breeding/moulting areas in Greenland are/were on mud/sand delta created by land-terminating glaciers. Such areas are easily accessible for seals, and the flat open space makes it difficult to catch them off guard. Kangerlussuaq is such a locality and when harbour seals were abundant, groups of seals would form in the Kangerlussuaq delta, both in the breeding and moulting seasons (Teilmann and Dietz 1993). In Majorariaq, the females and their pups are also close to each other during the breeding/nursing period. Their habitat is a fjord, with a very narrow entrance, so the water level in the fjord might change (because of rain or melt water from the glacier), and the seals might move around within the fjord because of that. This breeding area is not mentioned in the literature and have probably only been known for about 20 years. These seals are most likely a small remaining group of a much larger population of harbour seals that lived a little south of Majorariaq, breeding in a mud/sand delta somewhat similar to the Kangerlussuaq habitat.

In the southernmost breeding area (Qeqertat), the habitat is an archipelago, and the females typically spread out, so that there might be 1-2 km or more between single mother pup pairs, or small groups of mothers with their pups. Together they form a cluster (approximately 15x45 km) with

breeding females, and their moulting area "Qeqertat" is a small group of islands, (about 1 km^2), which is located approximately in the centre of the breeding cluster. A tagging study in the area in 2009 and 2010 (before the hunting ban) showed that both males and females, moulted at Qeqertat and many of them stayed in or near the "breeding cluster area" for most of the year. Just prior to the breeding season, however, some of the tagged seals swam about 250 km northward along the Greenland east coast and gave birth there in what appears to be another breeding cluster area (Puisortoq, Rosing-Asvid et al. 2020). In 1960, a hunting ban on adult harbour seals during May-September was imposed, and the hunt would therefore for half a century mainly be focused on pups and young seals. During the tagging study 2009-2010 (the last two years with open catch of pups), 14 harbour seals were tagged of which 2 were juveniles, 4 were adult females and 8 were males. When Qeqertat was visited again on 21 and 22 August 2019 (after 9 years with a hunting ban), no adult females were seen on the islands, but females with pups were found in the breeding cluster area at locations where they were hunted in the past. These observations show that not all females can be counted in the breeding cluster during the breeding period (some swam northward), and the moulting site Qeqertat seems to comprise mainly males and juvenile seals, at least in years with high survival of pups.

Discussion:

Despite being spread over a large area, harbour seals in Greenland seem to have kept their population at low levels. However, harbour seal populations have, at maximum reproductive rate, the potential to double every 5-6 years, and the population may just be slowly starting to increase, at least in the southern areas. Rosing-Asvid informed that there were signs of other populations of harbour seal existing in Greenland that have not been discovered yet or are in the making. However, detecting new populations in Greenland by conducting aerial surveys was considered challenging, due to the vast area to cover and the good camouflage of harbour seals. Also, photoidentification of individuals was considered difficult, due to the need to take pictures from different angles of the animal.

Rosing-Asvid further informed that hunters in Greenland have to report their hunts, but there is no reporting of harbour seal catches at the moment. Harbour seals cannot be hunted in Greenland now, but sometimes there are catches due to misidentification problems with other seal species or by-catch in fish nets.

The group was informed that local hunters wanted to start hunting harbour seals in the Majorariaq area, due to more frequent observations of harbour seals. This population, probably not numbering more than **50** individuals, is currently protected and cannot be hunted. The WG **recommended** that the harbour seal population in Greenland continue to be protected in order to allow the population to grow and recolonize former sites occupied by the species. The WG also **recommended** to continue monitoring all known harbour seal populations in the country, in cooperation with the hunters.

5.4 INFORMATION FROM OTHER AREAS IN THE NORTH ATLANTIC

5.4.1 United Kingdom

Russell presented current knowledge on UK harbour seal populations.

Summary:

The population estimate for the UK (figure 3) is 42,900 (derived from composite counts from 2016-2021; 95% CI: 35,100-57,100). Seal monitoring, and associated trend analyses, is conducted on a Seal Monitoring Unit (SMU) scale. The UK comprises 14 SMUs; for five of those SMUs, harbour seals are absent or present only in low number (< 100 individuals counted). There are no clear UK level trends but clear regional trends. Harbour seal abundance in West Scotland is increasing whereas abundance is depleted and/or declining in the north and east of the UK, as well as in Northern Ireland. The reasons for decreasing trends are unknown but there are multiple projects underway to understand

more about these trends and the potential drivers. The key project for Scottish SMUs is the Harbour Seal Decline Project which involves exploring both the proximate (vital rates) and ultimate of the declines and includes the use of Photo ID studies as well as population modelling. There is considerable killer whale predation of seals in Shetland; ECOPredS (Ecological Consequences of Orca Predation on Seals) examines the potential role of killer whales on seal behaviour and abundance. In addition, there is a PhD project focussed on the potential role of grey seal competition and predation on regional harbour seal declines (SMRUSealPred). The recent decrease in harbour seal count in Southeast England has led to the development of a project focussed on the potential role of grey seals and anthropogenic activity on the harbour seal decline. By-catch is unlikely to be a key driver of declines in Scotland or East England.

Recent genetic studies indicate that there is a clear differentiation between some regions with harbour seals in Scotland being part of a different metapopulation than the ones in South East England; the latter is part of the continental Europe metapopulation (Carroll et al. 2020; Steinmetz et al. 2022). More details can be found in the SCOS 2022 report which will soon be available here: SCOS Reports | SMRU (st-andrews.ac.uk).

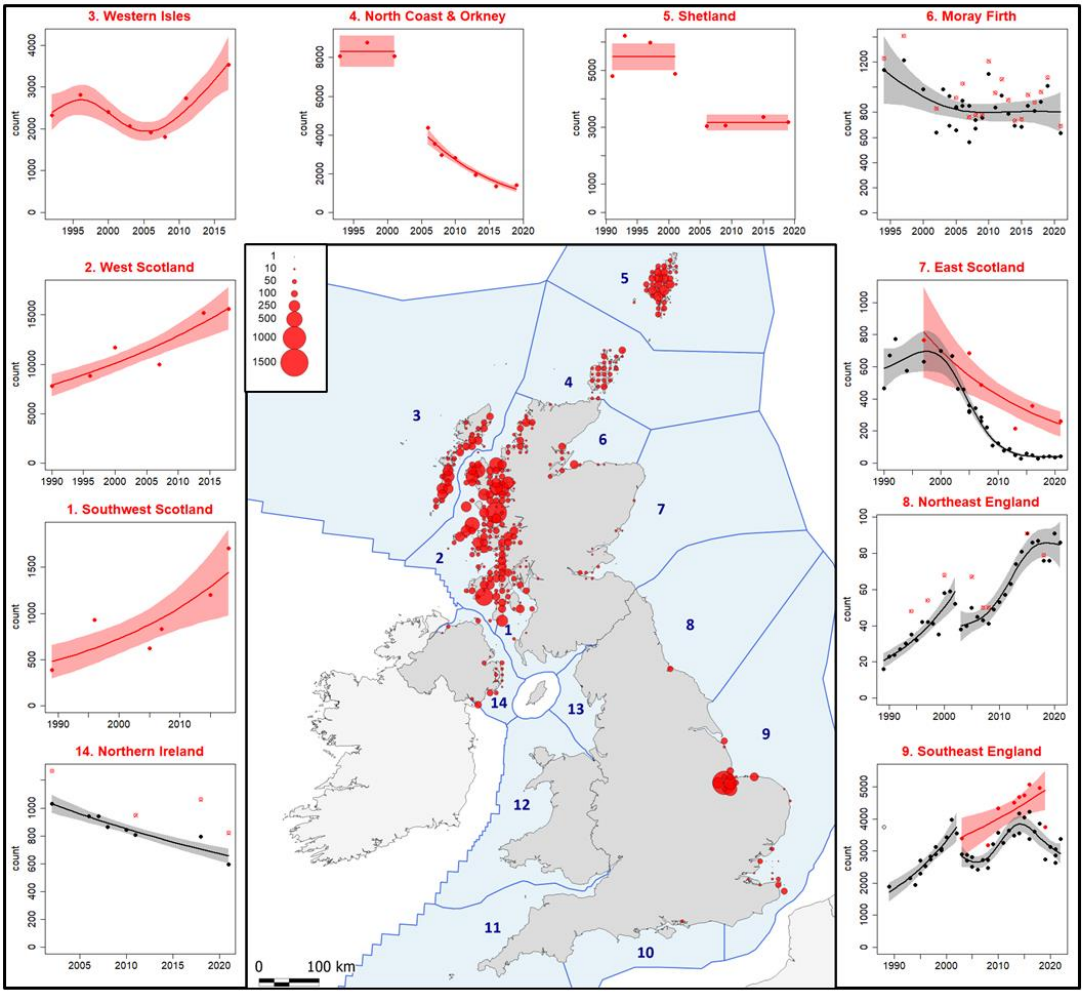

Figure 3. August distribution of harbour seals around the UK by 10 km squares based on the most recent available haul-out count data collected up until 2022 (coastline from GSHHS). Limited data available for SMUs 10-13. On a SMU-scale, the counts by year, and predicted trend and associated 95% confidence intervals are shown in red. The black lines indicate the use of a subset of the SMU. For more details see Russell et al. 2022 SCOS-BP 22/02.

Discussion:

Overall, the harbour seal population in the in UK is stable, with some regional declines. The small number of harbour seals in Northern Ireland is unlikely to be caused by emigration to Western Scotland as it is considered more likely that Scotland provides seals to Northern Ireland. Russell further informed that by-catch issues were largely restricted to Ireland and Southwest UK, where gillnet fisheries operate.

To the question of whether lack of food was pushing some grey seals to prey on harbour seals, Russell indicated that grey seals were also seen taking grey seal pups (several pups in few days, and that grey seals may just see pups as easy prey and that may not be linked to lack of food), since harbour seals in the same areas seemed to be in good condition. Grey seal predation on seals is a specialist behaviour mostly seen in adult males, but not an anecdotical one, as it is increasingly being observed in the UK and elsewhere (e.g. Heligoland). Therefore, it could be having a population effect on harbour seals in some local areas. However, grey seal predation on other seals has not been observed in Norway and seems also very rare in Sweden.

Russell further informed on research on seal health and diseases (avian influenza, PDV, herpes) being conducted on both grey and harbour seals, especially in the Southeast. There is an indication (from rehabilitation centres) that harbour seals in the Southeast UK seemed to have lower survival to release compared to harbour seals in the past, and also compared to grey seals currently; it is speculated that this is due to reduced immune function. It was suggested that the coexistence of grey and harbour seals in Southeast England may not be sustainable. Grey seals typically breed on offshore islands (and there are none in Southeast England) whereas harbour seals can breed on tidal sandbanks. However, grey seals in Southeast England now breed on the mainland beaches. Despite being a conservation success story, a large population of grey seals in the Southeast may not be good news for the local harbour seals.

5.4.2 Sweden

Markus Ahola presented current status of harbour seal populations in the Baltic Sea.

Summary:

Harbour seals in the Baltic Sea are monitored over the whole distribution area of the species from southern Baltic to Skagerrak. Two to three repeated fixed-wing aerial surveys for all the haul-outs are carried out in the peak moulting time during the second half of August. Averages of daily regional sums are used as abundance indices for monitoring population trends. Harbour seals in the area are monitored as five sub-populations in the area, namely Kalmarsund, southwestern Baltic, Kattegat, Limfjord and Skagerrak.

The harbour seal populations in Kalmarsund and SW Baltic have shown continuous exponential growth since the bottleneck in the 1980's. The current abundance indices are around 2,000 harbour seals in Kalmarsund and 1,200 in SW Baltic. The Limfjord area does not seem to support further growth in the harbour seal population even if the abundance index has not been higher than 1,000-1,200 for the last decade. In Kattegat and Skagerrak population growth has been interrupted by a few epidemics. After the last epidemic linked to avian influenza in 2014 in Kattegat and Skagerrak, reaching abundance indices were at around 10,000 and 5,000 respectively, until the last few years when the abundance indices dropped to 8,000 and 4,000.

Discussion:

To the question of why seals were declining in some areas, Ahola pointed to hunting and other disturbances as drivers, including declining fish stocks in Skagerrak. However, it was noted that dead seals had not been recorded on the shore and there was no sign of increases in mortality, so the reasons for such declines remained unknown. Some seals in Western Sweden may have migrated to Southern Norway, explaining the increase there. Alternatively, declines may reflect changes in seal

behaviour due to disturbance, with seals becoming more sensitive to human activity and hence less visible in the surveys.

Rosing-Asvid also informed on the occurrence of hairless ringed, hooded and harp seals in Greenland, and on the analysis of samples from these animals, which could not reveal the reason for that condition.

5.4.3 Eastern USA

Kimberly Murray presented information on the status of harbour seal populations in the Eastern USA.

Summary:

In the USA, the status of harbour and grey seals are assessed in annual stock assessment reports mandated by the Marine Mammal Protection Act. Stock assessments consider a stock's minimum abundance, maximum net productivity rate, trends, and estimates of human-caused mortality (mainly fisheries removals) to assess whether human-caused mortality may be impeding a stock's ability to recover.

The most recent abundance survey for harbour seals was conducted in 2018. Ideally, surveys are conducted every 5-8 years. The abundance survey takes place during the pupping season (late May/early June) on the coast of Maine where most of the population is assumed to be concentrated and available to be observed. Approximately 1,000 ledges are surveyed over a 2-week period and grouped into bay units for statistical analysis. The best estimate of abundance from the 2018 survey was 61,336 (CV=0.08, 95% CI: 72,132 – 53,577), based on a Bayesian hierarchical model fit to counts of pups and non-pups and correction factors from other studies to account for the proportion of animals not available to be seen during the survey (Sigourney et al. 2020). The trend in harbour seal abundance from 1993-2018 predicted by the model suggests a flat rate of growth for non-pups and a decreasing trend for pups during the last 8-year period (2011-2018). The Potential Biological Removal (PBR) for the portion of the western North Atlantic stock of harbour seals in U.S. waters is 1,729. For the period 2016-2020, the average annual estimated human-caused mortality and serious injury to harbour seals in the U.S. was 339 animals. A survey planned for 2023 to update abundance after health-related Unusual Mortality Events in 2018 and 2022 was cancelled due to funding constraints.

Discussion:

It was noted that harbour seal pup counts in the USA did not consider the pups that have not been born and that this was a limitation of the method but was discussed in Sigourney et al. 2020.

To the question of whether NOAA was testing for Covid and influenza on harbour seals in the USA, Murray informed that testing for several viruses (such as PDV, Covid, Avian Influenza) was done by colleagues at Tufts University, MA and Marine Mammals of Maine, ME, who share and update results as part of an Unusual Mortality Events Working Group.

5.5 HARBOUR SEAL POPULATION ASSESSMENT

The WG considered that the available information on harbour seals in the NAMMCO countries and neighbouring areas did not fulfil the data nor the methodological requirements to produce a large-scale population assessment of the species in the North Atlantic. Therefore, the WG **recommended** that a joint international workshop be planned to discuss data and methods to achieve a modelling framework for future assessments of coastal seals in the North Atlantic.

6 STATUS OF GREY SEAL POPULATIONS IN THE NORTHEAST ATLANTIC

6.1 NORWAY

6.1.1 Abundance estimation

Nilssen presented information on grey seal (*Halichoerus grypus*) abundance in Norway (available as working document SC/30/CSWG/05).

Summary:

From 2001-2003, pup counts have been carried out in all grey seal breeding areas along the Norwegian coast (Rogaland-Finnmark). The grey seal abundance increased in all areas until 2006-2008, when the total annual pup production was estimated to be around **1,200** pups. The total population (including pups) was modelled to be **8,740** (95% CI: 7320-10170) animals in 2011. A significant reduction in pup production occurred in middle Norway in 2014-2018 (Figure 4). A total population of **3,850** (95% CI: 3504-4196) grey seals was estimated in 2018. In the Lofoten area, in the northern part of Nordland, the pup numbers had increased in 2020. Also, an increase was observed in Finnmark in 2021. In other areas the pup production was stable.

It is an ongoing work to develop a grey seal population model by including by-catch estimates and to use catch data on monkfish as a driver in the model.

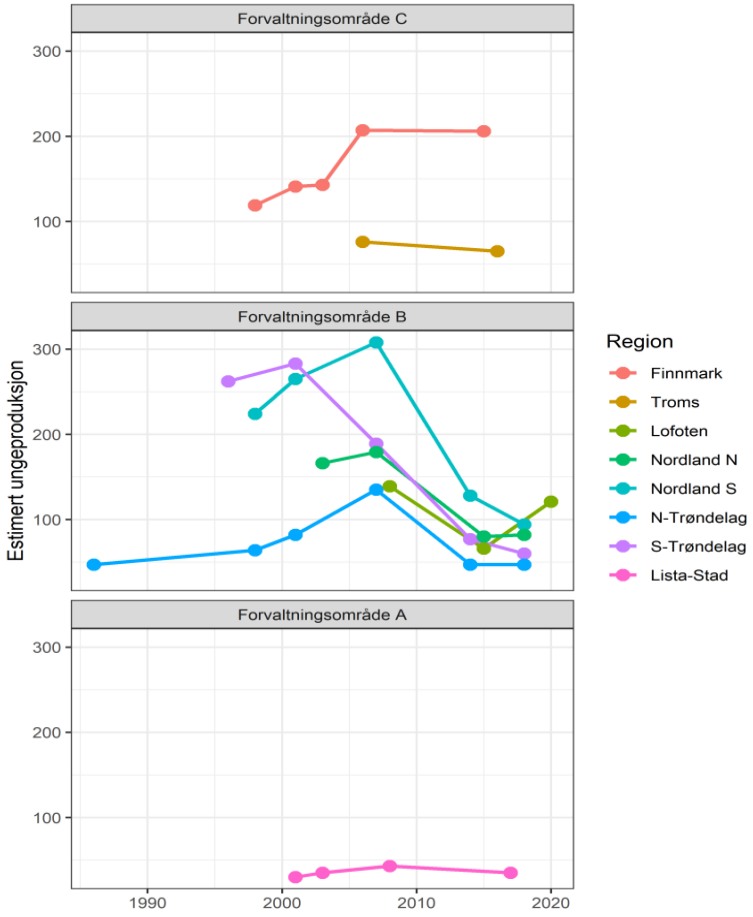

Figure 4. Estimated grey seal pup production in the management areas Lista-Stad (A), Stad-Lofoten (B) and Vesterålen-Varanger (C) in Norway in 1979-2020.

Discussion:

Nilssen informed that the management units used for grey seals in Norway (South, Middle and North) corresponded to well defined subpopulations, with different genetics and breeding periods, and that no reductions had been detected in the smaller colonies in the south and in the eastern part of Finnmark.

Nilssen informed that the gillnet fishery for monkfish increased in 2004, in middle Norway, and has been moving north and south along the coast, with a decline towards 2012 but an increase again in more recent years. Increased by-catch in monkfish gillnets may explain the grey seal population declines detected in middle Norway (see below).

6.1.2 Removals (Catch and By-Catch)

Nilssen presented information on grey seal catches in Norway (also available in working document SC/30/CSWG/05).

Summary:

In the period 2007-2011, the catch quotas were increased significantly and also a bounty for each seal taken was introduced by the Norwegian Directory of Fisheries. This action led to increased catches, particularly in Finnmark, where catches in some years were higher than the quotas. In Trøndelag and Nordland, the catches increased but were much lower than the quotas. After the management plan for grey seals was implemented in 2011, the quotas were reduced to levels related to the seal abundance estimates. Also, the management plan was followed by the authorities, when the pup production decreased more than 50% in 2014-2015 in Trøndelag-Nordland. The hunt was stopped in that area.

Current knowledge state of by-catches of coastal seals in Norwegian fisheries was presented under item 5.1 (documents SC/30/CSWG/FI11 and SC/30/CSWG/09). Reports of the coastal reference fleet indicate a high level of grey seal by-catch, with average annual by-catch estimates of **363** animals (95% CI 298 – 474; document SC/30/CSWG/FI11).

Discussion:

By-catch may be a key factor contributing to the apparent population decreases in Trøndelag and Nordland. The decline is assumed to be primarily linked to the monkfish fishery, as the main area for this fishery (where fishing intensity is the highest) is also the Trøndelag-Nordland area. It is not likely that lack of food could be a reason behind that population decline, as potential prey for grey seals (mainly cod, saithe, wolffish and herring; Nilssen et al. 2019) were abundant along the coast of middle Norway.

By-catch has likely continued to be an issue for the grey seal population despite no hunting in middle Norway since 2015. The significant role of by-catch on pup production declines is also suggested from a tagging study of five grey seal pups in Nordland, in which all tagged pups were by-caught in gillnets for monkfish and cod in the two months following the tagging. Tags might increase risk of entanglement, however pups with no tags were also taken in gillnets.

Because of the suggested link between variation in population size/production and changes in monkfish fisheries, Nilssen informed of ongoing plans to include data on monkfish or harvest levels, along the Norwegian coast, as covariates in a previous population model (Øigard et al. 2012) to test whether changes in abundance may be associated with by-catch.

Because knowledge on by-catch rates can be improved with Remote Electronic Monitoring (REM) systems, the WG **recommended** to continue efforts to implement the REM system on Norwegian vessels to estimate drop-out rates and supplement existing by-catch data. The WG also **recommended** the collection of the lower jaw of by-caught seals, to improve both species and age determination.

6.2 ICELAND

6.2.1 Current research, abundance estimation and anthropogenic impacts

Granquist gave a presentation on the status of the Icelandic grey seal population and current management efforts.

Summary:

Regular population estimates have been carried out since 1982. The count is carried out during the pupping period in October and beginning of November and pupping sites are covered 3-4 times. The results show that the population has declined over the last decades and the newest estimate from 2017 indicates a population size of **6,269** animals (table 5). The observed decline has led to the Icelandic grey seal population being defined as vulnerable on the national red list for threatened populations. A new count was made in 2022 and analysis will be finalised in the course of 2023.

Table 5. Population estimates for Icelandic grey seal from 1982-2017 (M.o. (management objective) corresponds to a population size of 4,100 animals, the lowest population size recommended by Icelandic authorities), probability of the 2017 population estimate being lower than previous estimates ($P(pop_{2017}<pop_{yr.X})$), exponential growth rate (r_{est}) with the total percentage change (*Δ(%)*) and discrete time per capita growth rate (*λ*) from the relevant year compared to 2017 (see also SC/30/CSWG/FI04).

Survey year	Est. pop.	P(pop2017<popyearX)	rest	Δ (%)	λ
1982	9,216	1.00	-0.011	-31.98	0.99
1985/6	8,632	1.00	-0.010	-27.38	0.99
1990	10,557	1.00	-0.019	-40.62	0.98
1992	7,624	1.00	-0.008	-17.78	0.99
1995	7,758	1.00	-0.010	-19.19	0.99
1998	5,612	0.08	0.0058	11.71	1.005
2002	4,731	0.0004	0.019	32.51	1.019
2005	5,568	0.064	0.0099	12.59	1.0099
2008/9	6,156	0.403	0.0023	1.84	1.00
2012	4,206	0.000004	0.080	49.05	1.083
2017	6,269	-	-	-	-
M.o.	4,100	0.000001			

In 2006, a management objective was put forward stating that the Icelandic grey seal population should be kept above **4,100** animals and, if the population drops below that number, measures should be taken. However, as for the harbour seal population, these measures have not been identified in a management plan. Very few grey seals have been hunted since the hunting ban was enacted in 2019 (see more under the previous harbour seal section). Iceland aims to conduct bi-annual grey seal estimates, however this has not always been possible due to financial reasons. As for the harbour seal population, Iceland also increased the effort in monitoring by-catch of grey seals through inspectors and closures of areas with high by-catch has also been tested, however no results are ready yet. A range estimate (min-max) of **977-1,634** by-caught grey seals had been quantified for the Icelandic lumpsucker gillnet fishery during the period 2014-2018 (NAMMCO, 2021).

Granquist also presented a pilot study on satellite tagged grey seal pups, which was published as a research note in 2016. This was the first time that seals were tagged using satellite tags in Iceland and the aim is to continue this work in order to understand important habitat of grey seals in Iceland.

Discussion:

Granquist clarified that the target level for grey seals in Iceland was 4,100 individuals, and that this meant that the population had to be above that number before any takes could be allowed. The population is currently above this management objective. Granquist also informed that a ratio of 4, based on a Canadian model, was used in Iceland to calculate the number of adults each pup represented. A scalar of 2.1 is estimated in the UK and 4.7 in Norway.

The WG **recommended as a priority** to put together a management plan for grey seals in Iceland, which should include a) biannual surveys, b) re-evaluation of the target population level objective with the new level being based on biological criteria, and c) consideration of total anthropogenic removals (hunt and by-catch) when setting catch levels.

6.3 FAROE ISLANDS

6.3.1 Current research, abundance estimation and anthropogenic impacts

Summary:

Mikkelsen provided updates on the survey effort to generate a total count of grey seals along the coast, by means of surveys conducted during the summer in 2018, 2019 and 2021 (working document SC/30/CSWG/10). The population was counted to number a minimum of **661** animals, based on the highest counts for each of the 18 islands and survey years. The plan is to repeat the counts on a regular basis, to follow the development of the stock. The harvest, which was on average **130** seals per year for the period 2010-2021, has now stopped due to a new law applied from the 1st of January 2021, prohibiting the intentional killing of marine mammals around fish farms (Figure 5).

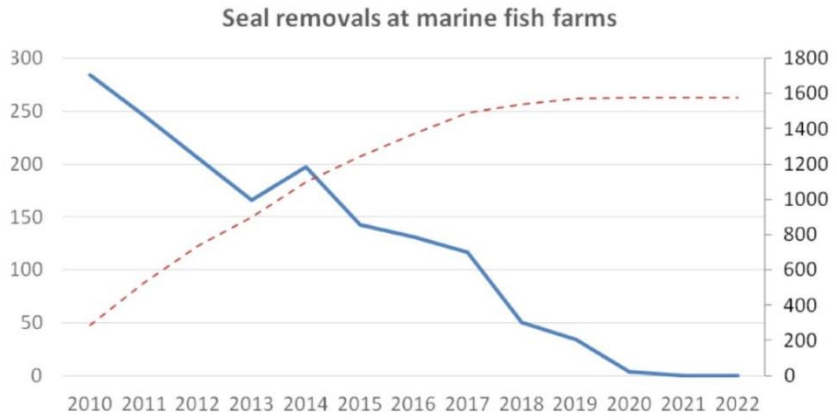

Figure 5. Removal numbers of grey seals at salmon farms (solid line) and accumulated removals (dotted line) for the period 2010-2022.

A more accurate estimate of the population, corrected for the unknown proportion of animals not present, and thus missed by the survey, can be achieved from tracking. Available tracking data from 13 juvenile and mature seals show that individuals are moving between a few favorable haul-out localities and are not going beyond the 200m depth line, staying relatively close to the shore. The plan is to track more seals in the coming years. There is also a plan to monitor haul-out sites with cameras to investigate haul-out behaviour, and the variation in the number of animals present at haul-out sites.

Discussion:

The harbour seal was exterminated in the Faroe Islands in the 1850s due to harvest pressure. Mikkelsen suggested that Faroese harbour seals might have used more the fjord systems within the archipelago and grey seals more the rough peripheral areas, not so accessible to hunters. Due to the

features of the Faroes, with many caves, grey seals might frequently have used caves for breeding and shelter.

To the question of whether grey seals were resident in the Faroes, Mikkelsen informed that there was no evidence of emigration/immigration of grey seals from/to the Faroes, apart from anecdotical records of four young animals from the Orkney area (with a flipper tag). However, it was considered that the increasing grey seal population in the UK might start using areas in the Faroes more frequently.

To the question of how seals affected fish farms, Mikkelsen informed of observations made by fish farmers of bite marks on salmons, possibly made by seals biting through the nets. It was noted that with the stop in the harvest and the apparent lack of grey seal by-catch in the Faroes, the population should be increasing. However, Mikkelsen indicated that an exponential increase may not be possible for grey seals in the Faroes, due to potential high pup mortality (which can be high when caves are used for breeding or shelter; Anderson et al. 1979) or space-dependent factors that slows down recruitment and population growth.

Currently, there is no management objective for grey seals in the Faroes. A minimum population estimate is seen as a first step in that direction, but the WG **recommended** more efforts in data collection and analysis (e.g. through regular count surveys and continued tracking studies). Mikkelsen informed that the equilibrium level of the population was unknown, but that a total population level of **3,000** seals was suggested in the 1960s, based on data from a bounty hunt. Given that the current minimum estimate is < 1000 animals, the population is still below historical records. However, the CSWG **agreed** that the 2020 ban should allow the population to recover.

6.4 INFORMATION FROM OTHER AREAS IN THE NORTH ATLANTIC

6.4.1 United Kingdom

Russell presented current knowledge on UK grey seal populations.

Summary:

The population of UK grey seals is estimated by using an age-structured population dynamics model (Thomas et al. 2019), which incorporates a time series of pup production estimates (Russell et al. 2019; Figure 6), three summer population estimates (August counts scaled using telemetry data; Russell and Carter 2021), and knowledge on ranges of demographic parameters. The most recent UK pup production estimate is from 2019; 67,850 (approximate 95% CI: 60,500-75,100) with an associated population estimate of 157,300 (of age 1+ just before the 2020 breeding season). Although there are no new data, the population estimate for 2022 was around 162,000.

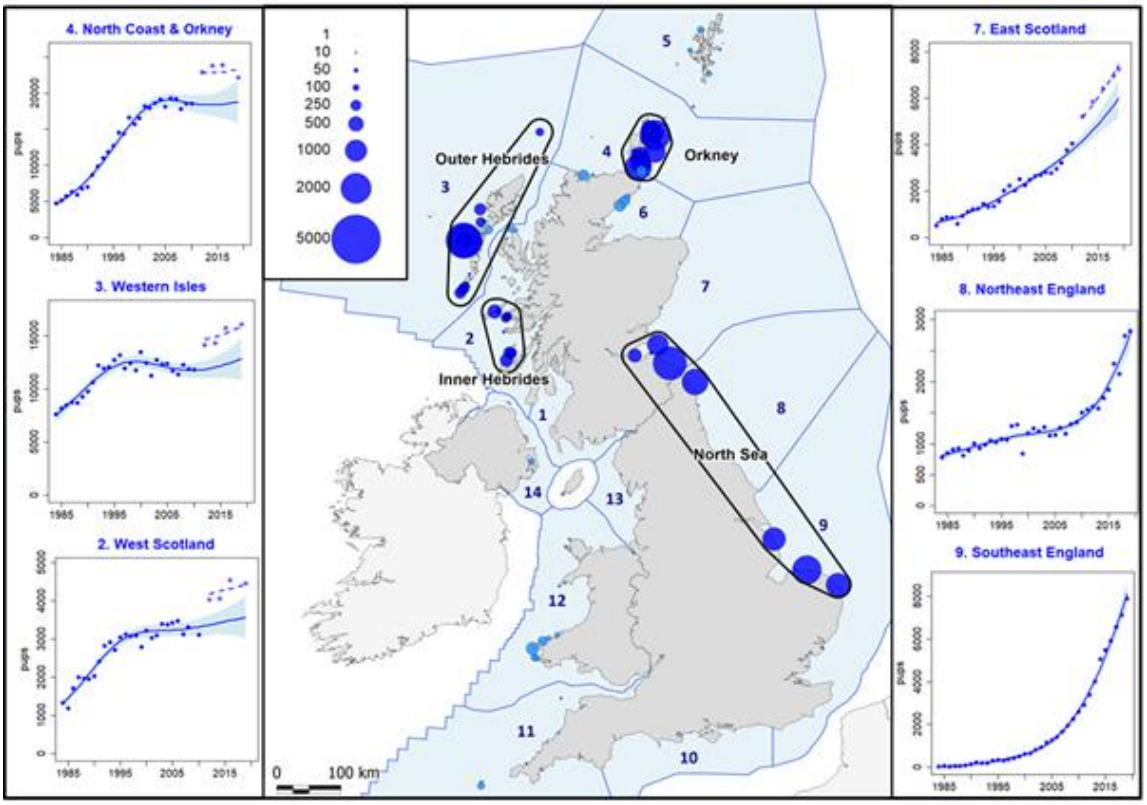

Figure 6. Distribution and estimated pup production (blue circles) of the main grey seal breeding colonies around the UK. Black polygons indicate regional groups of regularly monitored colonies and SMU boundaries are shown in blue. For regularly monitored colonies, on a SMU-scale, the pup production estimates by year, and predicted trend and associated 95% confidence intervals, are shown. For aerially surveyed SMUs (2-7), the dashed line shows the same trend as the solid line, but at the level of pup production predicted from digital surveys. (SCOS 2022).

Discussion:

For the pup production models used in the UK, Russell recommended conducting at least four count surveys, with counts separated into whitecoat and moulted in the counts, and taking into account the probability of detecting a pup, as well as misidentification problems. Pup survival (to age 1), even in areas that have not reached carrying capacity is estimated to be < 50% (from the population model), but this may be lower than reality because juvenile survival is assumed to be at the same high level as the one for adults. Russell further informed that the peak of the pupping season for grey seals in the UK varied clockwise, being in September in Wales, October-November in Scotland and December in East England. The drivers of that cline remain unknown.

6.4.2 Sweden

Ahola presented the current status of grey seal populations in the Baltic Sea.

Summary:

Grey seal population monitoring in the Baltic is based on moult counts. The surveys are coordinated among all the Baltic countries with haul-out sites. Two to three repeated surveys are carried out in all the areas and the maximum daily regional sum is used as abundance index for monitoring population trends. Grey seals in the Baltic are considered to form one population and management unit in the area. The core area of the moulting distribution covers the archipelagos of the east coast of Central Sweden, the Archipelago Sea in Finland and the Western Estonia. The population as a whole has increased rather steadily, but the recent increase in hunting pressure has decreased the hauling-out numbers in certain areas, particularly in the Stockholm archipelago, and increased them in the neighbouring areas.

Pup counts have not covered the whole pupping distribution area in the Baltic. In Estonia, the main pupping islands have been surveyed for over a decade, in southern parts of the Archipelago Sea until the early 2010's and in Sweden since 2021. The variable nature of the pup surveys does not yet allow monitoring of pup-production, but can be used for identifying pupping distribution. Compared to the moulting distribution, the core pupping distribution is more condensed/centralised.

Discussion:

Ahola informed of low reporting of by-catch of grey seals in the Baltic. However, based on interviews off the record with fishermen, it was estimated that around 2000 grey seals per year would be by-caught in the region (Vanhatalo et al. 2014).

6.4.3 Eastern USA

Murray presented information on the status of grey seal populations in the Eastern USA

Summary:

Surveys for grey seals are conducted ideally every five years in coordination with Department of Fisheries and Oceans Canada. In the U.S., grey seal abundance is estimated from pup counts scaled upwards using a multiplier of 4.19 based on the ratio of total population to pups in the Canadian herd. A simple multiplier is used to estimate population size because estimates of age-specific reproductive rates and survival necessary for fitting age-structured population models to pup counts are not available for the U.S. herd. Manned aircraft are used to survey all 10 colonies in the U.S. in early January after all pups are presumed to have been born. Unmanned surveys take place more frequently on the largest pupping colony in the U.S., Muskeget Island. Most recently in 2023, the NOAA Northeast Fisheries Science Center (NEFSC) partnered with Oceans Unmanned to conduct a pupping survey using a Trinity F90+ vertical take-off and lift (VTOL) hybrid drone. The drone was launched and recovered on land, flown at 120m (400ft), and covered the 1 km^2 island in roughly 90min with a SONY RX1 RII camera. Overlapping photos were stitched into an orthomosaic to count adults and pups with excellent resolution and full island coverage.

The last coordinated (NOAA-DFO) grey seal pupping survey was conducted in 2021. An estimated 6,663 pups were born in 2021 (Wood et al. 2022), approximately 6% of the total pup production over the entire range of the population (DFO 2022). Applying the 4.19 multiplier to the minimum number of pups born resulted in a population abundance of 27,911 animals (Wood et al. 2022). Mean rates of increase in the minimum number of pups born at various times since 1988 at four of the more frequently surveyed pupping sites ranged from 11.5% (95%CI: 3.7-19.2%) to 44.1% (95%CI: 28.1–60.2%; Wood *et al.* 2022) and suggest immigration into the area from Canada. The Potential Biological Removal (PBR) for the portion of the western North Atlantic stock of grey seals in U.S. waters is 1,757. For the period 2017–2021, the annual average estimated human-caused mortality and serious injury to grey seals in the U.S. was 1,348. NOAA Fisheries and research partners have been tagging grey seals since 2019 and will continue to collect telemetry data to study risk with commercial fisheries (Murray et al. 2021) and marine habitat use in areas of rapid wind area development.

Discussion:

Murray also informed of a pilot study deploying acoustic tags on grey seals in New England to investigate movements on seals in relation to wind farm developments and areas used by white sharks. These data are still being evaluated. To the question of what frequency was used in the acoustic tags, Murray informed that the frequency 69 Khertz (at the lower 145 dB) was chosen, as it was the frequency heard by the receivers used by many researchers conducting acoustic studies throughout the Northwest Atlantic. The study is integrated into the Mid-Atlantic Acoustic Telemetry System (https://matos.asascience.com/) to facilitate the sharing of detections across receivers deployed for various objectives. Despite this frequency being audible to seals, preliminary results

suggest no detrimental effects to young grey seals having acoustic tags though more data are being collected to test this hypothesis.

6.5 GREY SEAL POPULATION ASSESSMENT

The WG considered that the available information on grey seals in the NAMMCO countries and neighbouring areas did not fulfil the data nor the methodological requirements to produce a large-scale population assessment of the species in the North Atlantic. Therefore, the WG **recommended** that a joint international workshop be planned to discuss data and methods to achieve a modelling framework for future assessments of coastal seals in the North Atlantic.

7 RECOMMENDATIONS

7.1 GUIDELINES FOR RESPONSIBLE REMOVALS FROM SMALL COASTAL SEAL STOCKS

The NAMMCO Council, at its 30th annual meeting, adopted eight principles for the precautionary management of marine mammal stocks within the remit of NAMMCO (see box 1 below).

SC 29 principles for integrating a precautionary approach in NAMMCO's management of cetaceans and pinniped stocks:

1) Anthropogenic removals of marine mammals should be assessed for sustainability.

2) Sustainable management actions should be to maintain or restore stocks at levels ideally above 60% of their equilibrium in the absence of anthropogenic removals, disturbance and resource competition.

3) Stocks that are depleted below 60% should be managed to increase so that they can recover to the 60% level in a reasonable time period. For example, by having total removals that ensure at least a 70% probability of increase.

4) Stocks that are small (<1000 individuals, unless there are more than 400 reproductive age females in the population) should be fully protected from exploitation unless a data-based assessment is able to recommend a sustainable hunt.

5) Management decisions should be based on the best available science, which may include hunter and user data and observations.

6) Where the best available science is insufficient the precautionary approach shall be widely applied, particularly for small stocks. With greater uncertainty more caution is required.

7) Acknowledging that halting all hunting of a stock may not be sufficient to promote recovery of a depleted or small stock, additional management actions should be considered.

8) All species assessments should include data requirements for future assessments.

Box 1. Principles for integrating a precautionary approach to the management of marine mammal stocks (SC 29).

According to principles 2 and 3, stocks should be at least at 60% of their equilibrium level, or increasing, for a hunt to be allowed. The WG acknowledges that the equilibrium abundance is unknown and currently impossible to determine for many seal stocks in the NAMMCO countries, due to the lack of long-term records or reliable historical information. Guidelines for responsible removals from small coastal seal stocks in Greenland are provided under recommendations for harbour seals in section 7.3.

7.2 GENERAL RECOMMENDATIONS FOR HARBOUR AND GREY SEALS

All countries

- To complete an assessment for coastal seals in each of the NAMMCO member countries as soon as the necessary data are available.

- To plan a joint international workshop to discuss methods of data collection and ways forward to utilize the data for North Atlantic population models of coastal seals in the future.

Norway

Recommendations for research

- Improve knowledge on by-catches by collecting data on species, genetics and age by collecting jaws from by-caught seals in the reference fleet.
- Collect data on by-catches in recreational fisheries.
- Use reference fleet data to investigate by-catch levels in other fishing gears (e.g., fish traps).
- Conduct further tracking studies of coastal seals along the Norwegian coast, to obtain better knowledge on seal movements.
- Continue efforts to implement the Remote Electronic Monitoring (REM) system on Norwegian vessels to estimate drop-out rates and supplement existing by-catch data.

Recommendations for conservation and management

- Management plans should take total anthropogenic removals into account.

Iceland

Recommendations for research

- Continue efforts to develop population models for both species, assess whether data on biological parameters from other areas can be used for this and collect data on biological parameters from Icelandic seals to the extent that it is necessary.
- Continue investigating habitat use of both species using satellite telemetry to help evaluate co-occurrence with fisheries and risk of by-catch.

Recommendations for conservation and management

- Put forward a management plan for both harbour and grey seals, which should include:
    - Re-evaluation of the target population level objective with the new level being based on biological criteria.
    - When setting catch levels, consider total anthropogenic removals (including direct hunt and by-catch).
    - Biennial surveys for both species.
- Make legislation on seal hunting species-specific.
- Continue efforts to reduce by-catch.

7.3 SPECIFIC RECOMMENDATIONS FOR HARBOUR SEALS

Norway

Recommendations for research

- Continue the modelling efforts to estimate uncertainty around survey methods and incorporate both previous data (back to 2010) and the data being collected during the current survey period (2022-2027).
- Complete the analysis of DNA samples from harbour seal pups in Norway to help determine stock structure and propose more scientifically based management units.

Iceland

Recommendations for conservation and management

- Further develop mitigation measures to reduce anthropogenic disturbances from tourists on harbour seals. Consider restricting access for people to important areas for harbour seals during the breeding period.

Greenland

Recommendations for research

- Continue the monitoring of the three known harbour seal populations, together with local hunters.
- Regularly check on previously used breeding/moulting sites.
- Improve current knowledge on by-catch of harbour seals and its impact on known populations.

Recommendations for conservation and management

- All known harbour seal populations should be allowed to increase.
- According to NAMMCO principles, stocks should be at least at 60% of the equilibrium level before any hunting can take place. As the equilibrium level is unknown for all Greenland populations the MSY-level could be used, as it is a close proxy to 60+% that can be achieved in a shorter term than the equilibrium level.
- If a colony is the closest neighbour to a formerly significant but now abandoned breeding/moulting site, no hunting should be allowed until after the neighbouring breeding/moulting site has been recolonised and an assessment can show a sustainable catch.

7.4 SPECIFIC RECOMMENDATIONS FOR GREY SEALS

All countries

- Support the development of a Europe wide population model for grey seals through data provision and cooperation. A first step towards this goal should be to plan a joint international workshop to discuss methods and data to develop models for coastal seals in the North Atlantic.
- Support a joint effort to deliver samples for genetic analysis of grey seals to improve knowledge on population structure and status.

Norway

Recommendations for research

- Improve population modelling of grey seals and incorporate both the by-catch and catch (total anthropogenic removals) in the models.

Iceland

Recommendations for research

- Carry out biannual surveys of grey seals.

Faroe Islands

Recommendations for research

- Continue the summer counts for abundance estimations, and conduct monitoring of haul-out and breeding sites as well as additional tracking.

Recommendations for conservation and management

- Determine management objectives for the population in line with the NAMMCO precautionary principles

8 OTHER BUSINESS

The WG **suggested** that the frequency of CSWG meetings should be 2-3 years, depending on the data available and needs for advice from the member countries.

9 ACCEPTANCE OF REPORT

The report was provisionally adopted by the WG at the conclusion of the meeting on May 11th 2023. Following formatting and editorial revisions, the final report was adopted by correspondence on May 26th 2023.

10 CLOSING REMARKS

The Chair thanked both the participants for their work and Chacon for his effective rapporteuring. The participants also thanked Nilssen for his orderly and able chairing. The meeting was closed at 11:43 on May 11th 2023.

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APPENDIX 2: AGENDA

1. **Chairman welcome and opening remarks**
2. **Adoption of agenda**
3. **Appointment of rapporteurs**
4. **Review of terms of reference, available documents and reports**
   - 4.1. Coastal Seals Working Group 2016
   - 4.2. Coastal Seals Working Group 2021
   - 4.3. Summary of previous recommendations
   - 4.4. Others
5. **Status of Harbour seal populations in the North East Atlantic**
   - **5.1. Current research**
     - 5.1.1. Stock identity
     - 5.1.2. Biological parameters
     - 5.1.3. Distribution/migration
   - **5.2. Population size and anthropogenic impacts**
     - 5.2.1. Abundance estimation
     - 5.2.2. Removals (Catch and By-catch)
     - 5.2.3. Impacts from other anthropogenic stressors.
   - **5.3. Data gaps and information from other areas in the North Atlantic**
   - **5.4. Harbour seal population assessment**
     - 5.4.1. Norway
     - 5.4.2. Iceland
     - 5.4.3. Greenland
6. **Status of Grey seal populations in the North East Atlantic**
   - **6.1. Current research**
     - 6.1.1. Stock identity
     - 6.1.2. Biological parameters
     - 6.1.3. Distribution/migration
   - **6.2. Population size and anthropogenic impacts**
     - 6.2.1. Abundance estimation
     - 6.2.2. Removals (Catch and By-catch)

APPENDIX 3: LIST OF DOCUMENTS

WORKING DOCUMENTS

Doc. No.	Title	Agenda item
SC/30/CSWG/01	Draft Agenda	2
SC/30/CSWG/02	Draft List of Participants	1
SC/30/CSWG/03	Draft List of Documents	4
SC/30/CSWG/04	Note: Harbour seal tracking in the Norwegian Skagerrak Authors: Carla Freitas, Kjell T. Nilssen, Martin Biuw and Even Moland	5.1
SC/30/CSWG/05	Status of grey seal abundance and catch in Norway. Authors: Kjell T. Nilssen, Michael Poltermann, Martin Kristiansen, Martin Biuw and John-André Henden	6.2, 6.4.1
SC/30/CSWG/06	Status of harbour seal abundance and catch in Norway. Authors: Kjell T. Nilssen, Michael Poltermann and Martin Biuw	5.2, 5.4.1
SC/30/CSWG/07	Trends in UK seal abundance and grey seal pup production. Authors: Russell DJF, Duck CD, Morris CD, Riddoch NG, Thompson D	6.3
SC/30/CSWG/08	Responsible removals from small coastal seal stocks in Greenland. Author: Aqqalu Rosing-Asvid	5, 7.1
SC/30/CSWG/09	Estimates of at-sea distribution of coastal seals and overlap with gillnet fisheries in Norwegian waters. Authors: André Moan, Arne Bjørge, Martin Biuw and Kjell Nilssen	5.1.3, 6.1.3, 5.2.2, 6.2.2
SC/30/CSWG/10	Update on the status of grey seals in the Faroe Islands. Author: Bjarni Mikkelsen	6

FOR INFORMATION DOCUMENTS

Doc. No.	Title	Agenda item
SC/30/CSWG/FI01	Report of the NAMMCO Working Group on Coastal Seals (2016)	4
SC/30/CSWG/FI02	Report of the NAMMCO Working Group on Coastal Seals (2021)	4
SC/30/CSWG/FI03	Granquist, S. M. (2022). The Icelandic harbour seal (*Phoca vitulina*) population: trends over 40 years (1980–2020) and current threats to the population. NAMMCO Scientific Publications 12. https://doi.org/10.7557/ 3.6328.	5.2 & 5.4.2
SC/30/CSWG/FI04	Aerial census of the Icelandic grey seal (*Halichoerus grypus*) population in 2017: Pup production, population estimate, trends and current status (Report MFRI). Sandra M. Granquist & Erlingur Hauksson.	6.1, 6.2
SC/30/CSWG/FI05	Harbour Seal Report, MFRI, Iceland (2021)	5.1, 5.2, 5.4.2
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SC/30/CSWG/FI11	By-catch of coastal seals in Norwegian gillnet fisheries conducted by coastal fishing vessels - Report to the NAMMCO By-Catch Working Group (2021).	5.2.2, 6.2.2
SC/30/CSWG/FI12	Report of the 29th meeting of the NAMMCO Scientific Committee (2023).	7