

NAMMCO



SCIENTIFIC COMMITTEE WORKING GROUP ON BY-CATCH

*28 May 2020
Video Conference*

REPORT



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At the request of the NAMMCO Council, this report was not made public until after it had been reviewed by the NAMMCO Scientific Committee (SC). The comments of the SC on this report are found in section 3.1 of the 27th SC meeting report, which is available at: <https://nammco.no/topics/scientific-committee-reports/>

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1. WELCOME FROM CHAIR & OPENING REMARKS

The NAMMCO Scientific Committee Working Group on By-Catch (BYCWG) held a video conference on 28 May 2020. The Working Group was convened by Geneviève Desportes (NAMMCO Secretariat) and chaired by Kimberly Murray (NOAA, USA). Desportes welcomed the delegates to the meeting on behalf of NAMMCO and Murray invited participants to engage in a round of introductions to open the meeting.

Murray noted that one of the primary aims of the meeting was to provide information on by-catch for the assessment of grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) that would be performed by the NAMMCO Coastal Seals Working Group (CSWG) in November. The meeting would therefore focus on the presentation and discussion of new information from Iceland on marine mammal by-catch in the lump sucker (*Cyclopterus lumpus*) fishery, as well as new information from Norway on seal by-catch in monkfish (*Lophius piscatorius*) and cod (*Gadus morhua*) fisheries. In addition, a corrigendum to previously reported by-catch data from the Faroe Islands would also be presented. Finally, it was noted that there was also a desire to discuss approaches to assessing risks in fisheries without by-catch estimates if sufficient time was available.

2. ADOPTION OF AGENDA

The draft agenda (available as SC/27/BYCWG/01) was outlined by Murray before participants were asked if there were any additional items for discussion.

It was noted that a working document on observer coverage from the Faroe Islands was available to the meeting, although discussion of this topic did not appear in the draft agenda. This document presented currently available data and was prepared as a follow up to some of the recommendations from previous BYCWG meetings. Mikkelsen noted that this document should still be considered somewhat preliminary and it was agreed that it should be presented and discussed if time permitted.

Northridge highlighted that there was interesting information about seabird by-catch in document SC/27/BYCWG/04 from Iceland and questioned whether this would be included in the discussion. It was agreed that although seabirds are not within NAMMCO's mandate and therefore outside the scope of relevance for this WG, if informative for the analysis of marine mammal by-catch, then the information presented on seabirds could be discussed. The presentation of the document would, however, focus on the information regarding marine mammals.

The absence of working documents on mitigation efforts was noticed and a question asked as to whether this would be a topic discussed at the meeting. Norway informed that it has ongoing experiments with pingers but that information on this had not been prepared for this meeting. It was agreed that it would be interesting to have an update on this work if there was time. It was also agreed that a brief presentation on the conclusions and recommendations from the 2019 Norwegian workshop on by-catch monitoring and mitigation would be relevant (the report of which was available as document SC/27/BYCWG/FI04).

The WG also agreed that information on monitoring and data collection could be discussed under each fishery rather than as a separate agenda item as proposed in the draft.

The agenda was adopted with these amendments (see appendix 1).

3. APPOINTMENT OF RAPORTEURS

NAMMCO Scientific Secretary, Fern Wickson, was appointed as rapporteur, with assistance from the Chair, Convenor, and other participants as necessary.

4. REVIEW OF AVAILABLE DOCUMENTS

Murray reviewed the Working and For Information documents available to this meeting (listed in appendix 3).

Desportes informed the WG that she had also prepared an overview of the differences in by-catch reports following the corrigendum note from the Faroe Islands (SC/27/BYCWG/05) and that this would be presented during the discussion of this item.

5. ICELANDIC BY-CATCH UPDATES

5.1 LUMPSUCKER GILLNET FISHERY

Sigurðsson presented document SC/27/BYCWG/04 - *Bycatch of seabirds and marine mammals in lumpsucker gillnets 2014-2018*.

Author's summary

A new estimate was presented for the coastal lumpsucker gillnet fishery in Icelandic waters, based on data from 2014-2018. The main changes from the previous estimate (2014-2017) were that 102 inspection trips conducted in 2018 were added. Adding those trips did not result in major changes in species composition or by-catch estimates. Some minor changes were noted for several species, as the by-catch estimates for harbour seals (*Phoca vitulina*) and harp seals (*Pagophilus groenlandicus*) increased, while the grey seal (*Halichoerus grypus*) by-catch estimate decreased. A considerable drop in logbook reporting was observed between 2017 and 2018, likely due to the withdrawal of the Marine Stewardship Council (MSC) certification of this fishery in 2018, as fishermen were encouraged to report all by-catch as a part of one of the conditions for the MSC certificate.

Discussion

The reporting of by-catch dropped significantly following the implementation of the electronic log system (2012-13) compared with the handwritten logbook. A discussion was had concerning the drop in by-catch reporting after the shift from a paper to an electronic reporting system and why fishermen appeared to be less willing to report by-catch in this format. Although logbook reporting increased slowly up to 2017, it dropped off sharply in 2018. Iceland suggested that the drop in reporting was primarily linked to the loss of MSC certification in 2018 rather than the change in reporting format. Although they are working to regain the certification, this does not seem likely in the short term.

Certification came into place in 2015 and one of the requirements was to improve logbook reporting. Although improvements occurred between 2015-2017, it was noted that even the highest rate of logbook reporting in 2017 did not match the levels reported by inspectors. For harbour porpoises (*Phocoena phocoena*), there is an overlap in the confidence intervals between logbook and inspector reports. For seals, however, the by-catch in logbooks was still significantly lower than that in inspector reports even during the peak period. It was emphasised that the self-reported by-catch was approximately half of the estimated amount and that even when there is high pressure for by-catch reporting (e.g. under certification schemes), the reported by-catch is still significantly less than that documented by inspector programs. The WG agreed that this once again highlighted the unreliability of self-reporting, even with strong incentives such as retaining MSC certification. This, again, underlined the limitations of relying on self-reporting through logbooks to estimate by-catch rates and the WG therefore **recommended** that additional sources of information always be sought.

The WG noted that the ratio of different seal species varied between the logbook and inspector reports and agreed that misidentification (under both schemes) could be an issue in Iceland just as it is in Norway – notably the possibility that young seals and particularly grey and harp seals, are being misidentified and reported as harbour seals. As in Norway, young of the year and yearlings (1-2 years old) represent the bulk of the by-catch. It was noted that although photographs of by-caught seals are requested during inspection trips, this is not always followed through. An identification document has

been made to help train inspectors. However, when the seals are cut from the net in the water without being brought on deck, correct identification remains difficult. The WG was informed that inspectors and hunters are asked to collect DNA samples from by-caught seals when possible, and fishermen have also been asked to do this in the past. Although the samples are currently being collected to inform population estimates, the samples could also be used to check for bias in species identification and indeed some of the preliminary analysis indicates a level of misidentification in the fisherman/inspector reports. The WG agreed that this is a valuable approach for estimating this source of error and calculating a misidentification rate. The WG therefore **recommended** that DNA collection of by-caught seals in Iceland be continued and analysis conducted to assess the level of species misidentification.

Clarification was sought regarding the terminology used in document SC/27/BYCWG/04, where the term “landing” was being used to refer to a single trip, i.e. when a vessel returned to port. It was noted that Norway (and others) have used the term landing in connection with landed tonnes of fish. Given the multicultural nature of the WG, it was agreed that it was important to be clear and consistent in the meaning of key terms in the analysis, such as landing.

Clarification was also sought on the size of the boats in the gillnet fleet and the lengths of the nets being used. The WG was informed that the boats are small and that the total length of the nets per boat is restricted to 7.5 kms (divided into several strings). Nets can be left out for up to 3 days, which means that fishermen do not attend all their strings every day.

The level of by-catch from foreign fishing vessels operating in Icelandic waters was highlighted as an outstanding question in the 2017 and 2018 meeting reports. The WG was informed that there is no foreign fishery for lumpsuckers and therefore the Icelandic by-catch estimate for this fishery represents the total by-catch estimate.

It was acknowledged that the data set is statistically challenging, and it was noted as somewhat surprising that the most precise estimates (i.e. those with the lowest CV) were the unstratified estimates since stratifying the data placed it into more homogenous units. This was explained as connected to the small sample size, which meant that as soon as the data were stratified, the uncertainty increased. The WG **recommended** that in the future, working papers explain the method used for calculating CV. The WG agreed, however, that stratification by management area was preferred over no stratification, because this factor captured temporal and spatial variation in fishing patterns, as well as vessel characteristics and fishing behaviours. The sample size issue suggests that for this fishery, over-stratification might lead to imprecise estimates and so a minimal stratification scheme might be best.

The WG discussed the approach of excluding trips where depth information was missing from the depth stratification analysis. Since this led to the exclusion of 15% of the trips, which was considered quite high, the WG felt it was important to investigate other ways to estimate the missing data, particularly if some of those trips had observed by-catch. To compare estimates across different stratification schemes, the datasets need to be identical. One proposed way to impute missing depths would be to look at similar vessels operating at the same time in the same area. It was deemed important that the number of by-catch events that had been removed by excluding those trips with missing depth data was at least reported. Although the missing data on depth seemed to provide a valid justification for not using this stratification approach, it was acknowledged that industry had felt it was important to include depth in the analysis as a way to ensure there was not an overestimation of by-catch. The WG therefore **recommended** that Iceland look at ways to interpolate the missing depth data in the analysis, so all trips could be used in this stratification as well.

The WG also **recommended** that Iceland further investigate the occasions in which there appeared to have been the possibility for clumped by-catches of seals and explore the extent to which these were linked to a particular time period/area/net. The WG also **reiterated a previous recommendation** that a combination stratification scheme be explored (e.g. by grouped management areas and season combined).

The WG **endorsed** the estimates of marine mammal by-catch in the lump sucker fishery in Iceland. It agreed that all of the stratification approaches could be presented as relevant but **recommended** that assessments use the estimates from the stratification by management area as this approach captured some of the spatial and temporal variations and characteristics of the fishery.

5.2 COD GILLNET AND OTHER FISHERIES

Sigurðsson presented relevant aspects of document SC/27/BYCWG/04 - *Bycatch of seabirds and marine mammals in lump sucker gillnets 2014-2018*, including information on other gillnet fisheries and bottom trawl fisheries.

Author's Summary

The estimate for cod gillnets remains difficult due to lack of data on by-catch outside of April. However, work is ongoing using 4-5 years of data from both the annual gillnet survey and onboard inspectors.

A new gillnet fishery has emerged for Greenland halibut (*Reinhardtius hippoglossoides*) and some logbook reports from the fleet indicate that some interesting species (e.g. deep diving species like beaked and bottlenose whales) are being caught. This warrants further investigation into by-catch in this emerging fishery.

The gillnet fishery for monkfish/anglerfish, which was of interest due to some observed by-catch, stopped in 2018 due to low catches and dwindling stock size.

Work is underway to estimate by-catch in the bottom trawl fishery, as there is considerable inspector coverage and data on by-catch available. This estimate will hopefully be available at the next meeting of the BYCWG.

Discussion

It was noted that there was no new information available to assess by-catch in the cod gillnet fishery in Iceland. The WG agreed that there was a need to revisit this issue and particularly the advice from BYCWG for how the upcoming coastal seal assessment should proceed, e.g. by either operating with no information or using the previously unendorsed estimates from BYCWG.

The WG agreed that the growth in the gillnet fishery for Greenland halibut in Iceland made it an important fishery to follow and monitor. It was also informed that although the fishermen do not currently deliver the deep diving by-caught animals to scientists for research, they have been asked to provide pictures of future by-catches.

The level of by-catch from foreign fishing vessels operating in Icelandic waters was highlighted as an outstanding question in the 2017 and 2018 meeting reports. The WG was informed that there is a small percentage of foreign trawlers operating in Icelandic waters (estimated at 1% of the fleet). One seal had been reported by-caught on a German trawler fishing for red fish, which would be included in the by-catch estimate for trawlers at the next meeting. There are some bottom set long line vessels from the Faroe Islands targeting cod in Icelandic waters, but these have not reported any by-catch. The same picture is valid for Norway with no reported by-catch in this fishery. Since marine mammal by-catch has not been observed on long line vessels in Norway or Iceland, the reporting in this case was likely accurate. However, it was noted that Greenland had received a report of harbour seal by-catch in the Greenland halibut long line fishery, as well as ringed seal by-catch in longline lump sucker fishery. Since there are not many harbour seals in Greenland, this report was somewhat noteworthy. The Faroe Islands has also had grey seals and one harbour porpoise reported by-caught in long line fisheries in earlier years.

The group was informed that reporting by-catch via logbooks is required for all vessels fishing in Icelandic waters, although this reporting is low.

6. NORWEGIAN BY-CATCH UPDATES

6.1 COD AND MONKFISH GILLNET FISHERIES

6.1.1 Seals

Moan presented document SC/27/BYCWG/06 - *Bycatch estimates of harbour (Phoca vitulina) and grey (Halichoerus grypus) seals in Norwegian gillnet fisheries*

Author's Summary

Harbour and grey seal by-catch rates and totals were estimated for Norwegian commercial gillnet fisheries using a stratified ratio estimator, with number of hauls and total catch as two proxies 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. The best total estimates were 6,065 harbour seals (CV = 0.10, 95% CI: 4,846 – 7,284) and 878 grey seals (CV = 0.22, 95% CI: 506 – 1,249). This corresponds to 467 harbour and 68 grey seals per year. However, as mostly young grey seals are vulnerable to incidental by-catch, an unknown proportion of by-caught young grey seals may have been misidentified as harbour seals by reference fishermen, thus inflating estimated by-catch totals for the latter and reducing estimated by-catch totals for the former.

Discussion

The conclusion of the 2017 BYCWG meeting was that the available data were not good enough to generate reliable estimates, particularly due to the problematic misidentification of harbour and young grey seals. It was noted that seal identification in the reference fleet is still considered unreliable. However, the analysis presented assumed the species IDs were correct. Improvements were made to the analysis based on previous recommendations from BYCWG, such as the use of total catch to calculate the by-catch rates rather than just cod and monkfish catch. Data from proportions of harbour and grey seals tagged in the period 1975-1988 and subsequently recovered from fishing gear were also used to provide species corrected annual by-catch estimates of 302 harbour and 233 grey seals.

Haul was recommended as a better measure of fishing effort than catch in relation to by-catch, with one haul usually being around 250 gillnets. The WG was informed that although the CRF reports on the number of nets and soak time, this information is not available for the rest of the fleet and there is a large span between how many nets each vessel uses per haul over the years in the CRF dataset – i.e. from 1-500 nets.

The question of why there was a higher reported by-catch of seals in the monkfish fishery than in the cod fishery was discussed. Although this finding is based on a limited number of hauls, it was noted that the monkfish fishery uses a larger mesh size, may use many more strings than the cod fishery, and has long soak times (2-5 days, or longer), while the cod fishery typically uses smaller mesh and has a 24 hour soak time. Although the number of boats participating in the cod fishery is much higher than the monkfish fishery, the cod fishery has a very high catch per unit effort (CPUE) of target species. The high number of marine mammals by-caught in monkfish fishing gear means that the by-catch rates in the monkfish fishery are higher than the cod fishery, even if the total by-catch may be at a comparable level for the two fisheries.

A question was asked regarding whether interannual variation in fishing effort may be concealing a trend over the whole time period. It was noted that for monkfish there were some years with a significant drop in fishing effort and that since this fishery has a high by-catch rate, possible trends in total estimated by-catch may be obscured.

The apparent gap in the CRF reported by-catch of grey seals during 2012/13/14/15 was discussed. It was noted that there may be vessel specific biases in the fishing or reporting that are responsible for the apparent lack of grey seal by-catch in this period.

The WG noted that although the CRF may be selected to be representative over a wide geographical area, it may not be representative at a finer scale, which could influence the choice of a good stratification factor. Although any lack of representativeness is only speculation at this point, it was proposed that this may be a possible explanation for the large by-catch of grey seals in particular regions. The WG discussed that the annual by-catch as calculated here (467 harbour seals and 68 grey seals) represented a substantial removal in relation to the direct catch (an average of 363 harbour seals and 220 grey seals in the period 2007-2018) and therefore needed to be taken into account in the population assessments that would be conducted by the coastal seals WG in November. However, it also acknowledged the ongoing problem of potential misidentification between harbour seals and young grey seals, which may result in an unknown, but non-negligible proportion of harbour seal by-catch actually being grey seal by-catch, made it difficult to recommend using the estimates in any assessment. Although the data and estimates available certainly had limitations and the WG did not endorse them in their current form, it was recognised that in some cases, the by-catch estimates were as approaching levels similar to the direct catch (effectively doubling the level of removals) and that it was therefore important to have some input on by-catch included in the upcoming assessments.

Taking the current needs and limitations into account and as another way forward for delivering information for the CSWG assessments, the WG **recommended** that all seal by-catch data be pooled and apportioned according to: 1) the relative population estimate and 2) the relative harbour seal and grey seal pup/yearling abundance in the management areas. It was noted that the dataset of population estimates for both species along the Norwegian coast that would be necessary for this exercise is available.

6.1.2 Harbour porpoise

Moan briefly presented document SC/27/BYCWG/07 – *Extract from “New estimates of bycatch of harbour porpoise (Phocoena phocoena) in Norwegian gillnet fisheries suggest unsustainable incidental mortality”*

Author’s Summary

Harbour porpoise by-catch rates for Norwegian commercial gillnet fisheries from 2006 to 2018 were estimated using a traditional ratio estimator and generalized additive mixed models (GAMMs), with weight of fish landed and number of gillnet hauls as two proxies for fishing effort. Estimates were derived from data collected with a contracted reference fleet of small coastal vessels (less than 15 m length overall) and scaled up to the whole fleet using data from landing statistics. The ratio-based average annual by-catch estimate was 2,886 porpoises (CV = 0.05, 95% CI: 2,576 – 3,142) and the model-based average annual by-catch estimate was 2,871 porpoises (CV = 0.17, 95% CI: 1910 – 3324). About 75% of by-caught harbour porpoises were taken in the cod and monkfish fisheries, while the rest were taken in a variety of different gillnet fisheries. This level of anthropogenic mortality exceeds the Potential Biological Removal (PBR) for Norwegian waters of 2,542 animals per year and is unsustainable according to international standards for sustainability.

Discussion

It was noted that the estimates had been significantly reworked since the last BYCWG meeting to address the recommendations and feedback provided by the BYCWG and journal reviewers. The WG was informed that the paper had been submitted to the *ICES Journal of Marine Science* and was passing through peer review at the time of the meeting. The results would therefore be presented to the next meeting of the BYCWG.

6.2 OTHER FISHERIES

Although no specific presentation was made, information on other fisheries was discussed by the WG.

The level of by-catch in larger gillnet vessels was questioned since the CRF only contains vessels less than 15m. It was noted that these larger vessels have an electronic reporting system and are not allowed to fish in the coastal zone, which is where most by-catch of marine mammals likely occurs.

Some by-catch has been anecdotally reported from larger vessels, e.g. 5 seals were taken close to Bear Island in 2005. Although good data from these vessels are not available, there is an ongoing inspection program for larger vessels and the WG was informed that the by-catch data from these offshore gillnets and other gear types will be examined once the coastal gillnet estimates are finalised.

Recreational fishers in Norway are strongly encouraged to report by-catch and the WG was informed that the Directorate of Fisheries recently launched an app “Fritidsfiskeappen”, which features a dedicated and prominently placed button for recreational fishers to report marine mammal by-catch (Fiskeridirektoratet 2020). Despite this, no data on marine mammal by-catch is currently available for recreational fisheries in Norway (for which the use of a fixed maximum number of gillnets is allowed). The WG was, however, informed that work had begun at the Norwegian Institute for Marine Research (IMR) on the take of commercial fish species by the recreational fishery (Vølstad et al. 2019) and it was noted that the number of vessels involved in this fishery was likely to number in the high hundreds (although not all will be in regular use). Information on factors such as the number and length of gillnets and the number of days they are used in the recreational fishery would help with the estimation of by-catch, or at least indicate the magnitude of the interaction.

It was also noted that there had been no reports of marine mammal by-catch in Norwegian crab pots in the Barents Sea, although there had been humpback and minke whales reported entangled in the supported rope in the Russian fishery (Blanchet/PINRO pers. comm).

Although some humpback and killer whales had been caught in purse seines in recent years, these events were not usually fatal. The Sea Surveillance Unit and the Norwegian Coast Guard have collected data on such entanglements, and work is well underway in properly quantifying the number of whales so entangled and the mortality rate of those entanglements.

6.3 BY-CATCH MONITORING AND MITIGATION WORKSHOP

Bjørge presented the key conclusions and recommendations from the 2019 workshop on by-catch monitoring and mitigation, held in Ålesund in 2019 (SC/27/BYCWG/FI04).

Author’s Summary

The workshop on by-catch monitoring and mitigation was attended by international experts on marine mammal population monitoring and by-catch monitoring and mitigation, pinger manufacturers, fishers with experience from practical use of pingers, the Norwegian Fishermen’s Association, the Ministry of Fisheries, and scientists from IMR.

It was agreed during the workshop that there would be an aim to estimate by-catch with a CV of less than 0.3. The current monitoring effort for harbour porpoises is sufficient to deliver this. For seals, the current monitoring is not sufficient to generate reliable estimates. The workshop determined that to improve the reliability of by-catch estimates for seals it would be necessary to increase the number of vessels in the CRF from 30 to 60 to deliver data of sufficient quality.

Although there are no plans within IMR to increase the CRF beyond 30 vessels, an alternative approach to use remote electronic monitoring is underway. Collaboration has begun with a commercial company in the USA (Shellcatch) to develop a video system that can operate in the Norwegian conditions of high humidity and low temperatures. A prototype has been installed on one vessel in northern Norway. However, IMR has not yet granted permission for wider use due to privacy concerns related to video recording taking place during the entire voyage. Work is therefore ongoing to develop a system that can be turned on and off in association with net hauling. The system in development has two cameras – one filming nets coming onto the hauler and the other filming the deck. This allows the system to deliver information on the drop-out rate (i.e. animals falling out of the net as it is hauled), as well as improved seal species identification. The IMR is currently working on obtaining permission to expand use of this equipment. If it can be approved and shown to work, a budget will likely be available for its implementation on 30 vessels, effectively doubling the amount of data currently collected from the CRF. This monitoring effort would not replace the reference fleet, but rather would provide

information from an additional 30 vessels and therefore double the number of vessels reporting by-catch information. It is anticipated that this system will improve species identification and the reliability of reports and therefore provide a better basis for by-catch estimates. The information will, however, not be available for some years yet.

The workshop also concluded that if pingers were deployed in the Lofoten region alone during the cod spawning period, the reduction in harbour porpoise by-catch would be sufficient to bring it below PBR and into sustainable levels. The workshop therefore proposed to the Norwegian authorities that the use of pingers be made mandatory in this area. This proposal has now been sent for a public hearing.

Discussion

It was noted that although the reference fleet could be asked to take photos of all seals to help monitor misidentification rates, the IMR is reluctant to place an additional burden on the reference fleet at this point.

Although it is not yet clear whether the quality of the footage from the remote electronic monitoring system will be sufficient to determine species for young animals, the WG was informed that the image resolution is high and that it should certainly be possible to discriminate between grey and harbour seals (although young harp seals may be more challenging). The WG was also informed that artificial intelligence and machine learning systems are being used by Shellcatch to help train the system. This is a significant difference between the systems offered by Shellcatch and Anchor Lab (used in Denmark). Although the ability for fishermen to turn the cameras on and off themselves was discussed as potentially problematic, the WG was informed that efforts would be made to select fishermen with good relationships with IMR researchers and that they would be paid for their involvement in the program.

The choice of using a CV of 0.3 as a standard for reliable by-catch estimates was discussed, with the group informed that this was both the standard used in the USA and a target goal set by Norway. It was noted that the CVs for seal by-catch estimates presented in tables 1 & 2 of working document SC/27/BYCWG/06 were already below 30%, meaning that there apparently was already a high degree of precision in the estimates, although the accuracy of the estimates remains questionable. Enhancing the CRF was therefore highlighted as really being of value for improving additional aspects such as the sample design, representativeness of the fleet, species identification, drop-out rates etc.

7. FAROE ISLANDS BY-CATCH UPDATES

7.1 FAROES CORRIGENDUM ON BY-CATCH

On 8 April 2020, the Ministry of Foreign Affairs and Culture of the Faroe Islands sent NAMMCO a corrigendum on reported by-catch (SC/27/BYCWG/05), including by-catch that had previously been considered by the BYCWG and used to make recommendations. It was noted that these corrections had been implemented in the records of the Faroe Islands Fisheries Inspection on 21 November 2018. An overview of the corrections was presented by Desportes and explained by Mikkelsen.

Mikkelsen noted that the corrections were related to the implementation of the electronic logbook reporting system in 2013. During the introduction of the e-logbook system (mandatory for all vessels larger than 15 GRT), fishermen were trialling the system through entering hypothetical catches and some of these trial figures had not been removed and were then later reported as actual by-catch incidents. An additional inconsistency noted was that some of the by-catch data reported to the BYCWG (e.g. five killer whales in one trawl, by-catch of different species in purse seine) had never been reported to NAMMCO in the National Progress Reports (NPRs) from the Faroe Islands. The correction sent to NAMMCO in April 2020 therefore applied to both the data reported in the NPRs and the information previously discussed by the BYCWG.

The WG expressed concern that this correction overlapped in time with a stricter implementation of requirements under the US Marine Mammal Protection Act (MMPA). This was seen as raising

questions around the reliability of the data, especially given the current MMPA incentives not to report marine mammal by-catch. The WG agreed that this again highlighted problems associated with self-reporting of by-catch.

The WG emphasised the need for all officially reported data - direct catch, by-catch or other - to be validated before being submitted to formal databases and repositories. The WG **strongly recommended** that this be done in the future to avoid the undesirable situation where the reliability of an *a posteriori* validation may be questioned. The WG also **reiterated its recommendation** that self-reporting was an insufficient basis for quantifying by-catch and that independent observation and validation were necessary additional measures.

7.2 REVIEW OF OBSERVER EFFORTS

Mikkelsen presented document SC27/BYCWG/09 - *A review of observer efforts available from Faroese fisheries for exploring marine mammal bycatches*.

Author's Summary

A variety of independent observer data collected by inspectors and unintentionally, through scientific surveys, were reviewed. This data covered fisheries efforts by demersal and pelagic trawling as well as gillnets (Table 1).

Table 1. Summary of existing independent observer effort data for Faroes fisheries. MH = research vessel. Inspec. = inspection effort, Obs. = effort by scientists, Interv. = interview.

			Target	At sea		Coverage		Data source		
Fishery	Gear	Type	Species	Effort	Years	Effort	Landings	Inspec.	Obs.	Interv.
Pelagic	Trawl	Commercial	Blue whiting	5 trips 28 days	1	4% trips 1.5% time	na	X		
Pelagic	Trawl	Commercial	Mackerel	7 trips 67 days	1	8% trips 3% time	na	X		
Pelagic	Trawl	Commercial /Survey	Blue whiting, Herring, Mackerel	15 trawl hours	11	na	na		X	
Pelagic	Trawl	Survey MH	Blue whiting, Herring, Mackerel	30 trawl hours	15	na	na		X	
Demersal	Trawl	Commercial, deep	Mix	1 trip 6 days	1	0.1%	na	X		
Demersal	Trawl	Commercial, shallow	Mix	1 trip 9 days	1	0.7%	na	X		
Demersal	Trawl	Survey MH	Mix, shallow and deep waters	35 days	38	0.7%	na		X	
Demersal	Gillnet	Commercial	Anglerfish	14 trips	9	4.9%	~ 4.9%		X	
Demersal	Gillnet	Commercial	Greenland halibut	4 trips	4	5%	~ 5%		X	
Demersal	VHVO trawl	Commercial	Greater silver smelt		>10	na	na			X

The data review did not reveal any strong sign that whales and seals are by-caught in any significant numbers by the Faroese fishing fleet. This seems to be valid especially for the demersal trawl fisheries, with no by-catch recorded, but also the gillnet fisheries. Gillnets have in some fisheries been connected with high by-catch numbers, however this is not the case in Faroese waters, most likely because the

mandatory fishing depths of >380m prevents any frequent overlap with marine mammals. For the pelagic and semi-pelagic fisheries for blue whiting, herring and mackerel, over the last seven years there was one by-catch incident in the reviewed data, as well as five records in the electronic logbooks. This indicates that the pelagic and semi-pelagic fishery has an elevated chance for taking cetaceans as by-catch. Pilot and minke whales were the by-caught species identified and most by-catch records were from the autumn. No data were available from the longliners, the only missing gear type in the review, but the longline fishery has generally not been associated with high marine mammal by-catch numbers.

Discussion

Mikkelsen confirmed that there is a maximum of 4 gillnetters operating in the Faroe Islands (1 vessel fishing for monkfish and 2-3 for Greenland halibut) and no gillnet fisheries conducted by foreign vessels in Faroes waters. He also re-emphasised that gillnet fishing is not permitted at depths less than 380m and clarified that although there are 23 commercial fishing vessels below 15 GMT, these are jigging and longline fisheries, not gillnets.

The WG was informed that there are currently no plans to re-introduce independent observers and that a program in 2018 in which 2 observers operated for 10 months in the pelagic fisheries was funded by the fleet itself, although the observers were employed by the Faroese Fisheries Inspection. Fisheries inspectors on board the inspection vessels have been required to record information on by-catch. However, they have typically boarded vessels at sea for very short periods of time (1-3 hours) as these inspectors primarily check compliance with regulatory requirements (e.g in terms of gear, mesh size etc). This means that very few hauls, if any, are actually observed by these inspectors and therefore data on marine mammal by-catch from these efforts is not comprehensive. It is also worth noting that sea boarding inspectors are not regarded as observers in terms of catch/by-catch in other fora.

The WG reiterated the unreliability of using self-reporting for by-catch estimation and discussed that it would be useful for an independent observer program (in which the fleet does not pay the observer directly) to be reinstated in the pelagic fleet. However, the WG also noted that the necessity for an observation scheme could also be evaluated in light of the level of by-catch risk to the population. The WG therefore agreed that further discussion on this would be had when the WG addressed the agenda item on the risk of by-catch across fisheries in NAMMCO waters (see below).

8. STEPS AND DATA NEEDED TO ASSESS RISKS IN FISHERIES WITHOUT BY-CATCH ESTIMATES

The ICES Bycatch WG has previously developed an approach to assess by-catch risk in different fisheries and it was proposed that NAMMCO discuss the potential benefits of adopting a similar scheme. The general approach proposed by ICES was to look at fishing effort and investigate where this effort overlapped with the presence/absence of cetacean and pinniped species. Then where there was significant overlap, to investigate the susceptibility of the species to by-catch (including elements such as animal behaviour, fishing method, etc). The proposal was that this matrix of information could then be used to help target recommendations regarding future efforts towards monitoring and mitigation.

Not all members of the WG were convinced of the necessity or value of this approach. Rather than making an extensive and formal risk analysis, a simpler alternative proposed was to use the information already available and known about the fisheries in the NAMMCO countries, including the current identification of gaps in available information that would have a significant impact on by-catch estimates, and to invest data collection and monitoring efforts on this basis. The question was whether this alternative approach was systematic enough to be scientifically and politically robust.

The WG concluded that this topic required more attention than the time available allowed and therefore agreed to return to this discussion at a future meeting.

9. RECOMMENDATIONS

9.1 RECOMMENDATIONS FOR RESEARCH

Iceland

- Investigate ways to interpolate the missing depth data in the lumpsucker gillnet analysis.
- Further investigate the possible clumped by-catches of seals and the extent to which these are linked to a particular time period/area/net.
- Explore a combination stratification scheme (e.g. by grouped management areas and season combined).

Norway

- Before the meeting of the CSWG in November 2020, pool all seal by-catch data and apportion according to 1) the relative population estimate and 2) the relative harbour seal and grey seal pup/yearling abundance in the management areas.

All

- All papers presented to the BYCWG explain the method for calculating CV.

9.2 RECOMMENDATIONS FOR CONSERVATION & MANAGEMENT

Iceland

- DNA collection of by-caught seals be continued and analysis conducted to assess the level of species misidentification.
- Population assessments use the estimates from the stratification by management area.

Faroe Islands

- All data - direct catch, by-catch or other - be validated before being submitted to formal databases and repositories.

All

- Since self-reporting is an insufficient basis for quantifying by-catch, additional sources of information (e.g. independent observation) always be sought

10. OTHER BUSINESS

Greenland drew attention to the fact that it has data available on by-catch (a combination of logbooks, observer reports, and fishing effort data) but that there is currently no available scientist within its research institutes who can carry out an analysis. It asked BYCWG for a recommendation on how to proceed. The WG agreed that Greenland should circulate a summary of its available data and that the WG participants would provide feedback on this question following a review of that information. It was proposed that it may be possible for the WG to dedicate time during a future meeting to assist Greenland with an analysis of its available data.

Dates for the next BYCWG meeting were not set and were seen to depend on the availability of new information. However, the WG agreed on the possibility of holding a short meeting after the summer to revisit the risk assessment issue and consider the request from Greenland.

11. MEETING CLOSE AND ADOPTION OF REPORT

Murray thanked all the participants for their active participation in the online meeting and Desportes expressed her hope that the group may have the opportunity to meet in person in the future.

A draft meeting report was circulated 4 June 2020 and following the integration of amendments was finalised on 12 June 2020.

REFERENCES

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- Volstad, J. H., Christman, M., Ferter, K., Klieven, A. R., Ottera, H., Aas, O., ... & Haugen, T. O. (2019). Field surveying of marine recreational fisheries in Norway using a novel spatial sampling frame reveals striking under-coverage of alternative sampling frames. *ICES Journal of Marine Science*, 1-15. <https://doi.org/10.1093/icesjms/fsz108>

NAMMCO SCIENTIFIC COMMITTEE 27

BY-CATCH WORKING GROUP*28 May 2020, Video Conference***AGENDA**

- 1. Chair welcome**
- 2. Adoption of agenda**
- 3. Appointment of rapporteurs**
- 4. Review of available documents**
- 5. Icelandic by-catch updates**
 - 5.1. Lumpsucker gillnet fishery
 - 5.1.1. Harbour porpoise
 - 5.1.2. Seals
 - 5.2. Cod gillnet and other fisheries
- 6. Norwegian by-catch updates**
 - 6.1 Cod and monkfish gillnet fisheries
 - 6.1.1 Seals
 - 6.1.2 Harbour porpoise
 - 6.2 Other fisheries
 - 6.3 By-catch monitoring and mitigation workshop
- 7. Faroe Islands by-catch updates**
 - 7.1. Faroese corrigendum on by-catch
 - 7.2. Review of observer effort
- 8. Steps and data needed to assess risk in fisheries without by-catch estimates**
- 9. Recommendations**
 - 9.1. Recommendations for research from this WG
 - 9.2. Other recommendations from this WG
- 10. Other business**
- 11. Adoption of report**
- 12. Next meeting**

NAMMCO SCIENTIFIC COMMITTEE 27

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NAMMCO SCIENTIFIC COMMITTEE

BY-CATCH WORKING GROUP

28 May 2020, Video Conference

LIST OF DOCUMENTS

Working Documents

Doc. No.	Title	Agenda item
SC/27/BYCWG/01	Draft Agenda	2
SC/27/BYCWG/02	Draft List of Participants	1
SC/27/BYCWG/03	Draft List of Documents	4
SC/27/BYCWG/04	Marine and Freshwater Research Institute (April 2019). <i>Bycatch of Seabirds and Marine Mammals in Lumpfish Gillnets 2014-2018</i>	5
SC/27/BYCWG/05	Ministry of Foreign Affairs and Culture, Faroe Islands (April 2020). <i>Corrigendum note from the Faroe Islands Fisheries Inspection</i>	7
SC/27/BYCWG/06	A. Moan & A. Bjørge (2020). <i>Bycatch estimates of harbour (Phoca vitulina) and grey seal (Halichoerus grypus) in Norwegian gillnet fisheries</i>	6.2
SC/27/BYCWG/07	A. Moan, M. Skern-Mauritzen, J.H. Vølstad, A. Bjørge (2020). Extract from: <i>New estimates of bycatch of harbour porpoise (Phocoena phocoena) in Norwegian gillnet fisheries suggest unsustainable incidental mortality</i>	6.1
SC/27/BYCWG/08	A. Moan & A. Bjørge (2020). <i>Norway's responses to comments from NAMMCO WGBYC2018</i>	6
SC/27/BYCWG/09	B. Mikkelsen (2020). <i>A review of observer efforts available from Faroese fisheries for exploring marine mammal bycatches</i>	7

For Information Documents

Doc. No.	Title	Agenda item
SC/27/BYCWG/FI01	Report of the NAMMCO Scientific Committee Working Group on By-Catch – October 2018	5.1, 6.1
SC/27/BYCWG/FI02	Report of the NAMMCO Scientific Committee Working Group on By-Catch – April 2018	4
SC/27/BYCWG/FI03	Report of the NAMMCO Scientific Committee Working Group on By-Catch – May 2017 – with FO corrigendum	7
SC/27/BYCWG/FI04	Report of the Workshop on Marine Mammal Bycatch Monitoring and Mitigation – Ålesund Norway, 19-20 June 2019	6
SC/27/BYCWG/FI05	Outcome of the OSPAR-HELCOM workshop to examine possibilities for developing indicators for incidental by-catch of birds and marine mammals	4