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Submitted by	**Iceland**
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ICELAND

PROGRESS REPORT ON MARINE MAMMALS IN 2020

Compiled by, Gísli A. Víkingsson, Sandra M. Granquist, Þorvaldur Gunnlaugsson, Sverrir D. Halldórsson Valerie Chosson and Guðjón M. Sigurðsson.

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I INTRODUCTION

The following text reports on studies on marine mammals in Icelandic and adjacent waters in 20120. The studies were conducted by the following research institutes: Marine and Freshwater Research Institute, Reykjavík, Húsavík Research Centre (HRC), Húsavík Whale Museum (HWM); Faxaflói Cetacean Research project (FCR), Innovation Centre, Iceland (ICI); Keldur, Institute for Experimental Pathology (KIEP); The National University Hospital of Iceland; The Icelandic Institute of Natural History (INH); University of Iceland (UI), University of British Columbia in Canada, University of Barcelona in Spain, University of St Andrews in Scotland, Icelandic Seal Center (ISC), BioPol, Hólar University Collage, the University of Stockholm, Natural History Museum of Sweden, Natural History Museum of Denmark, Maine University and University of Aarhus, Denmark, University of Potsdam. Queries for information on research were sent to all offices, individuals and private commercial platforms such as whaling and whale watching companies known to have been involved in marine mammal research or data collection during the period.

II RESEARCH BY SPECIES 2020

Fin whale

Studies continued at the MFRI on the biology and ecology of fin whales based on data from commercial catches in recent years. Fin whale research conducted at the whaling station in Hvalfjörður is wide ranging and includes i.a studies on age, reproduction, feeding ecology, energetics, pollutants, genetics, hybridization, anatomy and physiology and involves several research institutions including the National University Hospital of Iceland, University of British Columbia in Canada, University of Barcelona in Spain, Innovation Centre, Iceland and Keldur, Institute for Experimental Pathology.
New information on abundance and trends in fin whales in Icelandic and adjacent waters from the NASS series was published in 2020 (MFRI).

Common minke whale

Genetic analyses have been completed for all common minke whale samples received until end of 2018. The dataset encompasses now 737 specimens from Iceland typed at 16 microsatellites and the mitochondrial control region. These data have been analysed regarding affinity of Icelandic minke whales to other regions of the North Atlantic in an IWC context, i.e., 2014 for the Icelandic RMP implementation review and 2018 for the Greenlandic AWMP implementation review. Microsatellite data are currently used to infer Parent-Offspring (PO) pairs which will inform about regional and ocean-wide movements. Final analyses are to be performed in 2020.

New nuclear Single Nucletide Polymorphisms (SNPs) have been developed using the ddRAD protocol. Initial analyses were performed on 4 specimens from the North Atlantic, including 2 specimens from Iceland. These analyses yielded 30,861 informative SNPs, of which 20,682 were shared among all specimens. These SNPs will form the basis for the development of an informative minke whale SNP panel for population structure assessment across the entire North Atlantic.
The HRC continued their long-term photo-identification and sightings studies of common minke whales.
New information on abundance and trends in common minke whales in Icelandic and adjacent waters was published in 2020 (MFRI).

Blue whale

The HRC in Húsavík continued their long-term photo-identification and sightings studies of blue whales in Skjálfandi bay. The UI in Vestmannaeyjar conducted 4 days of fieldwork in late August to attempt to characterize the baleen whales, particularly blue whales, but also fin whales and humpback whales, occurring in Vestmannaeyjar in the summer.
New information on abundance and trends in blue whales in Icelandic and adjacent waters was published in 2020 (MFRI).

Humpback whale

Humpback whales were the primary species of a whale observation effort during ecosystem surveys focused on capelin in 2020. The abundance of capelin was low but as in previous years the humpback whales were concentrated in the area where capelin was detected. The MFRI's long-term tagging program continued in 2020. The MFRI continued their photo-identification studies and the development of the national humpback whale photo-id database (ISMN Catalog for: ISland Megaptera Novaeangliae Catalogue): https://www.hafogvatn.is/en/research/whale-research/whale-photo-id. Today the ISMN catalogue records over 1470 unique individuals seen in Icelandic waters, as well as individual from partner´s catalogues, such are Guadeloupe (523), Norway (325), Azores (40), Irish (70), Capo verde (24), Bermuda/Samana Bay (45) and Greenland (22). So, it includes 48 individuals seen around the world and at least once in Iceland.

The HRC in Húsavík continued their long-term photo-identification and sightings studies of humpback whales in Skjálfandi bay. Research conducted by the HRC in Húsavík on humpback whale entanglement monitoring and mitigation in Iceland continued in 2020. This project includes entanglement scar analysis, whale pinger testing and questionnaires and interviews with Icelandic fishers.

A research project on the life-history strategy of humpback whales in the sub-arctic waters of Iceland investigates the body condition, physical and acoustic behaviour of humpback whale in the subarctic waters of Iceland during the winter in comparison to other seasons started in February 2019 and continued in 2020. This study is done in collaboration between UI, MFRI, the University of St Andrews, Scotland and University of Barcelona, Spain. The biopsy samples are used in a variety of studies including feeding ecology (stable isotopes/fatty acids), stock structure (DNA) and seasonality in reproduction (hormones). The project also involves i.a. tagging, photo-identification and behavioural observations. This study is ongoing until 2022.
New information on abundance and trends in humpback whales in Icelandic and adjacent waters was published in 2020 (MFRI).

Killer whale

In 2020, the UI and the Icelandic Orca Project conducted a field season in Vestmannaeyjar during July and August, continuing the long-term project on killer whales started in 2008. The current focus of the project

is to investigate dietary specialization on killer whales, to observe interspecific interactions with pilot whales and to investigate the acoustic behaviour of killer whales. Land-based observations also allowed for broader monitoring of variations in the occurrence of killer whales and other cetaceans in the local marine ecosystem.
New abundance estimates for killer whales in Icelandic and adjacent areas were published in 2020 (MFRI).

Long-finned pilot whale

The comprehensive research project started in 2019 continued in 2020 compiling photo-identifications, studying their behaviour in Vestmannaeyjar during interactions with killer whales and investigating the ecology of pilot whales through stable isotopes of carbon and nitrogen. The project aims to gather knowledge on this species in Iceland, such as understanding its occurrence in Icelandic coastal waters, the prey targeted by the species and whether that has changed in recent times. The project is conducted by UI in collaboration with MFRI.
A study on trends in the abundance of pilot whales was concluded with a publication (MFRI).

White-beaked dolphins

The HRC in Húsavík continued their long-term photo-identification and sightings studies of white-beaked dolphins in Skjálfandi bay. C-PODS were deployed in Skjálfandi Bay for detection of white-beaked dolphins.
Samples of white-beaked dolphins from stranded or bycaught individuals from the MFRI tissue bank collected from the 1980s until the present were analysed for stable isotopes of nitrogen and carbon to investigate their trophic ecology, as part of a study to investigate the diet composition of killer whales undertaken by UI and MFRI.
New abundance estimates for white-beaked dolphins in Icelandic and adjacent areas were published in 2020 (MFRI).

Harbour porpoise

Collaboration of the MFRI with the University of Potsdam on harbour porpoise genetic research is ongoing (Lah et al. 2016). Among the objectives of this study is estimation of population size based on close kin analysis. Preliminary results were presented to the workshop *Joint IMR/NAMMCO International Workshop on the Status of Harbour Porpoises in the North Atlantic* in Tromsö in December 2018. Since 2017 fishermen received a payment for each harbour porpoise DNA tissue sample that they sent in to the MFRI, and this resulted in an increased number of samples obtained. In addition, samples will continue to be included from bycaught porpoises in the annual gillnet survey around Iceland in the spring (18 in 2019) and occasional samples from stranded animals. The total number of samples collected since 2013 is now similar to the number collected in 1991 to 2001. Genetic analyses have now been completed for the entire set of harbour porpoise samples (2109 specimens typed at 13 microsatellites, one sex-determining locus, and the mitochondrial controll region). This data will be analysed in 2021 regarding affinity of Icelandic porpoises to other regions of the North Atlantic as well as with regard to population structure within Iceland. Towards the latter, microsatellite data are used to inferr Parent-Offspring (PO) pairs which will inform about local movements. PO pair inferences will also be used to obtain estimates of population size/abundance and trend by comparison of the two sampling periods.
New analyses on nuclear Single Nucleotide Polymorphisms (SNPs) have been performed on 150 harbour porpoise specimens from the North Atlantic, including 12 specimens from Iceland. These analyses yielded 26,320 informative SNPs which are currently used for population structure assessment across the entire North Atlantic.

Efforts to estimate bycatch of harbour porpoises in fisheries continued at the MFRI. Status of this work were reported to the WG on Bycatch in Copenhagen in 2020.
Accoustic porpoise deterrents (pingers) were tested for the first time in the Icelandic cod gillnet fishery in April of 2017, but their use showed no reduction in porpoise bycatch, as 7 porpoises got caught in nets with pingers, while 5 porpoises got caught in control nets nearby. Another type of porpoise deterreants (PALs) were tested in the cod gillnet fishery in April of 2018 and like the pingers, showed no reduction in porpoise bycatch as 12 porpoises were caught in nets with the devices, while 11 porpoises got caught in the control nets. A pinger with a different signal was tested in 2019, but no porpoises were caught. Further trials with that pinger will be conducted in April 2020.
C-PODS were deployed in Skjálfandi Bay for detections of harbour porpoises.
Samples of harbour porpoises from stranded or bycaught individuals from the MFRI tissue bank collected from the 1990s until the present were analysed for stable isotopes of nitrogen and carbon to investigate the trophic ecology of harbour porpoises, as part of a study to investigate the diet composition of killer whales undertaken by UI and MFRI.
New abundance estimates for harbour porpoises in Icelandic and adjacent areas were published in 2020.

Other (multi) cetacean species

A total of 30 stranding events of cetacean was recorded by the MFRI in 2020 whereof 8 were long-finned pilot whales, 3 sperm whales and 3 northern bottlenose whales.
The HÍ Research Centre in Húsavík hosted 18 in-person and 2 distance-learning internship students who continued long-term monitoring and ID matching of whales in Skjálfandi Bay (including individual ID catalogues, behaviour data, and sightings locations). This was carried out on humpback whales, minke whales, white-beaked dolphins, and fin whales.
One soundtrap was deployed and retrieved in Skjálvandi bay (in collaboration with the Whale Wise team) which recorded continuously for 3 months. The data is currently being used for a student project investigating the sound scape of Skjálfandi Bay. The data is also being analyzed to classify minke whale vocalizations. The team also deployed two soundtraps off west-Iceland for a WWF funded project with the main aim of collecting blue whale and shipping traffic data.
New information on abundance and/or trends from the NASS series was published on several cetacean species, including blue, fin, common minke, sei, humpback, sperm, N-bottlenose, long-finned pilot and killer whales, white-beaked and white-sided (L acutus) dolphins and harbour porpoises.

Harbour seals

A new harbour seal census was conducted by MFRI and ISC during the moulting period of 2020 and the analysis is ongoing and a report will be published in 2021. Efforts are taken by MFRI and ISC to improve knowledge on population demographics and factors contributing to mortality and/or affecting the status of the population. Research on timing of pupping period and monitoring of local pup production at important sites was initiated in 2009 and analysis and manuscript preparation carried out during 2020. A new project was initiated in 2018, where haul-out behavior was monitored by using camera traps and analysis continued during 2020. The results from the project will increase knowledge in factors affecting haul-out behaviour, and will assist in improving census design. Efforts to estimate bycatch of harbour seals in fisheries continued at the MFRI.
A study on the effect of land- and boat-based tourism on the spatial and behavioural haul-out patterns of harbour seals was initiated by ISC and MFRI in 2008 and continued during 2020. The study includes interdisciplinary cooperation with researchers from Hólar University Collage, University of Iceland, West Iceland Nature Research Centre, Griffith University in Australia, Stockholm University in Sweden. The

interdisciplinary research focus on research on best practice, management of seal watching and development of an ethical framework.
A study conducted in co-operation between MFRI, ISC, UI and University of Aarhus, Denmark on vocalisations and behaviour of male Icelandic harbour seals during the mating season continued during the year and a manuscript is in preparation.
A study of harbour seal genetics was initiated in 2016, in cooperation between MFRI, ISC and the Natural history museum of Denmark and analysis continued during 2019.

Efforts to estimate bycatch of harbour seals in fisheries continued at the MFRI.

Grey seals

To estimate the current status of the Icelandic grey seal population, an aerial census is planned by MFRI in cooperation with ISC during the pupping period in 2021.

A study of the effect of seals and seabirds on plant succession on the volcanic island Surtsey in the southern archipelago of Iceland was carried out in cooperation with the Icelandic Institute of natural history. The results were published in a paper in 2020, and monitoring will continue the following years.
A study of grey seal genetics was initiated in 2016, in cooperation between MFRI, ISC, the Natural history museum of Denmark and Main University, and analysis continued during 2020.

Efforts to estimate bycatch of grey seals in fisheries continued at the MFRI. Other (multi) pinniped species
A project investigating environmental toxicants in seals in Icelandic waters was initiated by MFRI during 2017 and analysis continued in 2020. Very little is known about contaminants in Icelandic seal populations. The focus of the project is to investigate the contents of new contaminants of concern in marine mammals, including new brominated flame retardants and PFAS (per- and polyfluoroalkyl substances). The project is an international cooperation between Sweden (Naturhistoriska Riksmuséet and Stockholm University), Greenland (Grönlands Naturinstitut) and MFRI (Iceland). A paper on fluorine mass balance and suspect screening in marine mammals from the Northern Hemisphere was published in 2020.

III ONGOING (CURRENT) RESEARCH

Pinnipeds

A grey seal aerial census is planned in 2021.

Cetaceans

A new research project on northern bottlenose whales around Iceland has been initiated in Jan 2020 by the University of Iceland in collaboration with MFRI and others. This three-year project uses long-term acoustic monitoring, satellite tags, photo ID and surface observations to provide new insights into the species' movement ecology (why, when, which and where animals move) and their vulnerability to high-intensity anthropogenic noise, such as seismic airguns and naval sonar. In 2020 the project focused on the deployment of the bottom-moored acoustic recorders (for locations, see https://hypmo.org/resources/) and the establishment of a photo ID catalogue for northern bottlenose whales in the northeast Atlantic (available at https://hypmo.org/catalogue).

IV ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

Cetaceans

Based on assessments conducted by the Scientific Committees of NAMMCO and the IWC, the MFRI recommended in 2017 that annual catches in 2018-2025 do not exceed 161 fin whales on the East Greenland – West Iceland management area and 48 fin whales in the East Iceland-Faroes management area. On the same basis the MFRI recommended in 2018 maximum annual takes of 217 common minke whales in the Icelandic continental shelf (CIC) area during 2018-2025. In 2019, Icelandic authorities issued a regulation on catch limits according to this advice for the period 2019-2023 (annual catch of 161 fin whales and 217 common minke whales). Despite the issued quotas, no whaling occurred in Icelandic waters in 2019.

Pinnipeds

A new legislation was initiated in 2019, where seal hunting is banned. However seal hunters can apply for exemption from this ban to the Directorate of Fisheries, to hunt seals for own utilization.

Harbour seals: The governmental management objective states that the Icelandic harbour seal population should be kept above 12.000 animals.
A new advice will be released after the new population estimate for 2021 has been finalized.

Grey seals: The governmental management objective from 2005 states that the Icelandic grey seal population size should be kept above 4100 animals, which corresponds to the observed population size from 2004.
A new advice will be released only after the new population estimate for 2021 has been finalized

V PUBLICATIONS AND DOCUMENTS

Peer-reviewed publications in 2020

Basran, C. J., Woelfing, B., Neumann, C., & Rasmussen, M. H. (2020). Behavioural Responses of Humpback Whales (Megaptera novaeagliae) to Two Acousitc Deterrent Devices in a Northern Feeding Ground off Iceland. Aquatic Mammals 46(6): 584-602. https://doi.org/10.1578/AM.46.6.2020.584

Basran, C. J. & Rasmussen M. H. (2020). Conflicts Between Arctic Industries and Cetaceans. In: E. Pongrácz, V. Pavlov & N. Hänninen (Eds.) Arctic Marine Sustainability: Arctic Maritime Businesses and the Resilience of the Marine Environment. Springer Polar Series, Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-28404-6_5

Groove, T, Senglat, C, Petiquyot, M, Kosiba, D and Rasmussen, MH (2020). Mass stranding and unusual sightings of northern bottlenose whales (Hyperoodon ampullatus) in Skjálfandi Bay, Iceland. Marine Mammal Science (https://doi.org/10.1111/mms.12689)

Ben Chehida, Y., Thumloup, J., Schumacher, C., Harkins, T., Aguilar, A., Borrell, A., Ferreira, M., Rojas-Bracho, L., Robertson, K.M., Taylor, B.L., Víkingsson, G.A., Weyna, A., Romiguier, J., Morin, P.A., Fontaine, M.C., 2020. Mitochondrial genomics reveals the evolutionary history of the porpoises (Phocoenidae) across the speciation continuum. Sci. Rep. 10, 15190. https://doi.org/10.1038/s41598-020-71603-9

Daniel G. Pike, Thorvaldur Gunnlaugsson, Bjarni Mikkelsen, Gísli Víkingsson, Geneviève Desportes, 2020. Distribution and Abundance of Killer Whales in the Central North Atlantic, 1987-2015. NAMMCO Sci. Publ. 11. https://doi.org/10.7557/3.5579

Garcia-Garin, O., Sala, B., Aguilar, A., Vighi, M., Víkingsson, G.A., Chosson, V., Eljarrat, E., Borrell, A., 2020. Organophosphate contaminants in North Atlantic fin whales. Sci. Total Environ. 137768. https://doi.org/10.1016/j.scitotenv.2020.137768

Gauffier, P., Borrell, A., Silva, M.A., Víkingsson, G., López, A., Giménez, J., Colaço, A., Halldórsson, S.D., Vighi, M., Prieto, R., de Stephanis, R., Aguilar, A., 2020. Wait your turn, North Atlantic fin whales share a common feeding ground sequentially. Mar. Environ. Res. 104884. https://doi.org/10.1016/j.marenvres.2020.104884

Gilles, A., Gunnlaugsson, Þ., Mikkelsen, B., Pike, D.G., Víkingsson, G.A., 2020. Summer Abundance of Harbour Porpoises (Phocoena phocoena) in the Coastal Waters of Iceland and the Faroe Islands. NAMMCO Sci. Publ. 11. https://doi.org/10.7557/3.4939

Grove, T., Senglat, C., Petitguyot, M., Kosiba, D., Rasmussen, M.H., 2020. Mass stranding and unusual sightings of northern bottlenose whales (Hyperoodon ampullatus) in Skjálfandi Bay, Iceland. Mar. Mammal Sci. 36, 1033–1041. https://doi.org/10.1111/mms.12689

Gunnlaugsson, Þ., Víkingsson, G.A., Halldórsson, S.D., Elvarsson, B.Þ., Haug, T., Lydersen, C., 2020. Body mass, muscle, blubber and visceral fat content and their seasonal, spatial and temporal variability in North Atlantic common minke whales. J. Cetacean Res. Manag. 21, 59–70. https://doi.org/10.47536/jcrm.v21i1

Hansen, R.G., Pike, D., Thorgilsson, B., Gunnlaugsson, Þ., Lawson, J., 2020. The Geometer: A New Device for Recording Angles in Visual Surveys. NAMMCO Sci. Publ. 11. https://doi.org/10.7557/3.5585

Houghton, L., Ramirez-Martinez, N., Mikkelsen, B., Víkingsson, G., Gunnlaugsson, Þ., Øien, N., Hammond, P., 2020. Oceanic Drivers of Sei Whale Distribution in the North Atlantic. NAMMCO Sci. Publ. 11. https://doi.org/10.7557/3.5211

Magnússon, B., Guðmundsson, G.A., Metúsalemsson, S. and Granquist, S.M. (2020). Seabirds and seals as drivers of plant succession on Surtsey. *Surtsey Research* 14: 115-130.

Pampoulie, C., Gíslason, D., Ólafsdóttir, G., Chosson, V., Halldórsson, S.D., Mariani, S., Elvarsson, B.Þ., Rasmussen, M.H., Iversen, M.R., Daníelsdóttir, A.K., Víkingsson, G.A., 2020. Evidence of unidirectional hybridization and second-generation adult hybrid between the two largest animals on Earth, the fin and blue whales. Evol. Appl. https://doi.org/10.1111/eva.13091

Pike, D., Gunnlaugsson, Þ., Sigurjónsson, J., Vikingsson, G., 2020. Distribution and abundance of cetaceans in Icelandic waters over 30 years of aerial surveys. NAMMCO Sci. Publ. 11. https://doi.org/10.7557/3.4805

Pike, D.G., Gunnlaugsson, Þ., Mikkelsen, B., Halldórsson, S.D., Víkingsson, G.A., Acquarone, M., Desportes, G., 2020. Estimates of the abundance of cetaceans in the Central North Atlantic from the T-NASS Icelandic and Faroese ship surveys conducted in 2007. NAMMCO Sci. Publ. 11, 1–19. https://doi.org/10.7557/3.5269

Punt, A.E., Sepúlveda, M., Siple, M.C., Moore, J.R., Francis, T.B., Hammond, P.S., Heinemann, D., Long, K.J., Oliva, D., Reeves, R.R., n.d. Assessing pinniped bycatch mortality with uncertainty in abundance and post-release mortality: A case study from Chile. Fish. Res. 235, 105816.

Punt, A.E., Siple, M., Francis, T.B., Hammond, P.S., Heinemann, D., Long, K.J., Moore, J.E., Sepúlveda, M., Reeves, R.R., Sigurðsson, G.M., Víkingsson, G., Wade, P.R., Williams, R., Zerbini, A.N., 2020a. Robustness of potential biological removal to monitoring, environmental, and management uncertainties. ICES J. Mar. Sci. https://doi.org/10.1093/icesjms/fsaa096

Punt, A.E., Siple, M., Sigurðsson, G.M., Víkingsson, G., Francis, T.B., Granquist, S.M., Hammond, P.S., Heinemann, D., Long, K.J., Moore, J.E., 2020b. Evaluating management strategies for marine mammal populations: an example for multiple species and multiple fishing sectors in Iceland. Can. J. Fish. Aquat. Sci. 77, 1316–1331.

Spaan, K. M., van Noordenburg, C., Plassmann, M. M., Schultes, L., Shaw, S., Berger, M., Heide-Jørgensen, M.P., Rosing-Asvid, A., **Granquist, S.M.,** Dietz, R., Sonne, C., Roos, A., Benskin, J.P. (2020). Fluorine mass balance and suspect screening in marine mammals from the Northern Hemisphere. *Environmental Science & Technology*, *54*(7), 4046-4058.

Thesis

Cécile Chauvat, 2020. Visitors in the land of seals: values, opinions and perceptions of visitors to inform management at seal watching sites. Master thesis, University center of the westfjords, University of Akureyri, Iceland.

Hanna Vatcher (2020). An assessment of whale watching impacts on the behaviour of humpback whales (Megaptera novaeangliae) in Skjálfandi bay, Iceland. MS thesis. University of the Westfjords.

Reports / Conference abstracts

Chauvat, C., Aquino, J. and Granquist, S. (2020). Understanding tourists value to improve management and protect sensitive seal populations from disturbance at seal-watching sites. Ecology in the Anthropocene: The fourth conference of the Nordic Society Oikos. Reykjavík, Iceland, 3-5 March 2020. Presenting author: Cécile Chauvat.

Granquist, S. 2020. Selarannsóknir við Selasetur Íslands 2008-2020: Samantekt af selarannsóknum sem hafa verið stundaðar við Selasetrinu, ásamt þýðingu þeirra fyrir samfélag og selastofna. Fyrirlestrarröð, Selasetur Íslands. 20 February 2020, Hvammstangi, Iceland. Sandra M. Granquist.

Rössler, H., Rasmussen, M., Tourgard, J., Granquist, S., and Wahlberg, M. (2020). Contrasting underwater vocalizations of remote Icelandic harbor seals. Ecology in the Anthropocene: The fourth conference of the Nordic Society Oikos. Reykjavík, Iceland, 3-5 March 2020. Presenting author: Helen Rössler.

Wensveen, P, Isojunno, S, Kvadsheim, P, Lam, FP, von Benda-Beckmann, A, Curé, C, Kleivane, L, Hansen, R & Miller, P (2020). Effects of distance and received level on sonar-induced behavioural disturbance in two deep-diving cetaceans. 4th Conference of the Nordic Society Oikos, Reykjavik, Iceland.

VI APPENDIX 1 - CATCH DATA

Catch data for pinnipeds are under re-evaluation and should not be considered reliable at this stage.

VII APPENDIX 2 - BY-CATCH DATA

a. Short narrative

Bycatch of marine mammals was monitored in all major fisheries in Icelandic waters in 2020, through logbook submissions, reports from onboard inspectors from the Directorate of Fisheries and in the MFRI annual gillnet survey. Onboard inspections by the Directorate of Fisheries were fewer than in a normal year due to Covid-19 restrictions.

By-catch in research surveys and when observed by inspectors on fisheries vessels is reported in Appendix 2. By-catch by fishermen now comes from electronic logbooks only. It should be noted that reported numbers of by-catch is underrepresented to an uncertain extent and hence numbers should not be regarded as reliable. There may be some overlap in the by-catch reported by fishermen and reports from the inspection. Numbers are given as requested in a separate sheet.

VIII APPENDIX 3 - STRANDINGS

a. Short narrative

According to the Icelandic stranding protocol, the MFRI is responsible for documentation and biological investigations related to cetacean standings. Therefore, all strandings should be reported to the MFRI, that subsequently organizes autopsies and/or biological sampling depending on circumstances. Genetic samples are stored in the genetic database at the institute and other biological samples stored at the MFRI or sent to cooperating institutes/scientists.

Live-strandings and associated actions (rescue/euthanasia etc) are managed by the Veterinary Authorities (MAST).

Stranding numbers for 2020 are given as requested in a separate sheet.

No systematic records are kept of pinniped strandings at the MFRI.

ICELAND

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I INTRODUCTION

The following text reports on studies on marine mammals in Icelandic and adjacent waters in 2019. The studies were conducted by the following research institutes: Marine and Freshwater Research Institute, Reykjavík, Húsavík Research Centre (HRC), Húsavík Whale Museum (HWM); Faxaflói Cetacean Research project (FCR), Innovation Centre, Iceland (ICI); Keldur, Institute for Experimental Pathology (KIEP); The National University Hospital of Iceland; The Institute of Natural History (INH); University of Iceland (UI), University of British Columbia in Canada, University of Barcelona in Spain, University of St Andrews in Scotland, Icelandic Seal Center (ISC), BioPol, Hólar University Collage, the University of Stockholm, Natural History Museum of Sweden, Natural History Museum of Denmark, Maine University and University of Aarhus, Denmark, University of Potsdam. Queries for information on research were sent to all offices, individuals and private commercial platforms such as whaling and whale watching companies known to have been involved in marine mammal research or data collection during the period.

II RESEARCH BY SPECIES 2019

Fin whale

Studies continued at the MFRI on the biology and ecology of fin whales based on data from commercial catches in recent years. Fin whale research conducted at the whaling station in Hvalfjörður is wide ranging and includes i.a studies on age, reproduction, feeding ecology, energetics, pollutants, genetics, hybridization, anatomy and physiology and involves several research institutions including the National University Hospital of Iceland, University of British Columbia in Canada, University of Barcelona in Spain, Innovation Centre, Iceland and Keldur, Institute for Experimental Pathology.

Common minke whale

Genetic analyses have been completed for all common minke whale samples received until end of 2018. The dataset encompasses now 737 specimens from Iceland typed at 16 microsatellites and the mitochondrial control region. This data have been analyzed regarding affinity of Icelandic minke whales to other regions of the North Atlantic in an IWC context, i.e., 2014 for the Icelandic RMP implementation review and 2018 for the Greenlandic AWMP implementation review. Microsatellite data are currently used to infer Parent-Offspring (PO) pairs which will inform about regional and ocean-wide movements. Final analyses are to be performed in 2020.

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Blue whale

The HRC in Húsavík continued their long-term photo-identification and sightings studies of blue whales in Skjálfandi bay. Acoustic tags were deployed on two blue whales in Skjálfandi Bay and playbacks with low frequency sounds to blue whales.

Humpback whale

Humpback whales were the primary species of a whale observation effort during ecosystem surveys focused on capelin in 2019. The abundance of capelin was low but as in previous years the humpback whales were concentrated in the area where capelin was detected. The MFRI's long-term tagging program continued in 2019. Ten humpback whales were instrumented with satellite tags in Icelandic and adjacent waters in 2019 as a part of the program and additional nine Limpet tags were deployed by Jake Levenson and coworker. The MFRI continued their photo-identification studies and the development of the national humpback whale photo-id database (ISMN Catalog for: ISland Megaptera Novaeangliae Catalog): https://www.hafogvatn.is/en/research/whale-research/whale-photo-id Today the ISMN catalog records over 1050 unique individuals seen in Icelandic water, as well as individual from partner´s catalog, such are Guadeloupe (500), Norway (880), Azores (70), Irish (60), and Greenland (20)
The HRC in Húsavík contined their long-term photo-identification and sightings studies of humpback whales in Skjálfandi bay.
A PhD. project on humpback whale (Megaptera novaeanglie) entanglement monitoring and mitigation in Iceland, conducted by the HRC in Húsavík was conducetd in 2019. This project includes entanglement scar analysis, whale pinger testing and questionnaires and interviews with Icelandic fishers. Fieldwork for this project was completed in 2018 and both 2019 and 2020 consist of data analysis and writing. The entanglement scar analysis resulted in an estimate of 25% of the Icelandic humpback whale population having been entangled in fishing gear at least once, and the most accurate estimate is this occurs at a rate of 2% of the population per year. Whale pinger testing results showed that humpback whales in the trials significantly reduced surface feeding behaviour in response to the pingers. Preliminary testing of these devices on capelin purse seines suggest they may be useful for preventing gear damage caused by humpback whales incidentally becoming encircled in the seine.
A research project led by Edda E. Magnúsdóttir investigated the singing behavior, a breeding display, of male humpback whales, in sub-arctic Icelandic waters during the winter breeding period of this species. The findings showed continual singing from Jan. – Mar with song progression like what has been found on breeding grounds.
A research project on the life-history strategy of humpback whales in the sub-arctic waters of Iceland investigates the body condition, physical and acoustic behavior of humpback whale in the subarctic waters of Iceland during the winter in comparison to other seasons started in February 2019. This study is done in collaboration between UI, MFRI, the University of St Andrews, Scotland and University of Barcelona, Spain. A total of 40 biopsies (skin/blubber) were collected in four cruises in Icelandic coastal waters in 2019. These are used in a variety of studies including feeding ecology (stable isotopes/fatty acids), stock structure (DNA) and seasonality in reproduction (hormones). The project also involves i.a. tagging, photo-identification and behavioural observations. This study is ongoing until 2022.

Killer whale

In 2019, the MFRI and the Icelandic Orca Project conducted a field season in Vestmannaeyjar during June, July and August, continuing the long-term project on killer whales started in 2008. The current focus of the project is to investigate dietary specialization on killer whales and thus the field work was focused on collecting information on prey targeted and dietary preferences of individual whales by collection of photo-identification, observation of feeding events and collection of skin biopsy samples. There was also the addition of a land-based station that allowed for broader monitoring of variations in the occurrence of killer whales and other cetaceans in the local marine ecosystem. The first catalogue of stereotyped calls produced by the Icelandic population of killer whales was published as a MFRI report (see section V), which should aid in repertoire comparisons with other areas and ongoing and future passive acoustic monitoring efforts.

Long-finned pilot whale

A comprehensive research project started in 2019 and is currently ongoing compiling photo-identifications from as many locations as possible of pilot whales to produce the first photo-identification catalogue of pilot whales in Iceland. In addition, the behaviour of pilot whales has been studied in Vestmannaeyjar during interactions with killer whales. Finally, studies on the ecology of pilot whales have also started by collecting samples of all available stranded animals in the MFRI tissue bank to analyse for stable isotopes of carbon and nitrogen. The aim is to gather knowledge on this species in Iceland that could help us understand the factors driving the unusually high number of strandings that occurred in 2019, such as understanding its occurrence in Icelandic coastal waters, the prey targeted by the species and whether that has changed in recent times.

White-beaked dolphins

The HRC in Húsavík continued their long-term photo-identification and sightings studies of white-beaked dolphins in Skjálfandi bay. C-PODS were deployed in Skjálfandi Bay for detection of white-beaked dolphins.

Harbour porpoise

Collaboration of the MFRI with the University of Potsdam on harbour porpoise genetic research is ongoing (Lah et al. 2016). Among the objectives of this study is estimation of population size based on close kin analysis. Preliminary results were presented to the workshop *Joint IMR/NAMMCO International Workshop on the Status of Harbour Porpoises in the North Atlantic* in Tromsö in December 2018. Since 2017 fishermen received a payment for each harbour porpoise DNA tissue sample that they sent in to the MFRI, and this resulted in an increased number of samples obtained. In 2019 received samples were 135, which is less than the around 200 samples that were received in the earlier years. No payment will be offered to fishermen in 2020. In addition, samples will continue to be included from bycaught porpoises in the annual gillnet survey around Iceland in the spring (18 in 2019) and occasional samples from stranded animals. The total number of samples collected since 2013 is now similar to the number collected in 1991 to 2001. Genetic analyses have now been completed for the entire set of harbour porpoise samples (2109 specimens typed at 13 microsatellites, one sex-determining locus, and the mitochondrial controllregion). This data will be analyzed in 2020 regarding affinity of Icelandic porpoises to other regions of the North Atlantic as well as with regard to population structure within Iceland. Towards the latter, microsatellite data are used to inferr Parent-Offspring (PO) pairs which will inform about local movements. PO pair inferences will also be used to obtain estimates of population size/abundance and trend by comparison of the two sampling periods.

New analyses on nuclear Single Nucleotide Polymorphisms (SNPs) have been performed on 150 harbour

porpoise specimens from the North Atlantic, including 12 specimens from Iceland. These analyses yielded 26,320 informative SNPs which are currently used for population structure assessment across the entire North Atlantic.

Efforts to estimate bycatch of harbour porpoises in fisheries continued at the MFRI. Status of this work will be reported to the WG on Bycatch in Copenhagen in April 2020.
Accoustic porpoise deterrents (pingers) were tested for the first time in the Icelandic cod gillnet fishery in April of 2017, but their use showed no reduction in porpoise bycatch, as 7 porpoises got caught in nets with pingers, while 5 porpoises got caught in control nets nearby. Another type of porpoise deterrents (PALs) were tested in the cod gillnet fishery in April of 2018 and like the pingers, showed no reduction in porpoise bycatch as 12 porpoises were caught in nets with the devices, while 11 porpoises got caught in the control nets. A pinger with a different signal was tested in 2019, but no porpoises were caught. Further trials with that pinger will be conducted in April 2020.

C-PODS were deployed in Skjálfandi Bay for detections of harbour porpoises.

Other (multi) cetacean species

A total of 37 stranding events of cetacean was recorded by the MFRI in 2019 whereof 15 were long-finned pilot whales, including three mass stranding, the largest group consisting of 60 animals beached in a remote area at NE-Iceland. Another group of 50 stranded pilot whales were discovered by helicopter pilot in a remote area West-Iceland. One group of around 30 beached in Garður, Reykjanes peninsula. Of that group 14 died on the beach while the rest was pushed out again.

Harbour seals

A new harbour seal census was conducted by MFRI and ISC during the moulting period of 2018 and the results were published in 2019 (Granquist and Hauksson, 2019a). In total, 4,168 harbour seals were observed, wich after cprection factors had been applied resulted in an estimated population size of 9,434 (CI 95%= 6,149-12,726). Efforts are taken by MFRI and ISC to improve knowledge on population demographics and factors contributing to mortality and/or affecting the status of the population. Research on timing of pupping period and pup production was initiated in 2009 and analysis and manuscript preparation carried out during 2019. A new project was initiated in 2018, where haul-out behavior was monitored by using camera traps and analysis continued during 2019. The results from the project will increase knowledge in factors affecting haul-out behaviour,and will assist in improving census design. Efforts to estimate bycatch of harbour seals in fisheries continued at the MFRI.

A study on the effect of land- and boat-based tourism on the spatial and behavioural haul-out patterns of harbour seals was initiated by ISC and MFRI in 2008 and continued during 2019. The study includes interdisciplinary cooperation with researchers from Holar University Collage, University of Iceland, Griffith University in Australia, Stockholm University in Sweden. The interdisciplinary research focus on research on best practice, management of seal watching and development of an ethical framework.

A study conducted in co-operation between MFRI, ISC, UI and University of Aarhus, Denmark on vocalisations and behaviour of male Icelandic harbour seals during the mating season continued during the year.

A study of harbour seal genetics was initiated in 2016, in cooperation between MFRI, ISC and the Natural history museum of Denmark and analysis continued during 2019.

Efforts to estimate bycatch of harbour seals in fisheries continued at the MFRI. Results of the estimates in the lumpsucker gillnets fishery can be found here: https://www.hafogvatn.is/is/moya/extras/medafli-fugla-og-sjavarspendyra

Grey seals

To estimate the current status of the Icelandic grey seal population, an aerial census was conducted by MFRI in cooperation with ISC during the pupping period in 2017 and results were published in 2019 (Granquist and Hauksson 2019b). The peak of the pupping period varied from 2 October (Frameyjar in Breiðafjörður, West Iceland) to 24 October (Strandir, North West Iceland). Based on the estimated pup production (1452; 95% CI=1385-1529), the total population size was estimated to be 6269 (95% CI=5375-7181). Breiðafjörður was the most important pupping area in Iceland, with 58% of the total pup production in 2017.

A project was initiated in October 2016 where five grey seal pups were tagged with satellite tags to map habitat use and the results were published in 2019 (Baylis et al. 2019).

A study of grey seal genetics was initiated in 2016, in cooperation between MFRI, ISC, the Natural history museum of Denmark and Main University, and analysis continued during 2019.

Efforts to estimate bycatch of grey seals in fisheries continued at the MFRI. Results of the estimates in the lumpsucker gillnets fishery can be found here: https://www.hafogvatn.is/is/moya/extras/medafli-fugla-og-sjavarspendyra

Other (multi) pinniped species

A project investigating environmental toxicants in seals in Icelandic waters was initiated by MFRI during 2017 and analysis continued in 2019. Very little is known about contaminants in Icelandic seal populations. The focus of the project is to investigate the contents of new contaminants of concern in marine mammals, including new brominated flame retardants and PFAS (per- and polyfluoroalkyl substances). The project is an international cooperation between Sweden (Naturhistoriska Riksmuséet and Stockholm University), Greenland (Grönlands Naturinstitut) and MFRI (Iceland).

III ONGOING (CURRENT) RESEARCH

Pinnipeds

A harbour seal aerial census is planned in 2020.

Cetaceans

A new research project on northern bottlenose whales around Iceland has been initiated in Jan 2020 by the University of Iceland in collaboration with MFRI and others. This three-year project will use long-term acoustic monitoring, satellite tags and surface observations to provide new insights into the species' movement ecology (why, when, which and where animals move) and their vulnerability to high-intensity anthropogenic noise, such as seismic airguns and naval sonar.

IV ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

Cetaceans

Based on assessments conducted by the Scientific Committees of NAMMCO and the IWC, the MFRI recommended in 2017 that annual catches in 2018-2025 do not exceed 161 fin whales on the East Greenland – West Iceland management area and 48 fin whales in the East Iceland-Faroes management area. On the same basis the MFRI recommended in 2018 maximum annual takes of 217 common minke whales in the Icelandic continental shelf (CIC) area during 2018-2025. In 2019, Icelandic authorities issued a regulation on catch limits according to this advice for the period 2019-2023 (annual catch of 161 fin whales and 217 common minke whales). Despite the issued quotas, no whaling occurred in Icelandic waters in 2019.

Pinnipeds

Harbour seals: To raise the numbers in the population to acceptable levels MFRI advices that direct hunt should be banned and that actions must be taken to reduce by-catch of seals in commercial fisheries. If limited hunting will be allowed, MFRI advices that a hunting management system should be initiated, and that reporting of all seal hunt should be mandatory. MFRI further advices that attempts to minimize anthropogenic disturbance of harbour seal colonies are initiated, in particular during breeding and moulting seasons between May and August.

Grey seals: The governmental management objective from 2005 states that the Icelandic grey seal population size should be kept above 4100 animals, which corresponds to the observed population size from 2004. The population is currently estimated to 6300 animals, which is above the management objective. If the population decreases significantly measures will be taken to reverse the trend. Close monitoring of the population is advised. MFRI advices that actions must be taken to reduce by-catch of grey seals in commercial fisheries. MFRI also advices that a hunting management system should be initiated, and that reporting of all seal hunt should be mandatory.

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VI APPENDIX 1 - CATCH DATA

Catch data for pinnipeds are under re-evaluation and should not be considered reliable at this stage.

VII APPENDIX 2 - BY-CATCH DATA

a. Short narrative

Bycatch of marine mammals was monitored in all major fisheries in Icelandic waters in 2019, through logbook submissions, reports from onboard inspectors from the Directorate of Fisheries and in the MFRI annual gillnet survey.

By-catch in research surveys and when observed by inspectors on fisheries vessels is reported in Appendix 2. By-catch by fishermen now comes from electronic logbooks only. It should be noted that reported numbers of by-catch is underrepresented to an uncertain extent and hence numbers should not be regarded as reliable. There may be some overlap in the by-catch reported by fishermen and reports from the inspection. Numbers are given as requested in a separate sheet.

VIII APPENDIX 3 - STRANDINGS

a. Short narrative

According to the Icelandic stranding protocol, the MFRI is responsible for documentation and biological investigations related to cetacean standings. Therefore, all strandings should be reported to the MFRI, that subsequently organizes autopsies and/or biological sampling depending on circumstances. Genetic samples are stored in the genetic database at the institute and other biological samples stored at the MFRI or sent to cooperating institutes/scientists.

Live-strandings and associated actions (rescue/euthanasia etc) are managed by the Veterinary Authorities (MAST).

Stranding numbers for 2019 are given as requested in a separate sheet.

No systematic records are kept of pinniped strandings at the MFRI.