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FAROE ISLANDS
PROGRESS REPORT ON MARINE MAMMALS 2022

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I. INTRODUCTION

This report summarises research on cetaceans and pinnipeds conducted in the Faroe Islands in 2022, by the Faroe Marine Research Institute and the Environment Agency.

II. RESEARCH BY SPECIES 2022

II.a Species/Stocks studied

- Grey seals (*Halichoerus grypus*) – tagging
- Pilot whales (*Globicephala melas*) – landed animals
- White-sided dolphin (*Lagenorhynchus acutus*) – tagging, stored samples

II.b Field work

In 2022, biological samples for age and reproductive analysis were collected from 214 **pilot whales**, by the Faroe Marine Research Institute, in 4 drives. In addition, 39 stomachs and 214 necropsies were stored for diet, genetic and ecological studies.

In 2021, the Environment Agency took samples of **pilot whales** in connection with grinds in Sandagerði on 7 May and Sandagerði 12 October. In all, 31 individual samples of muscle and blubber, and approximately same number of liver and kidney tissue, were taken.

One **grey seal** was tagged with satellite-linked transmitter.

Six animals from a group consisting 12 **white-sided dolphins** were tagged with satellite-linked transmitters.

II.c Laboratory work

The biological material collected from **pilot whales** in 2022, and material collected in previous years, together with samples from **white-sided dolphins**, is under processing for age, reproduction and diet analysis. The procedure for ageing of marine mammals at the Faroe Marine Research Institute is now fully implemented.

Pilot whale teeth are in progress for analyses of nitrogen, carbon and oxygen stable isotopes, for ecological studies, as part of the TOPLINK project.

The Environment Agency are regularly collecting **pilot whale** samples for a tissue bank, where the aim is to take samples from three schools a year, with generally 25 individuals from each. In

addition to a pollution monitoring program, as outlined in Table 1, research activities are done as projects and when funding allows. Such projects could be to investigate the presence of chemicals of emerging environmental concern and elucidate potential negative impact of pollutants on pilot whales.

Table 1. Pollutants in the pilot whale monitoring program of the Environment Agency.

Matrix (tissue)	blubber & muscle	kidney	liver	blubber / liver*,**	blubber*
Frequency of sampling	yearly, pref. from 3 schools, focus incr. on juv. males for timetrend				
number of samples analysed per year	25	15	15	5	5
Tissue analysed for:	Blubber:Legacy persistent organic pollutants$ Muscle:metals£	Cadmium, dry mass	Mercury, selenium, cadmium, dry mass	Perfluoroalkyl substances, polybrominated diethyl ethers	hexabromo cyclo-dodecane, Dechlorane plus

*Time trends
** PFAS is analysed in liver
$ PCB, HCH, HCB, DDT, DDE, and from ca. ½ of the samples even o,p-isomer DDT and metabolites, CHL, Mirex, Toxaphene.
£ Mercury, selenium, dry mass and stable N and C isotopes

II.d Other studies

Law No. 65 from 14. May 2020 ban the protective removal of **grey seals** around salmon farms. Statistics for this cull was collected back to 2010.

Faroe Marine Research Institute has since 2018 counted **grey seals** at haul-out localities during summer, for a minimum population estimate. The results will be reviewed by the NAMMCO Coastal Seal Working Group in 2023. Three grey seals have been tracked for behavioural studies since 2020, which together with older tracking data may provide a correction to the abundance estimate, for the proportion of animals outside the survey area during the count.

TOPLINK is new project cooperation between Faroe and Greenland for studying the role of the killer whale, pilot whale and dolphin in the ecosystem along the Greenland-Shetland Ridge.

Faroe Marine Research Institute continues the effort to tag **pilot whale** pods. Future tagging will harmonize with innovations in the field of bio-logging and the introduction of two upcoming tagging projects, MINITAG and TOPLINK, which will promote the continuation of tagging pilot whale and other species in the Faroe Islands.

II.e Research results

The six **white-sided dolphins** tracked in 2022 provided contacts for between 7 and 48 days. The animals first moved north, to the Faroe Shelf slope, where they started to split up. Three animals continued north, and eventually separated, where one animal continued north to 65N. The three animals from the other group also split, and started moving southward on separate but fairly similar paths. South of the Faroe-Iceland Ridge, these animals started moving westward towards south Iceland. Two animals crossed the Reykjanes Ridge, and continued into the Irminger Sea. The longest tracked animal moved all the way to the slope of the east

Greenland Shelf. This dolphin also moved along the slope and southward until being 200 nautical miles south of Cape Farwell, when it turned north again.

The juvenile **grey seal** was tracked for 87 days, until mid November. The seal showed a resident behaviour, moving mainly in the tagging area, which is a narrow sound with strong currents, but with additional movements to and residency in a bay 5 nautical miles south of the sound. A single trip with duration of seven days was spent at more distant islands 20 nautical miles to the south.

Cipriani *et al* (2022) studied the distribution and genetic diversity of anisakid nematodes of the genus *Anisakis* sampled in cetaceans from the Northeast Atlantic Ocean and the Mediterranean Sea. A total of 478 adults and pre-adults of *Anisakis* spp. was identified by a multilocus genetic approach (mtDNA *cox*2*,* EF1 $\alpha - 1$ nDNA and *nas* 10 nDNA gene loci) from 11 cetacean species. A clear pattern of host preference was observed for *Anisakis* spp. at cetacean family level: *A. simplex* (s.s.) and *A. pegreffii* infected mainly delphinids; *A. physeteris* and *A. brevispiculata* were present only in physeterids, and *A. ziphidarum* occurred in ziphiids. The role of cetacean host populations from different waters in shaping the population genetic structure of *A. simplex* (s.s.), *A. pegreffii* and *A. physeteris* was investigated for the first time. Significant genetic sub-structuring was found in *A. simplex* (s.s.) populations of the Norwegian Sea and the North Sea compared to those of the Iberian Atlantic, as well as in *A. pegreffii* populations of the Adriatic and the Tyrrhenian Seas compared to those of the Iberian Atlantic waters. Substantial genetic homogeneity was detected in the Mediterranean Sea population of *A. physeteris.* This study highlights a strong preference by some *Anisakis* spp. for certain cetacean species or families. Information about anisakid biodiversity in their cetacean definitive hosts, which are apex predators of marine ecosystems, acquires particular importance for conservation measures in the context of global climate change phenomena.

Skern-Mauritzen *et al* (2022) assessed prey consumption by the marine mammal community in the northeast Atlantic [including 21 taxa, across three regions: (I) the Icelandic shelf, Denmark Strait, and Iceland Sea (ICE); (II) the Greenland and Norwegian Seas (GN); and (III) the Barents Sea (BS)], and compare mammal requirements with removals by fisheries. To determine prey needs, estimates of energetic requirements were combined with diet and abundance information for parameterizing simple allometric scaling models, taking uncertainties into account through bootstrapping procedures. In total, marine mammals in the ICE, GN, and BS consumed 13.4 [Confidence Interval (*CI*): 5.6–25.0], 4.6 (*CI*: 1.9–8.6), and 7.1 (*CI*: 2.8–13.8) million tonnes of prey year^{-1}. Fisheries removed 1.55, 1.45, and 1.16 million tonnes year^{-1} from these three areas, respectively. While fisheries generally operate at significantly higher trophic levels than marine mammals, we find that the potential for direct competition between marine mammals and fisheries is strongest in the GN and weakest in the BS. Furthermore, the results also demonstrate significant changes in mammal consumption compared to previous and more focused studies over the last decades. These changes likely reflect both ongoing population recoveries from historic whaling and the current rapid physical and biological changes of these high-latitude systems. Changing distributions and abundances of mammals should be considered when establishing fisheries harvesting strategies, to ensure effective fisheries management and good conservation practices of top predators in such rapidly changing systems.

To identify the molecular mechanisms underlying intrinsic hypoxia-tolerance, Geßner *et al* (2022) excised neurons from the visual cortices of hooded seals and mice (*Mus musculus*) by laser capture microdissection. A comparison of the neuronal transcriptomes suggests that, compared to mice, hooded seal neurons are endowed with an enhanced aerobic metabolic capacity, a reduced synaptic transmission and an elevated antioxidant defense. Publicly available whole-tissue brain transcriptomes of the bowhead whale (*Balaena mysticetus*), long-finned pilot whale (*Globicephala melas*), minke whale (*Balaenoptera acutorostrata*) and killer whale (*Orcinus orca*), supplemented with 2 newly sequenced long-finned pilot whales, suggest that, compared to cattle (*Bos taurus*), the cetacean brain also displays elevated aerobic capacity and reduced synaptic transmission. We conclude that the brain energy balance of diving mammals is preserved during diving, due to reduced synaptic transmission that limits energy expenditure, while the elevated aerobic capacity allows efficient use of oxygen to restore energy balance during surfacing between dives.

Smouth *et al* (2021) report from a workshop where a team of international experts reviewed age-structured models of North Atlantic pinniped populations, including Grey seal (Halichoerus grypus), Harp seal (Pagophilus groenlandicus), and Hooded seal (Cystophora cristata). Statistical methods used to fit such models to data were compared and contrasted. Differences in biological assumptions and model equations were driven by the data available from separate studies, including observation methodology and pre-processing. Counts of pups during the breeding season were used in all models, with additional counts of adults and juveniles available in some. The regularity and frequency of data collection, including survey counts and vital rate estimates, varied. Important differences between the models concerned the nature and causes of variation in vital rates (age-dependent survival and fecundity). Methods for estimation of model parameters were reviewed and compared. They included Bayesian and maximum likelihood (ML) approaches, implemented via bespoke coding in C, C++, TMB or JAGS.

III. ONGOING (CURRENT) RESEARCH

Faroe Islands has requested NAMMCO for management advice on sustainable harvest levels for long-finned pilot whales and Atlantic white-sided dolphins. An NAMMCO assessment working group meeting is planned for white-sided dolphins in 2023, while the pilot whale assessment meeting will occur in 2024, or after a new abundance estimate has become available from the NASS-2024 survey.

The Faroe Marine Research Institute will continue the summer census for monitoring trend and abundance of the **grey seal** population. In 2022, the plan is to expand the study to include camera traps and satellite tracking, to study the behaviour, and to improve the accuracy of the abundance estimate.

The Environment Agency will continue to sample **pilot whales** for pollution monitoring in 2023. Co-operation with scientist at the Department of Anatomy and Cell Biology/ Canadian Light Source, Saskatoon, SK Canada, regarding the mercury/selenium in inner ear of the pilot whale, continues.

Biological sampling from drive hunts and stranding continues as part of a standard monitoring programme.

IV. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

Law no. 65, from 14 May 2020 bans all culling of marine mammals in connection with fish farming activities. Prior to this, fish farmers were allowed to cull **grey seals** interacting with their fish farms, but with the new law enforcement, this cull has completely ceased. Recreational hunting is not practiced on grey seals either.

The Fisheries Inspection has followed the recommendations from NAMMCO, that the Faroes should collect data on **bycatch** of marine mammals in the pelagic fisheries targeting mackerel, herring, and blue whiting, and has performed opportunistic inspections of the fleet. For all fisheries, fishermen are mandated to deliver by-catch information, both in the electronic and paper logbooks.

V. PUBLICATIONS AND DOCUMENTS

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