Project information

Project title

Giants of the ocean – affected by anthropogenic pollutants?

Year

2017

Project leader

Heli Routti

Geographical localization of the research project in decimal degrees (max 5 per project, ex. 70,662°N and 23,707°E)

78°N and 14°E)

Participants

Mikael Harju/NILU; Jenny Bytingsvik/Akvaplan-Niva; Anders Goksøyr/UiB; Christian Lydersen, Kit M. Kovacs, Geir W. Gabrielsen, Sabrina Tartu/NPI; Cristina Panti, Cristina Fossi/Univ. of Siena, Italy

Flagship

Hazardous Substances

Funding Source

Own funding NP	652200
NFR – ICE whales	121325
FRAM	500000 (NPI: 385 000, NILU: 115 000)

Summary of Results

We have completed our sampling material with 6 fin whales and 4 blue whales in summer 2017, so now we have samples in total from 27 whales. The samples were collected as a part of the ICE-whales project (K.M. Kovacs and C. Lydersen).

We have analyzed levels organophosphorous flame retardants, current-used and legacy brominated flame retardants, PCBs and organochlorine pesticides in the blubber samples collected in 2014-16 (n=17). We have tried different extraction methods for phthalates without success. We are still working on that aiming to get a method working in 2018. We will analyse 2017 samples (n=10) for the compounds detected in 2014-16 samples in December 2017.

We have established a luciferase reporter gene assay for fin/blue whale thyroid hormone receptor (the sequence is identical for the two species) and tested how the compounds with highest concentrations (PCBs and organochlorine pesticides) and their mixtures affect the receptor's activation.

We have also sequenced full length glucocorticoid receptor, and part of the aryl hydrocarbon receptor and peroxisome proliferator-activated receptor gamma (so far identical for both species). The sequencing of individual genes of blue whale has been challenging due to low quality of mRNA extracted from the biopsies. Therefore, we have sequenced the whole genome of blue whale at the Genomics Core Facility (GCF) at the University of Bergen. We are currently establishing collaboration with researchers from North-America also working on blue whale genome.

We will continue the project as planned. In 2018 we will concentrate on receptor activation work. We are planning to hire our current MSc-student to finish the receptor activation work including reporting after she has got her MSc-degree in February 2018. We will plan the analyses for correlative studies together with researchers from the University of Siena who are working on blue and fin whales from other parts of the world (Heli Routti will spend 3 months at the University of Siena in winter 2017-2018).

Master and PhD-students involved in the project

MSc-student: Katharina Luhmann, Univ of Landau, Germany

For the Management

Will be given later.

Published Results/Planned Publications

We are currently working on a publication on levels of pollutants and their effects on thyroid hormone receptor in blue and fin whales. The publication is planned to be submitted in February 2018. So far, we have presented one poster in a conference:

Conferences:

Lille-Langøy R, Øygaarden L, Luhmann K, Kovacs KM, Lydersen C, Goksøyr A, Routti H. Effects of environmental pollutants on the activity of transcription factors in blue and fin whales in vitro. 19th International symposium on Pollutant Responses in Marine Organisms. Matsyama, Japan 30.6-3.7.2017. Poster.

Communicated Results

The project has been shortly presented by Anders Goksøyr at eight faculty seminars held at North-American universities/ research institutes in September-October 2017.

1. Ocean Sciences Centre, Memorial University, St. John's, Newfoundland, Canada
2. McMaster University, Hamilton, Ontario
3. Woods Hole Oceanographic Institution, USA
4. Stony Brook University New York, Long Island Seminar, Dept. of Marine and Oceanographic Sciences
5. University of Minnestoa, Minneapolis-St. Paul, School of Biological Sciences
6. US EPA, Duluth, MN
7. UC Berkeley, Department of Integrative Biology
8. UC Riverside, Department of Environmental Science

Interdisciplinary Cooperation

This project absolutely benefits of the inter-disciplinary cooperation. We combine information from analytical chemistry, ecology and molecular biology.

Budget in accordance to results

Fram Centre funding has covered salary of Sabrina Tartu (NPI), pollutant analyses in 2017 samples (NILU) and travel costs for the MSc-student (NPI). NPI internal funding has covered costs of chemical analyses for 2014-16 samples (NILU) and salary for HR (NP), whereas receptor activation studies have been covered by NPI and NFR.

Fram Centre has covered approximately 1/3 of the costs in 2017.

Could results from the project be subject for any commercial utilization

No

Conclusions

We will continue the project according to the plan.

So far, we have developed a method to study in vitro activation of blue/fin whale thyroid hormone receptor by pollutants. This method is a valuable tool to assess endocrine disruptive potential of pollutants in whales.