

information

Keywords

Whale Contaminants Health effects

Project title

WhaleHealth - Contaminant levels and effects in killer (*Orcinus orca*) and humpback whales (*Megaptera novaeangliae*) present in Northern-Norway.

Year

2016

Project leader

Jenny Bytingsvik

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

69,75252°N/18,66493°E, 78,04022°N/14,18545°E, 78,39521°N/16,98490°E, 78,55786°N/11,74522°E

Participants

Project leader: Jenny Bytingsvik, Akvaplan-niva AS (APN).

Administrative responsible for lead institution: Anita Evenset.

Project participants (Institution): Martin Biuw (APN), Anita Evenset (APN), Ingar Wasbotten (APN), Dorte Herzke (NILU), Bert van Bavel (NIVA), Elisabeth Lie (NIVA), Pim Leonards (Institute for Environmental research (IVM), Vrije Universitet (VU), Mario Acquarone (UiT).

Flagship

Hazardous Substances

Funding Source

Hazardous substance-effects on ecosystem and health, WP2 Animal Health and ecosystem.

Summary of Results

Highlights

1. Equipment for sampling whale blow has been developed and is partly tested on beluga whales (Svalbard) through a collaboration with the Norwegian Polar Institute (NPI).
2. Sampling of adipose tissue, plasma and whale blow from beluga whales (Svalbard) is conducted and samples from this model species will be used to validate the use of whale blow as a surrogate for plasma in evaluation the health and examine effects of contaminants in large whales.

3. The project has led to a new collaboration with NPI and a new Flagship application on whales and contaminant effects (project leader: NPI).

Field equipment, field work and sampling

Shortly after funding was achieved we started to plan field work and to develop equipment needed for sampling of whale blow.

The sampling equipment we concluded would be optimal to use is a 6 m long carbon stick where we at the end have a frame where we can connect multiple sampling units for capturing blow (Figure 1). The sampling unit consist of a petri dish (Ø10 cm) covered with chemically cleaned piece of nylon which we stretch out to cover the dish opening and connect to Velcro underneath the dish. Velcro is also attached to the frame on the carbon stick for an easy and quick attach and release.

Through communication with the Norwegian Polar Institute (NPI) and their field plans for the summer months 2016, we got the chance to obtain whale blow, blood plasma and adipose tissue from beluga whales (*Delphinapterus leucas*). Hence, we decided to use this species as a whale model instead of the planned species harbor porpoise (*Phocoena phocoena*). Five belugas from Forlandsundet, Grønfjorden and Tempelfjorden at Svalbard was successfully sampled in July (Figure 2 and 3). In addition to biological samples, sea water blank samples were also collected as blow might be contaminated with sea water. Blank samples will be analysed for metabolites only.

Observations confirm that killer and humpback whales are about to arrive outside Tromsø and Kvaløya (Figure 4) these days, somewhat later than estimated. When density is reasonable we will conduct the planned sampling of these species. Equipment and personnel are ready to go into field on short notice.

Analysis

Adipose tissue from belugas have been delivered to NILU and chemical analyses is now ongoing. Blow and plasma samples will be sent to IVM/VU as soon as we get the hold of the -80 plasma samples. Metabolomics will be run on blow and plasma samples from beluga in November/December 2016.

4 out of 4 planned samples of the model whale will be analyzed chemically and biologically as these samples are of high priority due to their role in validation of using blow-samples as a surrogate for plasma samples in evaluating whale health.

Based on 2016 funding we have the budget to conduct chemical analyses of 3 blubber samples from killer whales and 3 blubber samples from humpback whales, and screening of 2 samples. If the project receives 2nd year funding, we will be given the opportunity to perform chemical and biological analysis on all the 20 killer and humpback whales' samples originally planned for this study.

Collaborations and Educational aspects

Field work at Svalbard to sample beluga was led by NPI. The collaboration with NPI has several benefits for both institutions. For instance, as we will use the chemical data from the same samples for different purposes, we can of course conduct a more comprehensive chemical analysis of the whale samples instead of conducting identical analysis on the same samples. The collaboration has already lead to new project ideas and Flagship applications (Giants of the ocean –affected by anthropogenic pollutants?).



Master and PhD-students involved in the project

Concerning outreach, the WhaleHealth project was presented to UiT students as a part of BIO2012 Fundamentals of Ecotoxicology lead by Sophie Bourgeon (UiT). This presentation has resulted in interests from several students contacting Akvaplan-niva for the possibility to conduct a Master degree within ecotoxicology and marine mammals along the Norwegian coast. If 2nd year funding is given to the WhaleHealth-project the material is considered to be suitable for a Master's thesis.

For the Management

As this project is on whales expected to come to the coast of Troms in October and they came in a bit later than expected this year, we are about to start our main sampling of whales the same week as we send in this report. Hence, there are no direct

findings yet. However, we are pleased to have obtained samples from the model whale to be used for validation of blow as a surrogate for plasma in evaluating the health of large whales.

If the development of this method and way of evaluating the health of whales is successful, it can be used as a tool to evaluate the health and contaminant effects in large whales where blood sampling today is impossible to collect.

Published Results/Planned Publications

No publications so far as sampling is about to start as whales came in late this year.

However, we will publish in highly ranked scientific journals (e.g. Environmental Science and Technology).

Communicated Results

Concerning outreach, the WhaleHealth project was presented to UiT students as a part of BIO2012 Fundamentals of Ecotoxicology lead by Sophie Bourgeon (UiT). This presentation has resulted in interests from several students contacting Akvaplan-niva for the possibility to conduct a Master degree within ecotoxicology and marine mammals along the Norwegian coast. If 2nd year funding is given to the WhaleHealth-project the material is considered to be suitable for a Master's thesis.

Interdisciplinary Cooperation

The project is inter-disciplinary as it combines biological and chemical aspects of ecotoxicology. Further, advanced analytical chemistry with regard to the metabolomics analysis is included in this project.

Budget in accordance to results

As the whales the last years suddenly has merged by the coast of Troms in high densities, it has given researchers unique possibilities to do various types of research associated with whale ecology and toxicology etc. As there is no guarantee for how many years this will last we were dependent on a quick application process to be able to do this project on whale health. This project as a whole, which is 100% funded by Flagships, was made possible due to the existence of the Flagship funding system.

Activities	Funding 2016	Used per 31.05.2016	Used from 01.06.2016 to 14.11.16	Estimated use from 15.11.16 to 31.12.16	Institution
Administration	40	16	24	0	APN
Fieldwork	278	13	105	160	APN, UIT
Analysis	227		219	8	NIVA, NILU, IVM, APN
Data analysis, publication, outreach	5	2	0	3	APN
Invoiced for last period		31			
Total	550	31	348	171	

Could results from the project be subject for any commercial utilization

Yes

If Yes

I believe it could be of interest to develop standardize equipment for sampling whale blow.

Conclusions

a) Indicate future research and/or perspectives which the project results have led to

b) List and describe new methods or techniques that have been developed during the project or that the project has revealed a need for

- a) For future studies this project has led to - see information in point 9. If whale blow and metabolomics appears to be successful as a surrogate for blood samples when evaluating animal health and examine contaminant effects, we will try to establish a larger project (e.g. NFR) to study this in a larger study group

of large whales (e.g. killer whales as they are known to be highly contaminated). It is also of interest to examine the more volatile parts of the exhale by taking gas samples, and not only study the more water soluble fractions accumulating in lung mucus etc as we focus on in this study. This has to an limited extent been examined in other marine mammals earlier and even show the presence of contaminants. Comparable methods can also be tested out on seals.

- b) A sampling technique for sampling of whale blow has been further developed within this project, and is based on available information in a limited number of published papers. The project reveal on good analytical techniques in metabolomics to screen for health variables, and the identification of the compounds. Metabolomics is a quite novel technique and research is needed to be able to identify all compounds present in whale blow or other samples from animals.