Mercury levels and effects in marine pelagic food webs from Svalbard

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Introduction

Mercury (Hg) pollution still constitutes a serious problem both in local and global perspectives. Mercury emitted to the atmosphere in industrial areas enters the global wind systems, and may be transported to the Arctic. There is evidence that levels of Hg in arctic biota have been increasing over the last decades[1]. This might be related to the high deposition of reactive Hg-II from the atmosphere during the Arctic spring (March-May)[2]. Both organic and inorganic Hg may enter the food chain and accumulate to possible adverse concentrations in animals by the process of biomagnification.

Methods

During the field season of 2007 sampling were carried out in May, July and October. Zooplankton were collected from two stations in Kongsfjorden using WP3 and MIK-nets. Fish were caught in ground nets and by trawling. Birds were hunted near Ny-Ålesund.
In 2008 and 2009 sampling will be carried out in July from the same stations in Kongsfjorden, and in addition one station in Rijpfjorden.

Analysis of inorganic mercury and other metals will be done by High Resolution ICP-MS. Methyl mercury will be determined by cysteine extraction followed by HPLC ICP-MS at NILU, Kjeller.

Aim of study

- Establish basal levels of annual and seasonal variation in mercury uptake and transport in arctic marine food webs.
- Is there a link between high deposition of atmospheric mercury during arctic spring and mercury levels in biota?
- Determine how mercury exposure affects individuals of selected species at the molecular level.
- Validate molecular responses as possible biomarker for mercury exposure.

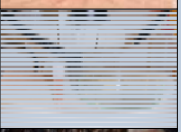
Stable isotopes will be analyzed at the Institute of Energy Technology (IFE) in Kjeller.

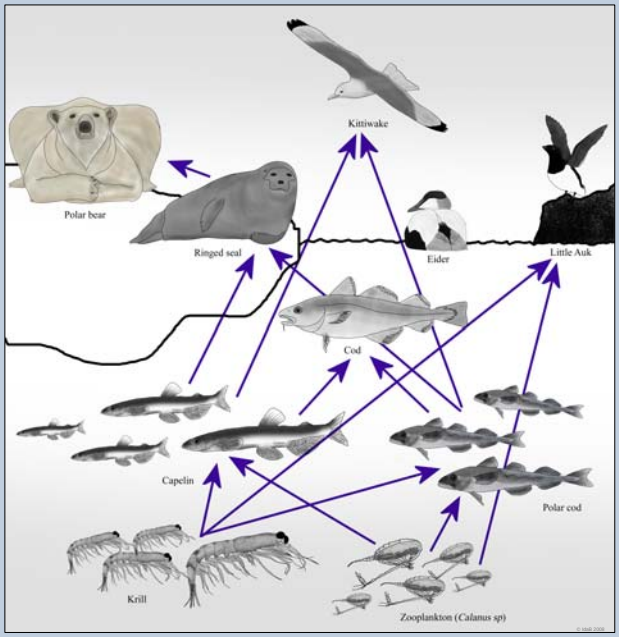
Laboratory studies on *Calanus* species will be carried out at SINTEF/NTNU SeaLab in Trondheim and Kings Bay Marine-laboratory in Ny-Ålesund. Gene expression studies will be done using quantitative PCR (qPCR) at SINTEF/ NTNU in Trondheim.

Protein studies will be carried out at the Department of Biology, NTNU, with main focus on metallothionein and catalase.

Map of Svalbard. Research areas indicated in red.



Possible pathways of mercury transport in arctic food webs.



Kittiwake (*Rissa tridactyla*)

The kittiwake is an important predator in arctic pelagic food webs, feeding on invertebrates and small fish like polar cod and capelin (*Mallotus villosus)*.
Antioxidant proteins will be studied in samples from kittiwakes collected in Kongsfjorden and Rijpfjorden to look for possible correlations with seasonal and annual variation in mercury content.

Polar cod (*Boreogadus saida*)

Polar cod is a small pelagic fish feeding on zooplankton and krill. It is prayed on by larger fish, marine mammals and sea birds.
Antioxidant proteins will be studied in samples from polar cod collected in Kongsfjorden and Rijpfjorden.

Calanus sp

The copepod genus *Calanus* is an important link between primary producers and higher trophic levels in arctic marine food webs.
A variety of possible biomarkers will be tested on different species of *Calanus*, with the main focus on expression of antioxidant genes after mercury exposure under controlled laboratory conditions.

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Kongsfjorden and Ny-Ålesund. Foto: Ida B