

Project information

Keywords

organophosphorus flame retardants, Ellasjøen, Arctic char

Project title

Uptake and trophic magnification of organophosphorus flame retardants in Arctic lake ecosystems.

Year

2015

Project leader

Anita Evenset

Participants

- Guttorm Christensen, Marianne Frantzen (Akvaplan-niva)
- Ingeborg Hallanger (UiT).
- Amanda Poste, Kine Bæk, Elisabeth Lie (NIVA).
- Eldbjørg Heimstad og Mikael Harju (NILU).
- Geir Wing Gabrielsen (NP).

Flagship

Hazardous Substances

Funding Source

No direct external funding, but fieldwork has been coordinated with the project "Is the cocktail effect of environmental contaminants a threat for Arctic fish populations?" Since fieldwork on Bjørnøya is very expensive this coordination made it possible to collect the samples for this project for a relatively low cost

Summary of Results

In September 2014 samples of sediment, chironomids, zooplankton and Arctic charr (different sizes and thereby different trophic levels; benthos feeders and cannibalistic individuals) were collected from Lake Ellasjøen and Lake Laksvatn on Bjørnøya. Thirty-five samples from Lake Ellasjøen, including sediment, zooplankton and fish (muscle and liver), have been analysed for Organophosphorus (OP) compounds (TEP, TCEP, TPrP, TCPP, TiBP, BdPhP, TPP, DBPhP, TnBP, TDCPP, TBEP, TCP, EHDP and TEHP) by NILU, Tromsø. In addition, an intercalibration between the laboratories of NIVA and NILU has been initiated. NIVA has worked on method development in 2014 and 2015, and have analysed 14 of the same samples that were analysed by NILU.

- Six compounds (TEP, TPP, TDCPP, TBEP, TCP and EHDP) were detected in sediment samples.
- Levels in zooplankton was comparable to levels in liver samples from fish, and the following compounds were detected: TCPP, TPP, TnBP, TDCPP, TBEP, TCP, EHDP.
- In muscle samples, 7 compounds were detected (TEP, TCEP, TCPP, TiBP, TPP, TnBP, TBEP, EHDP), but the levels were considerably lower than those that has been measured in fish from Lake Ellasjøen in a previous study (Hallanger et al. in prep).
- In liver samples, 8 different compounds were detected (TCPP, TiBP, TPP, TnBP, TDCPP, TDCPP, TBEP, EHDP). The dominant compound was TPP, followed by TBEP.
- There were quite substantial differences between the results from the two laboratories (NILU and NIVA) that were involved in the present study. The reason for these differences will be further explored the coming month.

For the Management

It is important for environmental managers to have information about environmental behavior of current used chemicals, such as OPFRs. If the chemicals are persistent, bioaccumulative and toxic they fulfill the criteria set by the Stockholm Convention for chemicals that should be phased out. The fact that we find OPFRs in sediment and organisms from a lake on Bjørnøya shows that these compounds are subject to long-range transport and that they bioaccumulate. This means that they have properties that makes them candidates for the Stockholm Convention. It is also important for environmental managers to be aware of potential challenges related to chemical analyses in order to make sure that reported results are interpreted correctly. The intercalibration between laboratories will therefore provide useful information for management.

Published Results/Planned Publications

One publications is under preparation:

Work title: Long-range transport of OPFRs to an Arctic lake.

One more is planned and the writing has just been initiated:

Work title article 2: Intercalibration of OPFR-analyses between two Norwegian laboratories.

Communicated Results

Data are being processed and will be included in future presentations, but no presentations has been made so far.

Interdisciplinary Cooperation

The project involves ecologists, chemists and ecotoxicologists. By combining knowledge from these three research disciplines we believe that we will be able to get a good overview of both chemical and biological processes that may cause bioaccumulation and biomagnification of OPFRs in Arctic food chains.

Budget in accordance to results

The funding from the Fram Centre was essential to perform this project. No other funding, except for partial funding for fieldwork, was available for the determination of OPFRs. Due to coordination with another project it was possible to carry out this project within a relatively limited budget.

Could results from the project be subject for any commercial utilization

No

Conclusions

- a. The results from the project are interesting and may lead to further studies on the behavior of OPFRs in Arctic food chains.
- b. Improved methods for OPFR-analyses have been developed at NILU and NIVA.