

Project information

Project title

Impact of climate sensitive life history traits on uptake and maternal transfer of pollutants in Arctic breeding geese

Year

2017

Project leader

Øystein Varpe

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

78.9N 11.9E

Participants

Øystein Varpe, Katrine Borgå, Tom Andersen, Daniel Hitchcock, Ingunn Tombre, Nicholas Warner, Dorte Herzke, Larry Griffin, Maarten Loonen.

Flagship

Hazardous Substances

Summary of Results

Barnacle goose eggs and vegetation collected along the barnacle goose's flyway have now been analysed for lipids, pollutants as well as stable isotopes of carbon and nitrogen. We were not able to separate eggs of geese utilising either capital (distant resources) or income breeding (local resources) strategies, but did find that all geese utilised resources from United Kingdom and northern Norway towards their egg production.

In addition to PCB data, NILU has also analysed all eggs and vegetation for HCBs. In vegetation, we did not detect PCBs, and HCBs were at very low levels. We did not observe a pollution gradient in vegetation from United Kingdom to Svalbard, possibly because samples needed to be pooled in large volumes to carry out pollutant analysis, reducing statistical power.

We detected PCBs and HCB in all eggs, but at low concentrations compared to other Arctic-breeding birds (e.g. marine). Variation in pollutant levels was high across all eggs, and we were not able to account for this variability using stable isotope data, hatch date or resighting of ringed individuals in northern Norway.

Mercury analysis is planned to take place within the next few weeks, both in eggs and vegetation.

Master and PhD-students involved in the project

The preparation of samples for chemical analysis, data interpretation and write up of results have been performed by the PhD student Daniel Hitchcock at the University of Oslo, with Katrine Borgå and Tom Andersen (UiO) and Øystein Varpe (UNIS) as advisers.

For the Management

The levels of PCBs and HCBs detected in the eggs of barnacle geese are quite low, especially when compared to bird species occupying higher trophic levels in the Arctic (e.g. marine birds such as gulls). These findings are not too surprising given the geese are herbivorous species and could suggest that developing chicks are less prone to negative health effects of POPs.

Published Results/Planned Publications

The results of this project are planned to be published in a manuscript titled "Effect of migration strategy on pollutant occurrence in eggs of Arctic breeding barnacle geese (*Branta leucopsis*)". The manuscript is in an advanced stage of preparation and is planned to be submitted to an ecology-oriented journal.

Poster presentations

- Hitchcock DJ, Loonen MJJE, Warner NA, Herzke D, Andersen T, Tombre IM, Shimmings P, Griffin LR, Varpe Ø and Borgå K. 2017. Migration effects on pollutants in eggs of Arctic-breeding geese. Svalbard Science Conference 2017.

Blog posts

- Hitchcock DJ. Clean-up counts. January 2017. Group page of Katrine Borgå.
- Hitchcock DJ. Colours of Svalbard. March 2017. Group page of Katrine Borgå.
- Hitchcock DJ. Left to dry. June 2017. Group page of Katrine Borgå.

Scientific publications

- Hitchcock DJ, Loonen MJJE, Warner NA, Herzke D, Andersen T, Tombre IM, Shimmings P, Griffin LR, Varpe Ø and Borgå K. In preparation. Effect of migration strategy on pollutant occurrence in eggs of Arctic breeding barnacle geese (*Branta leucopsis*).

Future communication

- Hitchcock DJ. GeesePOP project update. Toxicology seminar series at University of Oslo. December 2017.
- Hitchcock DJ, Borgå K, and Varpe Ø. Pollutants brought from afar in Arctic geese. Fram Forum 2018.
- Hitchcock DJ, Loonen MJJE, Warner NA, Herzke D, Andersen T, Tombre IM, Shimmings P, Griffin LR, Varpe Ø and Borgå K. Migration effects on pollutants in eggs of Arctic-breeding barnacle geese (*Branta leucopsis*). Platform presentation at Society of Environmental Toxicology and Chemistry (SETAC) 2018.

Interdisciplinary Cooperation

The project has combined expertise from ecologists (Øystein Varpe, Maarten Loonen and Larry Griffin), ecotoxicologists (Katrine Borgå and Daniel Hitchcock), environmental chemists (Nicholas Warner) and statisticians (Tom Andersen). The results from this study have been combined with resightings of ringed individuals in northern Norway (Ingunn Tombre, Paul Shimmings), which includes contribution from volunteer bird watchers.

Budget in accordance to results

The project has followed the revised budget with 150.000,- NOK allocated to NILU; 122.000,- NOK to UiO; and 28.000,- NOK to UNIS.

Could results from the project be subject for any commercial utilization

No

Conclusions

The analyses were performed successfully, and with exception of mercury analysis, all analyses have been completed. A manuscript for an international peer-reviewed journal is presently under preparation, in parallel with an outreach initiative for the Fram Forum. We hope to continue presenting the results from the project both in a Fram Centre context as well as internationally at conferences.

The findings from this study in combination with other projects (e.g. PFASs as funded by Svalbards miljøvernfond) have improved our understanding on pollution in Arctic terrestrial ecosystems. We also have a better overview of how migration influences pollutant accumulation and distribution, and such knowledge could be utilised in other future studies, for instance on climate effects on geese, or top-down effects such as polar bear predation on eggs.