

Project information

Keywords

Multiple stressors, seabirds, pollution, effects

Project title

Multi-stress relationships in seabird populations: interactions between natural stressors and environmental contaminants

Year

2018

Project leader

Jan Ove Bustnes

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

78°55'0"N, 11°56'0"E

Participants

Leader: Jan Ove Bustnes, NINA

Co-leader : Geir Wing Gabrielsen, NPI

Participant: Børge Moe, NINA

Participant: Bård Jørgen Bårdsen, NINA

Participant: Sveinn Are Hanssen, NINA

Participant: Dorte Herzke, NILU

Participant: Kjetil Sagerup, APN

Participant: Olivier Chastel, Chizé, France

Flagship

Hazardous Substances

Funding Source

FRAM

Summary of Results

**1. Summary of results, including 2-3 highlights from the project (max 1 A4 page, figures can be attached separately):**

**Highlights:**

1. Mercury levels are on the rise in breeding kittiwakes in Svalbard, but also modulated by diet and environmental factors.
2. Different fluorinated compounds (PFAS) show significant associations to telomere length in glaucous gulls from Kongsfjorden, Svalbard.

Seabirds are among the species most vulnerable to bio-magnifying environmental contaminants, and the main objective of this project is to document concentrations, distributions and effects of different environmental contaminants in northern seabird populations. Special focus is on how environmental contaminants may function in concert with other natural and anthropogenic stressors; i.e. a multi-stress perspective. The project is a continuation of the NFR projects COPOL and AVITOX (2014-2016). Presently, the Multistress project is coordinated with the COPE project (Integrated risk assessment framework for evaluating the combined impacts of multiple pressures on

arctic ecosystems) (2019-2023).

The project mainly studies different seabird species in Kongsfjorden, Svalbard. Prime species of interest are the common eider, the kittiwake, the glaucous gull, and skuas (great skua and arctic skua). These species represent different food chains (benthic, pelagic and scavenging). In 2020 new data have been collected on kittiwake, eiders and glaucous gulls and arctic skuas.

For kittiwakes, data have been collected in our study colony in Kongsfjord, for the 14'th year in a row. This has been done in cooperation with the group of Olivier Chastel, and in 2020 the cooperation has resulted in 2 published papers (Blevin et al. 2020, Sebastiano et al. 2020). These papers show that that organochlorines and PFAS might have contrasting effects on reproductive behavior in kittiwakes (Belvin et al. 2020), and that different PFAS congeners show different associations to telomere dynamics and demography in glaucous gull (Sebastiano et al. 2020). In addition, one paper has been written about the factors influencing Hg levels in the blood of breeding kittiwakes in Kongsfjorden (Tartu et al. in revision). The results shows that Hg is increasing in recent years, and that both diet and environmental factors such as sea ice distribution are affecting this increase. In 2020, Olivier Chastel's group has continued research on kittiwakes in Kongsfjorden, focusing on potential effects of POPs.

For common eiders, data collection has continued in the colonies in Kongsfjorden with special emphasis on collecting blood samples. However, nest predation from polar bears have caused great problems for research on this species in the recent years, including 2020.

Field work was carried out on Glaucous gulls, and a long-term data series has been established (2008-2020). These data includes reproductive variables, GLS loggers and POP analyses from blood samples.

Arctic skuas (N=127) have been equipped with GLS loggers that reveal their wintering grounds, and in the POPs have been measured in blood samples from these birds breeding season. A cooperation has been established with UiO (Katrine Borgå) and analyses of the data has been completed. The results show that arctic skuas from the European Arctic disperse over a very wide area, from the Mediterranean through the Tropics to southern Ocean (Fig. 1), and that their winter area is the most important explanatory factor for the composition of POPs in skuas in the breeding season, and that birds wintering in remote areas have higher concentrations of POPs with high transport potential, notably HCB, compared to those wintering in more populated regions, such as the Mediterranean (Hanssen et al. in prep).

For the Management

This project shows that pollutants may have great effects if combined with other stressors. Hence, the effects of given concentrations of POPs may be different depending on other factors. This is important to keep in mind when establishing safe levels of contaminants.

Published Results/Planned Publications

## Publications supported by the Multi-stress project in 2020:

Blévin, P., Shaffer, S.A., Bustamante, P., Angelier, F., Picard, B., Herzke, D., Moe, B., Gabrielsen, G.W., Bustnes, J.O., Chastel, O. 2020. Contaminants, prolactin and parental care in an Arctic seabird: Contrasted associations of perfluoroalkyl substances and organochlorine compounds with egg-turning behavior. *General and Comparative Endocrinology* 113420.

Sebastiano, M., Angelier, F., Blévin<sup>a</sup>, P., Ribout, C., Sagerup, K., Descamps, S. Herzke, D., Barbraud, C., Bustnes, J.O., Gabrielsen, G.W. & Chastel, O. Exposure to PFAS is associated with telomere dynamics and demographic responses of an arctic top predator. *Environmental Science & Technology* 54: 10217-20226.

Megan M. Lee, Veerle L.B. Jaspers, Geir W. Gabrielsen, Bjørn M. Jenssen, Thomas M. Ciesielski, Åse-Karen Mortensen, Svein Strand Lundgren & Courtney A. Waugh (2020). Evidence of avian influenza virus in seabirds breeding on a Norwegian high-Arctic archipelago. *BMC Veterinary Research* 16:48

### In press

Tartu, S., Blevin, P., Bustnamante, P., Angelier, F., Bech, C., Bustnes, J.O., Gabrielsen, G.W., Guotte, A., Moe, B., Sauser, C., Sire, J., Barbraud, C. & Chastel, O. Less mercury and larger size over 17 years: does retreating sea ice benefit Svalbard kittiwakes? *Global Change Biology*

### Submitted

Midthaug, H.K., Hitchcock, D., Bustnes, J.O., Polder, A., Descamps, S., Tarroux, A., Soininen, E.M., Mabile, G. & Borgå, K. Within and between breeding season changes in contaminant occurrence and body condition in the Antarctic breeding South polar skua.

## Communicated Results

The following results related to Multistress have been communicated in 2020.

<https://www.npolar.no/nyhet/rovdyr-plyndrer-fugleholmene-i-kongsfjorden/>

<https://www.npolar.no/nyhet/overvakingen-av-sjofugler-i-kongsfjorden/>

<https://www.npolar.no/nyhet/polarmaker-en-miljogiftvarsler/>

<https://www.facebook.com/NILUNorskinstittuttforsknings/posts/3184900458215961>

<https://framsenteret.no/forum/2020/how-to-cope-contaminant-climate-change-interactions-in-the-arctic/>

How to COPE? Contaminant-climate change interactions in the Arctic.

Krogseth, Ingjerd Sunde

AMINOR lunch seminar, Tromsø, 30.04.2020–30.04.2020

Populærvitenskapelig kapittel/artikkel

COPE: Undersøker kombinerte effekter av miljøgifter og klimaendringer på arktiske økosystemer

Krogseth, Ingjerd Sunde

Årsrapport 2019, 2019

Kategori: Rapport/avhandling, Rapport

Utgiver: NILU, Kjeller

Side: 8–9

ISBN: 978-82-425-2971-8

Interdisciplinary Cooperation

Ecology, physiology, chemistry

Budget in accordance to results

Yes

Could results from the project be subject for any commercial utilization

No

Conclusions

Understanding variation and impacts of POPs in the vulnerable ecosystems of the north is a long-term endeavor. In this respect this project is important because it allows us to have a long horizon on our research. The project is now starting to generate new results, both with regard to trends and effects of POPs that is novel to ecotoxicology.