

## Project information

### Keywords

migration seabirds habitat use

### Project title

Seabird habitat use and migration strategies

### Year

2018

### Project leader

B Moe

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

78.9°N and 12,22°E; 69,6°N and 18,02°E; 69,6°N and 18,85°E; 68,2°N and 69,1°E

### Participants

Project participants in the Fram Centre and/or in Kongsfjorden:

NINA: Sveinn Are Hanssen, Akvaplan-NIVA: Kjetil Sagerup, UIT: Dorothee Ehrich

Norwegian Polar Institute: Geir Gabrielsen, Sebastien Descamps (NPI), NTNU: Claus Bech, CNRS ( France): Olivier Chastel

Core partners in the skua networks: Univ Wageningen/IMARES, Netherlands: Rob van Bemmelen

Univ Bourgogne, France: Olivier Gilg

Many national and international collaborators in the research networks on the study species, including researchers from Russia, Denmark, Finland, Faroe Island, UK, Iceland, Germany, Spain, USA.

### Flagship

Fjord and Coast

### Funding Source

FRAM CENTRE (350k)

NINA (105k)

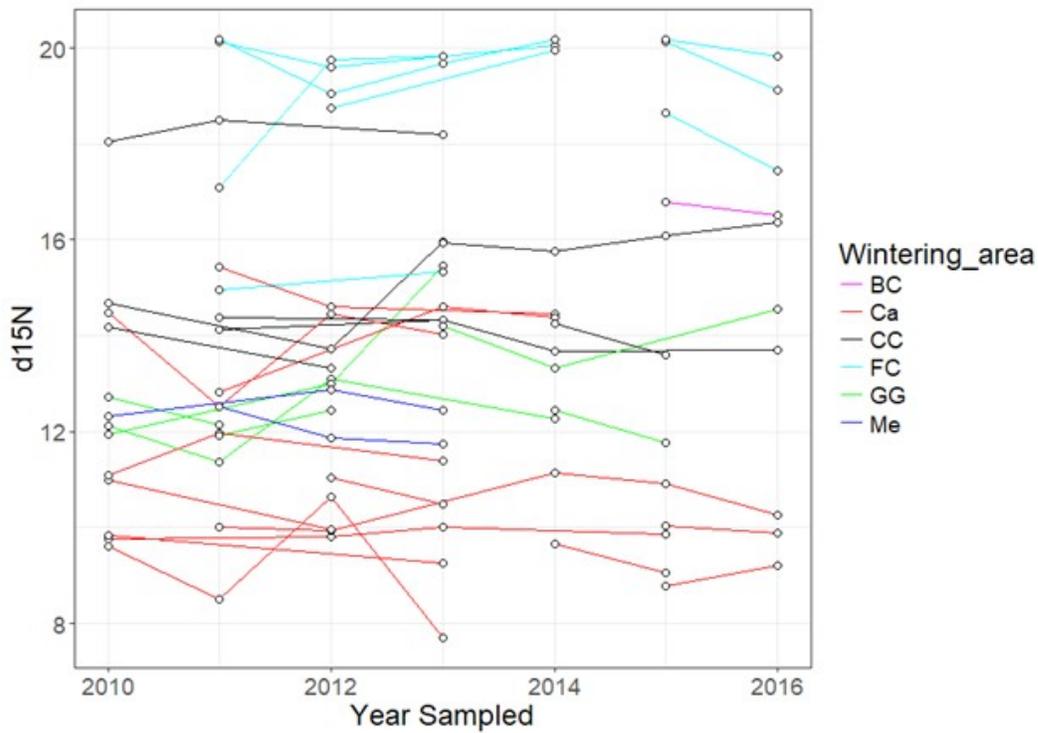
SEATRACK (118k)

Kartverket (50k)

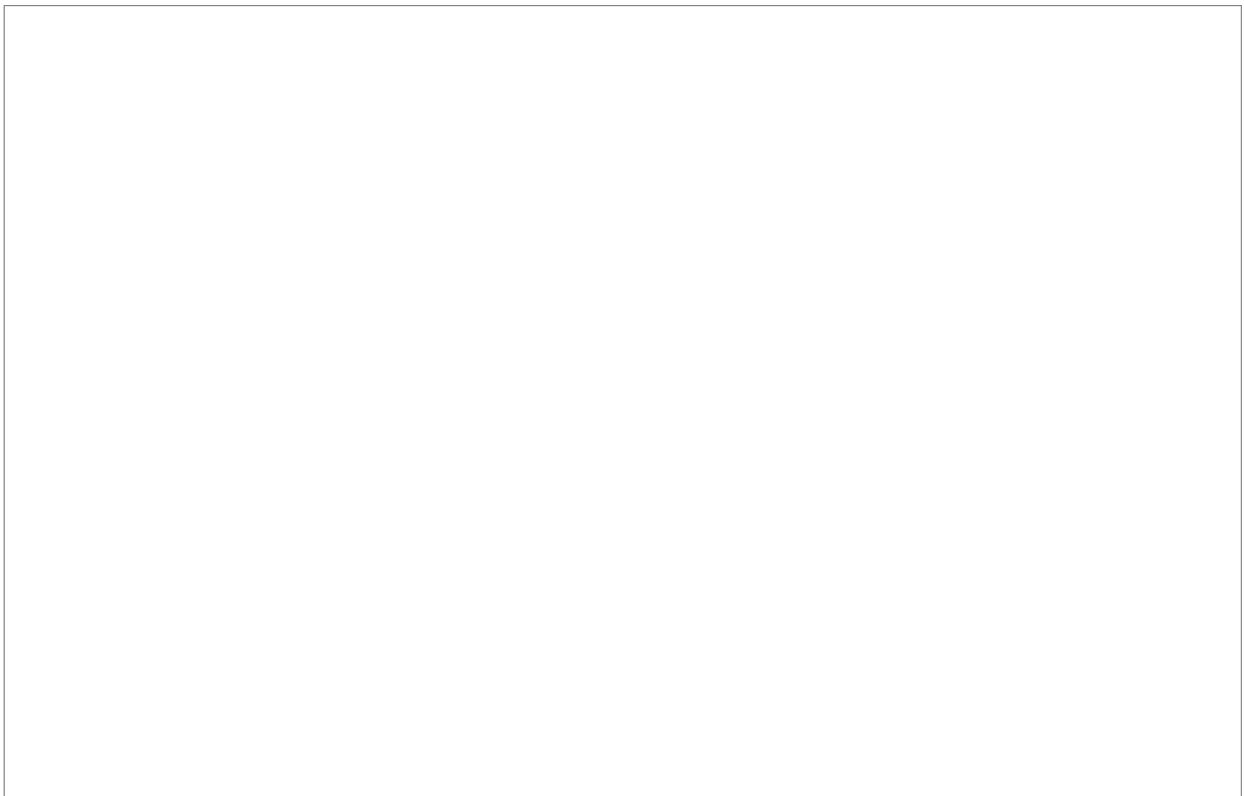
## Summary of Results

This project has provided important new knowledge about habitat use and migration strategies of arctic seabirds, with relevance for conservation management. The project is focused on the fieldwork we do in Kongsfjorden and in Troms, along with support to field work in Yamal, and we take part in large-scale research networks to ensure multi-colony tracking at many Arctic and sub-Arctic locations. One highlight is the scientific output, including three published papers, one manuscript in revision, two MSc thesis, one MSc internship and communication of results at meetings, education and media.

The manuscript in revision (Guéry et al 2018, MEPS) suggest that migration strategy and wintering location of common eiders may influence their exposure to storms and cyclones which in turn may affect their annual adult survival. The paper published by Keogan et al (2018, Nature Climate Change) was a large-scale analysis of seabird phenology demonstrating global phenological insensitivity to shifting ocean temperatures among seabirds. The MSc thesis of Emily Hill demonstrated that migration strategy and wintering location partly explained element concentrations of common eider eggs and mainly determined by breeding location. This is in line with recent findings that the common eider is a partly capital breeder and acquire most of the nutrients required for producing the eggs at the breeding grounds. The MSc thesis of Eline Rypdal demonstrates high repeatability of isotopic signatures in arctic skuas feathers across years. This repeatability was linked to consistent individual migration strategies and individual specialization in this long-distance migratory seabird.



**Fig 1.** Feather d15N values of individual arctic skuas sampled across several year, demonstrating strong repeatability linked to migration strategy. See fig 2 for explanation of wintering area.



**Fig 2.** Tracks of Arctic skuas from Kongsfjorden, Troms and Finnmark (left). Examples of consistent migration strategies across years, demonstrated with examples of winter centroids for individuals with tracking data for more than two years. Unique numbers or letters are separate individuals. Boxes are distinct wintering area regions (CA Canary Current, FC Falkland Current, ME Mediterranean Ocean, CC Canary Current, GG Gulf of Guinea, BC Benguela Current).

Another highlight is the fieldwork, which has been successful. For example, for the first time we have obtained tracks of great skuas from Kongsfjorden. The other species continued to provide tracks, thus, improving the time series from Kongsfjorden and Troms. Another new aspect was a pilot project- with the first deployment ever done on European storm petrels on the Norwegian coast. In Yamal they succeeded in recapture and obtain tracks from both long-tailed skua and arctic skua. This project supplied the loggers and equipment for the field team in Yamal.

#### Master and PhD-students involved in the project

##### Phd:

Rob van Bemmelen (defence 2019)

Pierre Blevin (mainly ecotox, defended autumn 2018, CNRS, Univ La Rochelle)

Don Jean Léandri-Breton (started autumn 2018m McGill Univ)

##### MSc:

Eline Rypdahl (final exam and thesis defended spring 2018)

Emily Hill (final exam and thesis defended 2018)

Melissa Fontenille (internship in 2018)

Ingvild Eldøy (final exam and defense in 2019)

Hilde Dørum (final exam and defense in 2019)

#### For the Management

The main message for the management is that Arctic seabirds depend on healthy oceans and coasts on local to global scales. This calls for national and international management of our seas. Applied output from this project. Results/data has been part of an international process with proposal for a new marine protected area (MPA) in the northeast Atlantic Ocean. Proposal led by an NGO (Birdlife International) to OSPAR which focuses on MPAs in areas beyond national jurisdiction (ABNJ). Nominated site: North Atlantic Current and Evlanov Seamount MPA. Results are also part of the large scale tracking program SEATRACK. Results have been applied by the petroleum industry/consultancies to perform risk assessments and environmental impact assessments (EIA), e.g. for Equinor and Hywind offshore windfarm in the North Sea

#### Published Results/Planned Publications

Keogan, K., F. Daunt, S. Wanless, Daunt, RA. Phillips, CA Walling, P. Agnew, DG. Ainley, T. Anker-Nilssen, G Ballard, RT. Barrett, KJ. Barton, C. Bech, P. Becker, P-A. Berglund, L. Bollache, AL. Bond, S. Bouwhuis, RW. Bradley, Z. Burr, K. Camphuysen, P. Catry, A. Chiaradia, S. Christensen-Dalsgaard, R. Cuthbert, N. Dehnhard, S. Descamps, T. Diamond, G. Divoky, H. Drummond, KM. Dugger, MJ. Dunn, L. Emmerson, KE. Erikstad, J. Fort, W. Fraser, M. Genovart, O. Gilg, J. González-Solís, JP. Granadeiro, D. Grémillet, J. Hansen, SA. Hanssen, M. Harris, A. Hedd, J. Hinke, JM. Igual, J. Jahncke, I. Jones, PJ. Kappes, J. Lang, M. Langset, A. Lescroël, S-H. Lorentsen, P.O'B. Lyver, M. Mallory, B. Moe, W.A. Montevecchi, D. Monticelli, C. Mostello, M. Newell, L. Nicholson, I. Nisbet, O. Olsson, D. Oro, V. Pattison, M. Poisbleau, T. Pyk, F. Quintana, JA. Ramos, R. Ramos, TK. Reiertsen, C. Rodriguez, P. Ryan, A. Sanz-Aguilar, NM. Schmidt, P. Shannon, B. Sittler, C. Southwell, C. Surman, WS. Svagelj, W. Trivelpiece, P. Warzybok, Y. Watanuki, H. Weimerskirch, PR. Wilson, AG. Wood, AB. Phillimore & S. Lewis,. (2018) Global phenological insensitivity to shifting ocean temperatures among seabirds. *Nature Climate Change* 8 (4): 313

Guéry, L., S. Descamps, K. I. Hodges, R. Pradel, B. Moe, S. A. Hanssen, K. E. Erikstad, G.W. Gabrielsen, H. G. Gilchrist, S. Jenouvrier and J. Bêty (2018) Winter extra-tropical cyclones influence seabird survival: variation between and within common eider populations (*Marine Ecology Progress Series*, in revision)

Costantini, D., P. Blévin, D. Herzke, B. Moe, G.W. Gabrielsen, J.O. Bustnes & O. Chastel (2019) Higher plasma oxidative damage and lower plasma antioxidant defences in an Arctic seabird exposed to longer perfluoroalkyl acids. *Environmental Research* 168: 278-285

Blévin, P. S.A Shaffer, P. Bustamante, F. Angelier, B. Picard, D. Herzke, B. Moe, G.W. Gabrielsen, J.O. Bustnes & O. Chastel (2018) Organochlorines, perfluoroalkyl substances, mercury and egg incubation temperature in an Arctic seabird: insight from data loggers. *Environmental Toxicology and Chemistry*. 37: 2881-289

Hill, E. (2018). Exposure of the Common Eider (*Somateria mollissima*) to toxic elements in relation to migration strategy and wintering area. MSc thesis. IBI, NTNU, Trondheim.

Rypdal, E. (2018). Repeatability in isotopic signatures is linked to consistent individual migration strategies and individual specialization in a long-distance migratory seabird. MSc thesis. IBI, NTNU, Trondheim

## Communicated Results

### National and international symposium/meetings

Hill, E, 2018. Exposure of the Common Eider (*Somateria mollissima*) to toxic elements in relation to migration strategy and wintering area. Norwegian Environmental Toxicology Symposium; 2018-03-14 - 2018-03-16

Moe, B, 2018. Kittiwakes and sea ice. SENSEI meeting; Chize, France, 2018-09-17 - 2018-09-18

Moe, B. & Reiertsen, T. 2018. Sjøfugler. Dialogmøte, Framsenteret Tromsø; 2018-10-16 - 2018-10-17

### Education:

Lectures at UNIS by GW Gabrielsen (AB-201, AB-202, AB-203)

Lectures at UIT by GW Gabrielsen (Bio 3003)

### Media:

Moe, B. Skotsk adelsmann vil bevare sjøfuglene. Dagens Næringsliv [Avis] 2018-07-21

## Interdisciplinary Cooperation

The project has benefitted from cooperation between researchers from different disciplines. The listed papers mainly belong to the following disciplines: migration, ecology, climate change biology and ecotoxicology.

## Budget in accordance to results

We applied for 446k from the Fram Centre and we were granted 300K with an additional 50K in September 2018 . We aimed at submitting two-five new manuscripts for publication in 2018. The numbers of papers published is in accordance with that goal but we still would have liked to submit one or two more papers from the core of this project. The financial cut partly explain this, meaning less hours devoted to writing. We have some manuscripts that are relatively close to being submitted. Hence, there is a very strong basis for further publication of results.

The total 350k funding from the Fram Centre played an important role for financing fieldwork, equipment, tracking analyses and for writing papers, and has thus given us the opportunity to take an active role in the large-scale network of collaborators. The project also benefitted from external funding (Seatrack, Kartverket) as well as a use of own research hours (NINA egenforskning). The Fram Centre funding has been crucial for obtaining these external funds. This project is linked to huge research networks, involving many researchers and costly field work and analytical work. Its large-scale success has depended on external funding for the field activities of project partners (e.g. extensive field operations in Russia, Greenland, Sweden, Faroes, Iceland and other Norwegian colonies).

Most of the 350k has been allocated to our fieldwork in Kongsfjorden (Svalbard) and Brensholmen (Troms), equipment and tracking analyses, and resources available for writing papers. The funding of this project has been important for our role in the papers, and especially Guery et al 2018. Furthermore, the funding has also been crucial for the two MSc theses completed this year. For the other papers the main funding has come from other sources, but they are relevant for the project.

Money allocated to Fram Centre partners within the project:

60k was allocated to NPI and costs at the Sverdrup Station in Ny-Ålesund.

23.5k was allocated to Sagerup/Akvaplan NIVA for field work contribution in Ny-Ålesund, and approximately 15k was allocated to cost/equipment for Ehrlich (UIT) for field work in Yamal

Could results from the project be subject for any commercial utilization

No

If Yes

No, but the results may have major implications for management and industry (e.g. oil industry, fisheries, shipping)

Conclusions

The project has established a strong basis for further work. We have a long-term perspective and will further develop the project to focus on climate effects on migratory strategies and habitat use in arctic seabirds, along with consequences of exposure to contaminants. The project has provided a unique basis for assessing inter-annual as well as inter- and intra-individual variation habitat use, since we now have obtained several years of data from the same individuals and population, in a wide collaborative network. This project is now also linked to SEATRACK (funding from the Ministry of Climate and Environment (KLD), Ministry of Foreign Affairs (UD) and the oil industry (NOROG), a large-scale tracking program of seabirds in Norway, Russia, UK, the Faroes and Iceland.

The development of small-sized electronic tags has been a prerequisite for the project. However, there is a constant need for further decreasing the size, increasing the battery life and increasing the precision of the electronic tracking tags