

## Project information

### Keywords

Adaptive monitoring, food webs, climate impacts

### Project title

Climate-ecological Observatory for Arctic Tundra

### Year

2017

### Project leader

Rolf A. Ims

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

Svalbard; 74-81oN, 15-30oE, Varanger Peninsula; 70-71oE, 28-31oE

### Participants

UiT, NP, NINA, MET, UNIS

### Flagship

Terrestrial

### Funding Source

Terrestrial flagship: 0,440 mill

UiT: 1,7 mill

MilDir: 2,0 mill

## Summary of Results

COAT is a strategic activity within the terrestrial flagship that aims to develop and run an ecosystem-based adaptive monitoring system for arctic tundra in Svalbard and the Norwegian mainland.

The financial support from the Fram Centre has allowed us to maintain several monitoring series in Svalbard and the Varanger Peninsula as well as to develop new monitoring tools.

Beyond the standard maintenance of the monitoring series, the following other achievements have been made in 2017:

- Acoustic sensors (sound stations) to monitor populations of willow and rock ptarmigan have been tested on Varanger Peninsula and Svalbard. At the latter site the sensor data can be calibrated against point transect data. The sensors functioned appropriately, i.e. they recorded ptarmigan calls (as well as other vocal arctic bird species) with good quality. The large amounts of raw data acquired require automated processing to identify species, and hopefully also unique ptarmigan individuals. The development of algorithms and software to achieve this is underway in the COAT Tools project in collaboration with UiT computer scientists.
- Surveys made to identify new sites for small mammal camera traps in Varanger Peninsula.
- The COAT arctic fox module has initiated artificial feeding in collaboration with NINA's arctic fox conservation program. Two feeding stations have been deployed at the Varanger

Peninsula.

New published studies from the COAT team:

- A review and opinion paper on ecosystem-based monitoring targeted to assess climate change impacts with new technologies (Ims & Yoccoz 2017) ; the importance of models in guiding monitoring activities is stressed. New technologies and big data are also very useful advancements, but are not by themselves a panacea.
- A study reporting trials of satellite telemetry to unravel the winter ecology of Svalbard ptarmigan; although the instruments used gave some new information about winter movements they need to be improved to function better (Fuglei et al. 2017).
- A review and opinion paper on impact of climate change on ptarmigan populations (Henden et al. 2017); It is advocated that a food web approach is needed to elucidate the role of climate change on the observed population declines.
- A paper synthesizing the results of the COAT Varanger Arctic fox module so far (Ims et al. 2017); increasing red fox populations (due to more anthropogenic food subsidies) and more (irregular lemming cycles) due to warmer winter climate are the key drivers of the population decline of the arctic fox on Varanger Peninsula. The population is presently on the edge of regional extinction.
- A paper analyzing the disturbance effect of tourist snow mobile traffic on arctic fox resource use on Svalbard (Fuglei et al. 2017); disturbed foxes shifts to more nocturnal activity.
- Members of the COAT Arctic fox modules have contributed to a paper that aims to harmonize arctic fox monitoring at a circumpolar scale (Berteaux et al. 2017).
- Members of the COAT Arctic fox modules have contributed to a paper that reviews the current evidence for increased competition for red fox and arctic fox (Elmhagen et al. 2017); the abundance of the red fox is increasing in arctic due to the combined effect of climate warming and anthropogenic subsidies, which increases the competition effect on the arctic fox.
- Members of the COAT tall shrub and ungulate modules have published a paper on reindeer impact on distribution of tall shrubs (Bråthen et al. 2017): At densities of >5 reindeer per square kilometers reindeer are able to halt the expansion of tall shrubs in tundra even under considerable warming.
- Members of the COAT Goose contributed to several papers of a species issue of AMBIO on goose management (<http://link.springer.com/journal/13280/46/2/suppl/page/1>)
- A review paper on the impact of changing snow condition on arctic wildlife (Berteaux et al. 2017).

Master and PhD-students involved in the project

PhD student Malin Ek; The forest-ecotone module

For the Management

Members of the COAT tall shrub and ungulate modules have published a paper on reindeer impact on distribution of tall shrubs (Bråthen et al. 2017): At densities of >5 reindeer per square kilometers

reindeer are able to halt the expansion of tall shrubs in tundra even under considerable warming.

New monitoring methods are developed for harvested ptarmigan populations.

Members of the COAT Goose contributed to several papers of a species issue of AMBIO on goose management (<http://link.springer.com/journal/13280/46/2/suppl/page/1>)

Disturbance effect of tourist snow mobile traffic cause arctic fox to shift to more nocturnal activity (Fuglei et al. 2017).

#### Published Results/Planned Publications

Berteaux D., Thierry A.-M., Alisauskas R., Angerbjörn A., Buchel E., Ehrich D., Eide N.E., Flagstad Ø., Fuglei E., Gilg O., Goltsman M., Henttonen H., Ims R.A., Killengreen S.T., Kondratyev A., Kruckenberg H., Kulikova O., Landa A., Lang J., Menyushina I., Mikhnevich J., Norén K., Ollila T., Ovsyanikov N., Pokrovskaya L., Pokrovsky I., Rodnikova A., Roth J., Sabard B., Samelius G., Schmidt N.M., Sittler B., Sokolov A.A, Sokolova N.A., Stickney A., Unnsteinsdóttir E.R. & White P. 2017. Harmonizing circumpolar monitoring of Arctic fox: benefits, opportunities, challenges, recommendations. *Polar Research* 36: DOI:10.1080/17518369.2017.1319602

Berteaux, D., Gauthier, G., Dominé, F., Ims, R.A., Lamoureux, F.F., Esther, L. & Yoccoz, N.G. 2016. Effects of changing permafrost and snow conditions on tundra wildlife: critical places and times. *Arctic Science* 3: 65-90.

Bråthen, K.A., Ravolainen, V., Stien, A., Tveraa, T. & Ims, R.A. 2017. Rangifer management controls a climate-sensitive tundra state transition. *Ecological Applications* (in press)

Elmhagen, B., Berteaux, D., Burgess, R.M., Ehrich, D., Gallant, D., Henttonen, H., Ims, R.A., Killengreen, S.T., Niemimaa, J., Norén, K., Ollila, T., Rodnikova, A., Sokolov, A.A., Sokolova, N.A., Stickney, A.A. & Angerbjörn, A. 2017. Homage to Hersteinsson & Macdonald: Climate warming and resource subsidies cause red fox range expansion and arctic fox decline. *Polar Research* 36: DOI:10.1080/17518369.2017.1319109

Fuglei, E., Blanchet, M.A., Unander, S., Ims, R.A. & Pedersen, Å.Ø. 2017. Hidden in the darkness of the Polar night: A first glimpse into winter migration of the Svalbard rock ptarmigan. *Wildl. Biol.* <https://doi.org/10.2981/wlb.00241>.

Fuglei, E., Ehrich, D., Killengreen, S.T., Rodnikova, A.Y., Sokolov, A.A. & Pedersen,

Å.Ø. 2017. Snow mobile impact on diurnal behavior in the Arctic fox. Polar Research <http://DOI:10.1080/17518369.2017.1327300>

Henden, J.A., Ims, R.A., Fuglei, E. & Pedersen, Å.Ø. 2017. Changed Arctic-alpine food web interactions under rapid climate warming: Implication for Ptarmigan Research. Wildl. Biol. <https://doi.org/10.2981/wlb.00240>.

Ims, R.A., Killengreen, S.T., Ehrich, D., Flagstad, Ø., Hamel, S., Henden, J.-A., Jensvoll, I. & Yoccoz, N.G. 2017. Ecosystem drivers of an arctic fox population at the western fringe of the Eurasian Arctic. Polar Research 36: <http://DOI:10.1080/17518369.2017.1323621>

Le Moullec, M., Pedersen, Å.Ø.P., Yoccoz, N.G., Aanes, R., Tufto, J & Hansen B.B. 2017. Ungulate population monitoring in an open tundra landscape: distance sampling versus total counts. Wildlife Biology (2017):wlb.00299. <https://doi.org/10.2981/wlb.00299>

Soininen, E. M., Zinger, L., Gielly, L., Yoccoz, N. G., Henden, J. A., & Ims, R. A. 2017. Not only mosses: lemming winter diets as described by DNA metabarcoding. Polar Biology, 1-7.

#### Communicated Results

Foredrag ved R. A. Ims Tromsø museum 3 mars: «Hva skjer med de arktiske rovdyrene i et varmere klima».

Oral presentation R.A. Ims «International Arctic fox conference», Quebec, 13 October: “On the edge: The Arctic fox in the Fennoscandian Arctic”.

Oral presentation E. Fuglei «International Arctic fox conference», Quebec, 14 October: “Impact of harvesting and genetic structure of the Svalbard arctic fox populations”.

Intervju med R.A. Ims på NRK dagsrevyen, 30 august, om klimaendringer på skog og reindrift”.

Intervju med J.A. Henden i ITromsø og artikkel i forskning.no, 17. juli, om rypeovervåkning med akustiske sensorer.

Artikkel ved Åshild Pedersen i Svalbardposten 11. august. «Jegerne bidrar til overvåking av reinsdyr».

Nyhetsnotis i forskning.no 19. September, «Værstasjoner leverer klimadata fra dyrelivet på Svalbard»

Budget in accordance to results

The funding from the Fram Centre was used according to plans; i.e. to run the long-term observation series in Varanger and Svalbard and to test new census methods.

Could results from the project be subject for any commercial utilization

No

If Yes

No

Conclusions

The aims of the project was fulfilled and the funding obtained from the Fram Centre's terrestrial flagship has contributed significantly to the development/maintenance of the COAT program.