Project information

Keywords
Adaptive monitoring, food webs, climate impacts
Project title
Climate-ecological Observatory for Arctic Tundra
Year
2019
Project leader
Rolf A. Ims, UIT
Geographical localization of the research project in decimal degrees (max 5 per project, ex. 70,662°N and 23,707°E)
74-81oN, 15-30oE, Varanger Peninsula; 70-71oE, 28-31oE
Participants

UiT, NP, NINA, MET, UNIS, Aarhus Univ,

Flagship
Terrestrial
Funding Source

Internal founding (own institutions):

UiT: 3.5 mill

NP: 1.1 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 strategic funding support from the Fram Centre allows us to maintain core monitoring series in Svalbard and the Varanger Peninsula as well as to develop new monitoring tools.

The COAT monitoring series have contributed to 21 publication in 2019. Highlights include original research papers in *Nature Climate Change*, *Nature Communication* and *Global Change Biology* that have documented impacts of current climate change on COAT monitoring targets like ground nesting birds, Svalbard reindeer and high-arctic geese. These papers have led to popular news stories both on the web sites of COAT (COAT.no), the Fram Centre and Forskning.no (see "Communicated results" below). To be mentioned is also that COAT researchers have contributed with data and analyses to pan-arctic assessment, some of which has been led by COAT module leaders.

Beyond the standard maintenance of the monitoring series in COAT's food web modules (4 on Svalbard and 6 in Finnmark), other achievements on the field sites in 2019 includes:

- In collaboration with Department of Computer Science at UiT we have deployed 12 sensors that log subnivean concentrations of CO2 at sites on Varanger Peninsula where habitat occupancy of lemmings and other small rodent species are recorded year-round. High CO2 consentration under wet or icy snow may be harmful for the health of small mammals.

- We performed a new season with trials of acoustic sensors (sound stations) to monitor populations of ptarmigan on Varanger Peninsula and Svalbard. On Svalbard this was expanded to include new sites on Brøggerhalvøya. In Adventdalen and Sassendalen the senor data can be calibrated against point transect data.

- A pilot study within COAT's ptarmigan module was continued in 2019 that aimed to test whether motion sensitive cameras could aid the identification of nest predators was conducted on Varanger Peninsula.

- Camera traps for documenting spread of the invasive population of the sibling vole were established in the Isfjorden area in Svalbard.

Screening of a sample of voles samled by means of a sitizen science project in Longyearbyen was made to investigate the prevalence of the zoonotic tape worm *Echinococcus multilocularis*. No parasites were fortunately not found in the sample.

Master and PhD-students involved in the project

PhD-students

Jørgen Agersborg, UiT, NINA

Malin Ek, UiT, NINA

Eivind Kleiven, UiT

Marita Anti Strømeng, UiT

Isabel Eicheid, UiT, NP, Univ. Aarhus

Mike Murphy, UiT

Ingrid Jensvoll, UiT

Filippo Marolla, UiT, NP, NINA

Pedro Nicolau, UiT

Matteo Petit Bon, UiT

Mari Tuomi, Univ. i Turku

Master students

Jonas Mölle, Kiel Univ, UiT

Anne Meløe, UiT

Ellen Dymit, UiT

Shannon Moore, UiT

Pernille Stordalen Rønning, NMBU

Asbjørn Karbø, NMBU

Bachelor thesis students

Hugo Moro, UiT

Berit Gaski, UiT

For the Management

COAT monitoring data are much used in analyses concerning the effect of management actions, as well for identifying the drivers behind trends in terrestrial arctic biodiversity and ecosystem functions that are of concern to regional and national management. In 2019 , the COAT team has analyzed COAT time series data from Svalbard and Varanger in context of developing and testing a new protocol for assessing the state of high and low-arctic ecosystems in Norway's sector of the terrestrial arctic. This work, which has been commissioned by the Norwegian Environment Agency, is published in:

Jepsen, J.U., Arneberg, P., Ims, R.A., Siwertson, A. & Yoccoz, N.G. 2019. Test av fagsystem for økologisk tilstand. Erfaringer for arktisk tundra og arktisk del av Barentshavet. NINA Rapport 1674, pp. 94.

Published Results/Planned Publications

Published in 2019 (peer reviewed)

Peeters, Bart; Pedersen, Åshild Ønvik; Loe, Leif Egil; Isaksen, Ketil; Veiberg, Vebjørn; Stien, Audun; Kohler, Jack; Gallet, Jean-Charles; Aanes, Ronny; Hansen, Brage Bremset. Spatiotemporal patterns of rain-on-snow and basal ice in high Arctic Svalbard: detection of a climate-cryosphere regime shift. *Environmental Research Letters* 2019 ;Volum 14.

Ancin Murguzur, Francisco Javier; Munoz, Lorena; Monz, Christopher; Hausner, Vera Helene. Drones as a tool to monitor human impacts and vegetation changes in parks and protected areas. *Remote Sensing in Ecology and Conservation* 2019

Balboni, Andrea; Tryland, Morten; Mørk, Torill; Killengreen, Siw Turid; Fuglei, Eva; Battilani, Mara. Unique genetic features of canine adenovirus type 1 (CAdV-1) infecting red foxes (Vulpes vulpes) in northern Norway and arctic foxes (Vulpes lagopus) in Svalbard. *Veterinary research communications* 2019 ;Volum 43.(2) s. 67-76

Bjorkman, Anne D.; Criado, Mariana Garcia; Myers-Smith, Isla H.; Ravolainen, Virve; Jónsdóttir, Ingibjörg Svala; Westergaard, Kristine Bakke; Lawler, James P.; Aronsson, Mora; Bennett, Bruce; Gardfjell, Hans; Heiðmarsson, Starri; Stewart, Laerke; Normand, Signe. Status and trends in Arctic vegetation: Evidence from experimental warming and long-term monitoring. *Ambio* 2019

Ehrich, Dorothee; Schmidt, Niels M.; Gauthier, Gilles; Alisauskas, Ray; Angerbjörn, Anders; Clark, Karin; Ecke, Frauke; Eide, Nina Elisabeth; Framstad, Erik; Frandsen, Jay; Franke, Alastair; Gilg, Olivier; Giroux, Marie-Andrée; Henttonen, Heikki; Hörnfeldt, Birger; Ims, Rolf Anker; Kataev, Gennadiy D.; Kharitonov, Sergey P.; Killengreen, Siw Turid; Krebs, Charles J.; Lanctot, Richard B.; Lecomte, Nicolas; Menyushina, Irina; Morris, Douglas W.; Morrisson, Guy; Oksanen, Lauri; Oksanen, Tarja Maarit; Olofsson, Johan; Pokrovsky, Ivan G.; Popov, Igor Yu.; Reid, Don; Roth, James D.; Saalfeld, Sarah T.; Samelius, Gustaf; Sittler, Benoit; Sleptsov, Sergey M.; Smith, Paul; Sokolov, Aleksandr A.; Sokolova, Natalya A.; Soloviev, Mikhail Y.; Solovyeva, Diana. Documenting lemming population change in the Arctic: Can we detect trends?. *Ambio* 2019 s. 1-15

Fuglei, Eva; Henden, John-André; Callahan, Chris T.; Gilg, Olivier; Hansen, Jannik; Ims, Rolf Anker; Isaev, Arkady P.; Lang, Johannes; McIntyre, Carol L.; Merizon, Richard A.; Mineev, Oleg Y.; Mineev, Yuri N.; Mossop, Dave; Nielsen, Olafur K.; Nilsen, Erlend Birkeland; Pedersen, Åshild Ønvik; Schmidt, Niels Martin; Sittler, Benoit; Willebrand, Maria Hörnell; Martin, Kathy. Circumpolar status of Arctic ptarmigan: Population dynamics and trends. *Ambio* 2019 s. 1-13

Fuglei, Eva; Tarroux, Arnaud; Tarroux, Arnaud. Arctic fox dispersal from Svalbard to Canada: one female's long run across sea ice. *Polar Research* 2019

;Volum 38.

Hansen, Brage Bremset; Gamelon, Marlène; Albon, Steve D.; Lee, Aline Magdalena; Stien, Audun; Irvine, Robert Justin; Sæther, Bernt-Erik; Loe, Leif Egil; Ropstad, Erik; Veiberg, Vebjørn; Grøtan, Vidar. More frequent extreme climate events stabilize reindeer population dynamics. *Nature Communications* 2019 ;Volum 10.(1)

Hansen, Brage Bremset; Lorentzen, Jon Runar; Welker, Jeffrey M.; Varpe, Øystein; Aanes, Ronny; Beumer, Larissa Teresa; Pedersen, Åshild Ø.. Reindeer turning maritime: Ice-locked tundra triggers changes in dietary niche utilization. *Ecosphere* 2019 ;Volum 10.(4)

Hansen, Brage Bremset; Pedersen, Åshild Ønvik; Peeters, Bart; Le Moullec, Mathilde; Albon, Steve D.; Herfindal, Ivar; Sæther, Bernt-Erik; Grøtan, Vidar; Aanes, Ronny. Spatial heterogeneity in climate change effects decouples the long-term dynamics of wild reindeer populations in the high Arctic. *Global Change Biology* 2019

Ims, Rolf Anker; Henden, John-André; Strømeng, Marita Anti; Thingnes, Anders Voss; Garmo, Mari; Jepsen, Jane Uhd. Arctic greening and bird nest predation risk across tundra ecotones. *Nature Climate Change* 2019 ;Volum 9. s. 607-610

Layton-Matthews, Kate; Hansen, Brage Bremset; Grøtan, Vidar; Fuglei, Eva; Loonen, Maarten J.J.E..
Contrasting consequences of climate change for migratory geese: Predation, density dependence and carryover effects offset benefits of high-arctic warming. *Global Change Biology* 2019

Le Moullec, Mathilde; Pedersen, Åshild Ønvik; Stien, Audun; Rosvold, Jørgen; Hansen, Brage Bremset. A Century of Conservation: The Ongoing Recovery of Svalbard Reindeer. *Journal of Wildlife Management* 2019 ;Volum 83.(8) s. 1676-1686

Loe, Leif Egil; Pigeon, Gabriel; Albon, Steve D.; Giske, Pernille Andrine Eriksdatter; Irvine, R. Justin; Ropstad, Erik; Stien, Audun; Veiberg, Vebjørn; Mysterud, Atle. Antler growth as a cost of reproduction in female reindeer. *Oecologia* 2019 ;Volum 189.(3) s. 601-609

Marolla, Filippo; Aarvak, Tomas; Øien, Ingar Jostein; Mellard, Jarad Pope; Henden, John-André; Hamel, Sandra; Stien, Audun; Tveraa, Torkild; Yoccoz, Nigel Gilles; Ims, Rolf Anker.
Assessing the effect of predator control on an endangered goose population subjected to predator-mediated food web dynamics. *Journal of Applied Ecology* 2019 ;Volum 56.(5) s. 1245-1255

Mørk, Torill; Ims, Rolf Anker; Killengreen, Siw Turid. Rodent population cycle as a determinant of gastrointestinal nematode abundance in a low-arctic population of the red fox. *International Journal for Parasitology: Parasites and Wildlife* 2019 ;Volum 9. s. 36-41

O'Brien, Michael J; de Menezes, Luis Fernando Tavares; Bråthen, Kari Anne; Losapio, Gianalberto; Pugnaire, Francisco I.. Facilitation mediates species presence beyond their environmental optimum. *Perspectives in plant ecology, evolution and systematics* 2019 ;Volum 38. s. 24-30

Speed, James David Mervyn; Skjelbred, Ina Åsnes; Barrio, Isabel C.; Martin, Michael David; Berteaux, Dominique; Bueno, C. Guillermo; Christie, Katie S.; Forbes, Bruce C.; Forbey, Jennifer; Fortin, Daniel; Grytnes, John-Arvid; Hoset, Katrine Skamfer; Lecomte, Nicolas; Marteinsdóttir, Bryndís; Mosbacher, Jesper Bruun; Pedersen, Åshild Ønvik; Ravolainen, Virve; Rees, Eileen C.; Skarin, Anna; Sokolova, Natalya; Thornhill, Andrew H.; Tombre, Ingunn; Soininen, Eeva M. Trophic interactions and abiotic factors drive functional and phylogenetic structure of vertebrate herbivore communities across the Arctic tundra biome. *Ecography* 2019 ;Volum 42.(6) s. 1152-1163

Tombre, Ingunn; Oudman, Thomas; Shimmings, Paul; Griffin, Larry; Prop, Jouke. Northward range expansion in spring-staging barnacle geese is a response to climate change and population growth, mediated by individual experience. *Global Change Biology* 2019 ;Volum 25.(11) s. 3680-3693

Vindstad, Ole Petter Laksforsmo; Jepsen, Jane Uhd; Yoccoz, Nigel Gilles; Bjørnstad, Ottar Nordal; Mesquita, Michel d. S.; Ims, Rolf Anker. Spatial synchrony in sub-arctic geometrid moth outbreaks reflects dispersal in larval and adult life cycle stages. *Journal of Animal Ecology* 2019 ;Volum 88.(8) s. 1134-1145

Wheeler, Helen Claire; Berteaux, Dominique; Furgal, Chris; Cazelles, Kevin; Yoccoz, Nigel Gilles; Grémillet, David. Identifying key needs for the integration of social?ecological outcomes in arctic wildlife monitoring. *Conservation Biology* 2019 ;Volum 33.(4) s. 861-872

Communicated Results

Media
- Fjellreven rasker over isen, men hvor lenge? Nationen 23.10.2019
- Klimaendringer påvirker gjess på Svalbard. Nationen, 19.10.2019
- Gir bedre værvarsler og klimaforståelse. Svalbardposten, 12.10.2019
- Hvordan påvirker klimaendringer gjess på Svalbard? ABC Nyheter, 07.10.2019
- Hvordan påvirker klimaendringer gjess på Svalbard? Gemini.no, 02.10.2019
- Busker og trær i Finnmark dør ut: – Kritisk for fugler og dyr. NRK, 01.10.2019
- Denne fuglen er en klimavinner: – Vi har aldri sett en bestand endre trekkrute så raskt. NRK, 03.09.2019
- Undersøker musebestand. Svalbardposten, 29.08.2019
- Sørlige måleratrer sprer enda mer skogdød i Finnmark. Bondebladet, 22.08.2019
- Sultne sommerfugllarver påvirker rein, biller, rype, blåbær – og mennesker. Forskningsdagene.no, 31.07.2019
- Sultne sommerfugllarver spiser opp skogen i nord. Påvirker rein, biller, rype, blåbær og mennesker. Forskning.no, 29.07.2019
- Fant mer enn 200 døde rein: – Skyldes klimaendringer. NRK, 27.07.2019
- Eggplyndring kan ødelegge rypebestand. Forskning.no, 22.07.2019
- Ny fjellrev har vært på langtur. NRK, 06.07.2019
- Norsk fjellrev satte fartsrekord Norge-Canada. VG, 03.07.2019
- FOX MAKES 3,500-KILOMETRE TREK FROM NORWAY TO CANADA. Barrie 360, 03.07.2019 (Engelsk)
- Fuchs wandert in 76 Tagen von Norwegen nach Kanada. Spiegel Online, 03.07.2019 (Tysk)
- L'incroyable périple d'une renarde arctique intrigue la science. I'éditon du Soir, 03.07.2019 (Fransk)
- Arctic fox treks 3,500 km from Norway to Canada in 76 days. The Weather Network, 02.07.2019 (Engelsk)
- Fantastic arctic fox: animal walks 3,500km from Norway to Canada. The Guardian 02.07.2019 (Engelsk)
- An Arctic Fox's Epic Journey: Norway to Canada in 76 Days. The New York Times, 02.07.2019 (Engelsk)
- Polarræv i forbløffende bedrift: - Troede det var løgn. Ekstra Bladet, 02.07.2019 (Dansk)
- Denne reven gikk fra Norge til Canada i rekordfart. Nettavisen, 02.07.2019
- An arctic fox walked 2,700 miles from Norway to Canada. Yes, that's possible. The Washington Post, 02.07.2019 (Engelsk)
- Forskerne er målløse: Fjellreven vandret fra Svalbard til Canada på 76 dager. Sosialnytt, 02.07.2019
- Tutkijat hämmästyivät: napakettu kipitti 3 500 kilometriä Norjasta Kanadaan ennätysvauhdilla. YLE, 02.07.2019 (Finsk)
- "Maailman nopein naali" jolkotteli yli 3 500 kilometriä Huippuvuorilta Kanadaan. Helsingin Sanomat, 02.07.2019 (Finsk)
- Scientists 'speechless' at Arctic fox's epic trek. BBC News, 01.07.2019 (Engelsk)
- Fjellrev vandret fra Svalbard til Canada på 76 dager. High North News, 27.06.2019 (Engelsk)
- Fjellrev vandret fra Svalbard til Canada: – Eksepsjonelt. NRK, 25.06.2019
- Finnmark hardt rammet av lauvmakk. –Ikke realistisk å stoppe utbruddene. iFinnmark, 29.05.2019 (NB! For abonnenter)
- Forsker på laumakk. NRK Nordnytt, 13.05.2019
- Unikt møte framfor kamera: Fjellrev overraska av isbjørn ved hiet. NRK, 19.04.2019
- Svalbardreinen feiter seg med lengre somre. NRK Radio, Ekko, 25.03.2019
- Frykter at folk skyter den utrydningstruede fjellreven. NRK, 02.02.2019
- Klima og rein - Potensielle verknader på beite, helse og sjukdom - Del 1. Villrein.no, 31.01.2019
- Setter ut flere revekull på Varangerhalvøya. Ságat, 30.01.2019 (NB! for abonnenter)
- Ser du ikke forskjell på revene? Det kan koste dyrt! Finnmarken, 24.01.2019 (NB! for abonnenter)
- Jakten på klimaendringene. NRK, 12.01.2019
- Klimavinnere og klimatapere. Vårt land, 02.01.2019

Oral Presentations:
- "Hvilken fremtid har de arktiske rovdyrene". Lørdagsuniversitetet, 2 februar.
- «Arktiske økosystemer utsettes for ekstreme klimaendringer»: Hva bør forskerne gjøre? Det Kongelige Norske Vitenskapers Selskap, Trondheim
- «Hvordan forvalte norsk-norsk natur bærekraftig i klimaendringenes tidsalder?» 31. august UiT and NORAD Sustainability seminar.
- «Hva skjer med naturen i Nord-Norge når klimaet blir varmere», Academia Borealis, 26. november.
- Demonstrations of COAT activities at the Research days at UiT: «Open day for children» and «School day» in September.

Books and popular papers:
- Vindstad, O.P.L. & Jepsen, J.U. Populasjonssykler hos målere. Naturen nr. 3, 2019: 86-98.
- Soininen, E., Kleiven, E. & Neby, M. Populasjonssykler hos gnagere. Naturen nr. 3, 2019: 87-107.

- Ehrich, D. & Yoccoz, N.G. Populasjonssykler hos hare. Naturen nr. 3, 2019: 107-115.
- Henden, J.A., Fuglei, E. & Ims, R.A. Populasjonsykler hos rype. Naturen nr. 3, 2019: 116-123.

Interdisciplinary Cooperation

COAT's main interdisciplinary axes:

- Ecology - climatology/geophysics

- Ecology - statistics

- Ecology -computer science/informatics

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/implement new census methods.

Could results from the project be subject for any commercial utilization

No

If Yes

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. In fact, the strategic funding from the terrestrial is intrumental for the overall success of the program. Compared to previous years, COAT has in 2019 significantly increased its production of scientific results and communication with end-users and the general public.