

Project information

Keywords

forest mortality, insect outbreaks, resilience, ecosystem dynamics

Project title

What comes after the new pest? Ecosystem transitions following insect pest outbreaks induced by climate change in the European high North (After-the-Pest)

Year

2016

Project leader

Jane Uhd Jepsen

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

The Varanger fiord area including Tana and Polmak. Example coordinate Tana Bru 70.1994, 28.1852.

Participants

The project leader is Jane U. Jepsen (senior researcher, NINA, jane.jepsen@nina.no). Administratively responsible at NINA is research director Sidsel Grønvik (sidsel.gronvik@nina.no). Project participants: From NINA: Audun Stien (audun.stien@uit.no) and Erling Solberg (erling.solberg@nina.no). From UiT: Stian N. Anfinsen (stain.normann.anfinsen@uit.no), Rolf A. Ims (rolf.ims@uit.no), Nigel Yoccoz (nigel.yoccoz@uit.no), Ole Petter Vindstad (postdoc, ole.p.vindstad@uit.no) and Malin Ek (PhD student, malin.ek@uit.no). Administratively responsible at UiT is Faculty Director Terje Aspen.

Flagship

Terrestrial

Funding Source

The Research Council of Norway

The Fram Centre

Summary of Results

This 2nd year of the project was, according to schedule, the most field-intensive year of the project. In the course of 2016 we have completed four field campaigns in the Tana-Varanger region. Among these was a ptarmigan snow tracking campaign in the Tana Valley in order to document the area use of ptarmigan and other herbivores in forests suffering a varying degree of mortality following the moth outbreak. The survey revealed less ptarmigan in the most damaged forest areas, but also large regional differences in ptarmigan presence. In August we completed a resurvey of 40 regional study plots around the Varanger fiord last visited in 2010. The 2010 survey revealed strong contrasts in the ecosystem level response to the moth outbreak (Jepsen et al. 2013). We now plan to quantify whether and how this pattern has changed over time since 2010. All remaining field activities were completed according to plan. We have had a project meeting with the local landowner (Fefo) and forest authorities (Fylkesmannen i Finnmark) to discuss preliminary results from the 2015 and 2016 field seasons.

In 2016 we have worked to strengthen our collaborations within two specific fields: 1) Cascading impacts of moth outbreaks and vegetation state transitions on reindeer and moose. In *After-the-pest* we monitor the movement of ungulates using non-invasive camera traps. We have initiated a new collaboration presenting us with the option of comparing this approach with one based on data from satellite tagged reindeer (J. Colman [NMBU] & S. Eftestøl [UiO]) and moose (E. Solberg [NINA]). A data analysis workshop has been planned for late November 2016, and the collaboration will continue into 2017. 2) Quantification of structural vegetation changes using Synthetic Aperture Radar (SAR). In *After-the-pest* we quantify changes in woody vegetation structure using ground based estimates such as vegetation height, composition and stem damage. We have initiated a new interdisciplinary collaboration with a remote sensing specialist (Stian Anfinsen [Dept. Physics and Technology UiT]) in order to explore the potential for using SAR for quantifying vegetation structure in the moth damaged forest on a regional scale. We completed a ground truthing field campaign in August 2016. The collaboration will be significantly strengthened in 2017, since we have been awarded a new PhD on the UiT strategic project COAT Tools (2017-2020)

Master and PhD-students involved in the project

MSc student Ragnhild Bjørkås (2015-2016)

PhD student Malin Ek (2014-2018)

In addition 1 MSc student, 1 international internship student (6 months) and 1 Fulbright student (7 months)

For the Management

WP3 in the project is dedicated to discussions with landowners and forest management in Finnmark and contains an experimental test of the short and long term effects of salvage logging on forest regeneration following moth outbreaks. The results will provide immediate input into the management strategies adopted by Finnmarkseiendommen and Fylkesmannen i Finnmark.

Published Results/Planned Publications

Jepsen, J.U., Vindstad, O.P.L., Barraquand, F., Ims, R.A., Yoccoz, N.G. (2016). Continental scale travelling waves in forest geometrids in Europe: an evaluation of the evidence *J. Anim. Ecol.* 85: 385-390.

In preparation autumn/winter 2016:

Vindstad, O.P.L., Jepsen, J.U., Ims, R.A., Bjørnstad, O. et al. Meso-scale patterns of spatial population synchrony in sympatric geometrid defoliators are related to dispersal capacity

Pepi, A. Ek, M., Vindstad, O.P.L. & Jepsen, J.U. Elevationally biased avian predation as a contributor to the spatial distribution of geometrids moth outbreaks in sub-arctic mountain birch forest.

Communicated Results

Conference contributions:

Vindstad, O.P.L., Jepsen J. U., M. Ek & R. A. Ims. 2016. Meso-scale geometrid guild dynamics in a geographically complex sub-arctic birch forest ecosystem. Invited talk at International Congress of Entomology, Orlando, USA Sept 2016.

Jepsen, J.U., O.P.L. Vindstad, M. Ek & R.A. Ims. 2016. Outbreak range expansions in

geometrid moth as drivers of ecosystem state changes in sub-arctic birch forest. Invited talk at International Congress of Entomology, Orlando, USA Sept 2016.

Ek, M. Jepsen, J.U., Vindstad, O.P.L.; Ims, R.A. 2016. Functional relationships between geometrid larval density, crown defoliation and NDVI in a subarctic birch forest. Poster at the International Congress of Entomology, Orlando, USA Sept 2016.

Jepsen, J.U. 2016. Moth outbreaks as driver of ecosystem state changes in the sub-arctic birch forest. Invited plenary, Network for Arthropods of the Tundra (NeAT) Annual meeting, Århus, Nov. 2016.

Other contributions:

We have hosted a visit from a graduate school (2. videregående) from Denmark in the Fram Centre (March 2016). They visited a local school in Tromsø and FRAM to learn about climate change and climate change research activities in FRAM.

Interdisciplinary Cooperation

During 2016 we have initiated a new interdisciplinary collaboration with a remote sensing specialist (Stian N. Anfinsen, DEpt. Physics & Technology UIT), which means that we now have an opportunity to explore the potential of using SAR (synthetic aperture radar) for quantifying vegetation structure in the moth damaged forest on a regional scale. This collaboration has resulted in a new PhD from the strategic UIT project COAT Tools, to be initiated in 2017.

Budget in accordance to results

The added funding from the Terrestrial Flagship has enabled us to strengthen our collaborative network within the two specific fields detailed above: 1) Cascading impacts of moth outbreaks and vegetation state transitions on reindeer and moose, and 2) Quantification of structural vegetation changes using Synthetic Aperture Radar (SAR). This has broadened the impact of the project, and also opened up new opportunities for funding. The budget has been used according to plan with one exception. A planned workshop with a scheduled guest researcher has been cancelled, since the guest researcher is no longer an active collaborator in the project. The resources allocated for the workshop (40K) have instead been used for related activities in the project, e.g. increased collaborations towards COAT Tools.

Could results from the project be subject for any commercial utilization

No

Conclusions

We have completed the 2nd year of the project according to schedule. The year has presented some interesting new opportunities for collaborations, which we have pursued with funding from FRAM. We have hosted both national and international students and trainees, and initiated new contacts including a EU funded Agreenskills+ fellow whom we will host in 2017. It has been a very field intensive year with more than 8 man months of field work being completed, and comparably less time available for publication and dissemination. This will be balanced by a much less field intensive year in 2017.