PolliClim

“If it wasn’t for the snow, some may have call this spring”

-Dr. Nielsen

A Sporadic Newsletter

Vol 2; April 2015

PolliClim has survived its first year. Congratulations to us all! The “Oslo group”, located here at CEES (the master students, Anne Brysting, Trond Reitan and Dr. Nielsen himself) is holding meetings on a regular basis, ensuring good communication within the group and among the different parts of the project. The international collaboration is also active, with the pan trap project initiated by Adrian and Thomas and the organizing of Ingvild’s field work in Argentina as good examples. In this newsletter I will present our progress so far, our experiences from last year’s field work in particular, and our future plans, as they currently appear.

What have we done so far?

The first PolliClim paper will, hopefully, be submitted this week (Reitan & Nielsen 2015. “Do not divide count data with count data; a story from pollination ecology with implications beyond” intended for Methods in Ecology and Evolution). Here we have shown that using counts of pollinator visits as response variable, with number of flowers observed as an offset variable, improve the statistical power of the tests (as compared to the more commonly used approach with number of visits per flower per hour as the response variable). For certain simple models we show that a doubling of the sampling effort is needed to achieve the same test strength by use of the “classical” approach.

Dr. Nielsen and Stein Joar Hegland have been working on a manuscript based on last year’s field work on flower visits to raspberry. Trond has conducted the statistical analyses and generated some predictions related to the different environmental variables recorded. Our main conclusion is that we have not sampled enough; in particular the environmental gradients are too narrow, giving our predictions enormous confidence intervals towards the end of the gradients. The example of ambient temperature is shown in (Fig.1). It seems that there is an optimal temperature for pollinator activity around 25˚C (corresponding to the optimal temperature for the Glen Ample variety of raspberry plants), but our sampling has not been able to give very confident predictions for high and low temperatures.

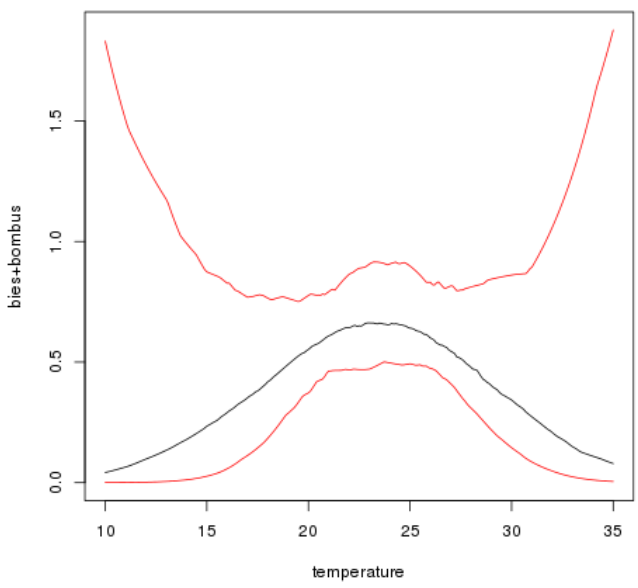

Figure 1: Predicted number of flower visits (honeybees and bumble bees combined) per 10 minutes observation in relation to ambient temperature.

The only variable that turned out statistically significant in our models were air humidity, showing a negative effect on flower visitation. Another interesting finding was that on the two farms located on the West coast of Norway ~95% of flower visits were conducted by honeybees, while on the two farms located on the East coast the numbers were ~85% (15% bumble bees) and

~75% (10% Syrphid flies and 5% bumble bees). Very interesting indeed. However, the lack of statistically significant patterns within the dataset has made me rethink the focus of a potential paper based on the first year of field work. I aim to change the focus of the study more towards a framework for building a sampling protocol targeting temperature sensitivity in crop pollination. Based on our result, or rather the lack thereof, we can say something about when and how we should focus our sampling. The conclusion being that a pilot season is needed to get some basic information on the activity patterns of the most important pollinators. The results from the limited sampling can then be used to build a targeted sampling protocol for the focal crop in the particular area under study. I hope as many as possible will be interested in joining this project, as it can be a very general framework if we use the knowledge we have on very different systems. More on this later.

Collaboration with the industry

Monday April 13th Andreas and Dr. Nielsen went to Moskvil, one of our raspberry farms. We discussed our findings and our ideas for field work this summer. Our collaboration with Gartnerhallen and the farmers works well and we will be able to do all the work we intend.

Field work Norway 2015

Andreas' master project will be the core of this year's field season in Norway. He will spend most of June, and even the last part of May, if possible, observing flower visits to raspberry and wild flowers surrounding the farm. I have hired Evaliina Kallioneimi as field assistant for a month to help us out. She has a PhD in ecology and has been doing bumble bee sampling for The Norwegian Institute for Nature Research (NINA). Welcome on board. Since Stein Joar has taken on the position as Dean of the Faculty at the Sogn and Fjordane University College he will not be able to do much practical work (work at al?) in the years to come. He has promised, however, to help us find a person to conduct field work in Sogn. This might not be easy, but we still hope to get something done over there this summer.

Field work Norway 2016

The data sampled last year revealed that it will be difficult to get some real and significant climate gradients covered by studying commercially grown raspberry in Norway. This led some of us to think about sampling pollinators in wild raspberry. The plant grows throughout large parts of Norway under very different climatic conditions. The plan, though vague, is to recruit a master student to look into this next summer. It should be easy to locate populations at contrasting elevations, representing different temperature and snow cover regimes not too far from Oslo. Though not being precisely our target crop this will still give us useful information on raspberry pollination over a broader temperature range.

Field work abroad

Ingvild is going to Argentina in December to be a part of Mariano's team working on soybean pollination. This will strengthen the international collaboration within the project and hopefully help us do some comparative work. My plan to go to Greece this summer did not work out, which is a pity. Lesvos is a very nice island and Thomas a very nice guy, so I would have loved to come for a visit. Greece will be prioritized in my travel schedule next year and we therefore postpone our field work there for another year. In Australia Adrian has initiated a study of the attractiveness of pan traps of different colours. This in collaboration with Thomas (I will try to use the same protocol for our sampling here in Norway). The main PolliClim related field work in Australia and Argentina will start in December when I plan to visit both places.

Master students

Currently there are four master students associated with the PolliClim project. Mari Bø decided to do something else (a very strange decition). Megan Hoff, did not succeed in getting the Fulbright scholarship, so she will not join us either. However, the best of the best of the best are still among us!

Julie Paus-Knudsen is setting up a lab experiment where she will expose bumble bees to pollen containing different doses of pesticides. Her focus will be on sub-lethal effects, learning and foraging behaviour in particular. The flight arena will contain flowers with either of two colours and the idea is to quantify how fast the bees learn which flowers contain sugar solution.

Andreas Westgård Rinvold will do the bulk of field work this summer. We will focus the sampling on one of the farms we worked in last year (Moskvil in Vestfold, Eastern Norway). He will study pollinator activity in relation to temperature and seek for potential temporal mismatches between plants and pollinators. He will observe pollinator activity to wild flowers before, during and after raspberry flowering as well as to the raspberries themselves. In addition to direct pollinator observations

we will use pan traps to get "unbiased" estimates of the pollinator community following the protocol developed by Adrian and Thomas. If we are successful we can use these data in comparison with those collected by Adrian and Thomas.

Helge Lone is working on the economics of raspberry production in Norway, or more precisely, on a review of the economics of pollination in agricultural production more in general. We do not have good enough data on the pollinator dependency of raspberry (it differs a lot among varieties) to make some economic modelling. Helge is writing a short 30 credits master so he will finish in June this year.

In August **Ingvild Fonn Asmervik** will join the PolliClim team for her master thesis. She will be involved in the 2015 field season here in Norway but her main focus will be the soybean pollination in Argentina. She will travel to Argentina in December 2015 to conduct fieldwork and collaborate with Mariano and his team. This will indeed strengthen the collaboration between Norway and Mariano and we will have a much better understanding of what is going on in the Argentinean soybean fields also here. I plan to join Ingvild on her voyage down south.

Networking/visitors

The COST Action SUPER-B had a call for Short Term Scientific Missions (STSMs) earlier this year. Mikael Garratt from Centre for Agri-Environmental Research in Reading applied and got funded. He will come to Norway in June to have a look into the details of our sampling protocols and initiate collaboration. A fun-fact here is that he was one of the reviewers of the PolliClim application ☺

Outreach/dissemination/presentations/publications

PolliClim is on the move and we are communicating our research in different settings. One paper is about to be submitted and we aim to publish something based on the field work from last year. My goal is also that the pan trap work of Adrian and Thomas (and Andreas/me) will give results that can be published. There is also a draft of a paper led by Adrian hanging somewhere that we will pick up again shortly. The field work of Andreas this summer will not only result in a fantastic master thesis, but my ambitions, on behalf of all my students, is to publish their work. Julie's experiments also have a publication potential, though a bit on the side of our main focus. I can't see why this should not be the case for Ingvild as well. Economics is a bit different topic so whether it is common to publish master thesis there I do not know. I will however, encourage Helge to look into this.

Outreach and dissemination is important for the Research Council and for us. In the project plan it is stated that outreach is a major goal of the project and we have tried our best to communicate the project through more non-scientific channels. Dr. Nielsen and the PolliClim team have been around talking about the flowers and the bees on several occasions. Here is a brief list of outreach activities:

Trond (and Dr. Nielsen) had a poster on our simulation study at the biannual meeting of the Norwegian Ecological Society (in Bergen).

Julie has been presenting her master thesis including the PolliClim project on several occasions, including the annual meeting of The Norwegian Pharmacologists and Toxicologists, for students at The Norwegian University for Science and Technology (in Trondheim), and at an invited presentation for key staff at The Norwegian Environment Agency.

Dr. Nielsen himself visited the conference "Adapting Agriculture for Future Uncertainty" in Amsterdam (no presentation though), had a presentation at the biannual meeting of the Norwegian Ecological Society (in Bergen), a presentation and discussion of the coming report of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) on pollination with a NGO working for biodiversity conservation in Norway (SABIMA) (as I reviewed the report), and a presentation on pollinator diversity in agricultural systems at a conference organized by Norwegian Genetic Resource Centre.

To you all: Please let me know if you are doing some outreach that might be relevant for PolliClim. Showing that we are taking dissemination seriously is very important. All good stories of activities can, and will, be published on my web page under "Project progress". A short note on what you are doing of relevance to PolliClim, with some photos, will be highly appreciated.

Take care
Anders