

BTO- Report of the stay of Marc Niggemann at the INIA Madrid

Travelling person: Marc Niggemann, PhD student, University of Marburg

Duration: August the 2nd to August the 28th 2009

Supervisor Marburg: Ronald Bialozyt, University of Marburg, Member of P12 (Uni-Mar), Germany

Supervisor Madrid: Juan J. Robledo-Arnuncio, INIA, Member of P16a (INIA), Spain

Purpose of the travel

We aimed to combine the expertises in modelling dispersal and population genetics to improve our model of gene flow in Poplars. While the group in Marburg has many years of experience with modelling effective pollen dispersal, the INIA group has broad experience with population genetics.

The work at INIA Madrid

During my stay at the INIA Madrid I have worked with Juan J. Robledo-Arnuncio on the improvement of my dispersal model. To implement pollen dispersal of genetic modified poplars in my model, I presented my previous work and we discussed different ideas how to include genetic modified trees in the landscape.

First, I reworked my simulation model to implement genetic modified trees as pollen donors. Additionally, the output component had to be optimised to directly use the produced files in statistical software like R. This takes some time including visual debugging and first tests with theoretical parameters.

In order to improve my model, we worked on the dispersal kernel as the most important part for modelling dispersal processes. In former published models kernel fitting to datasets of pollen dispersal distances ignored the spatial structure of the trees. This leads to an underestimation of the uncertainty in kernel estimation, especially at larger distances.

To be sure that our used dispersal kernel based on genetic paternity analyses is suitable and statistically validated, we conducted some simulations in a theoretical landscape using the kernel function we already developed and published. Thereby, the question raised how many

seed samples per mother tree and how many mother trees would be necessary to receive a statistically confirmed dispersal kernel. We discussed and worked on the idea to assure that future sampling will lead to the best fitted kernel possible. Therefore new simulation studies were conducted using a virtual ecologist for the collection of seeds in different theoretical landscapes. These landscapes were uniform as well as linear arrangements of trees, making short and long distance dispersal possible. The number of female trees and the number of seeds from these trees were varied leading to different scenarios.

After all the simulations we fitted a new dispersal kernel to the simulation results. The fitting took some time, but after that we could compare the new kernels of the different scenarios with the kernel used for the dispersal of pollen in our simulations. As I had not the time for sufficient replications of the simulations, what seems to be necessary, we will continue to work on this joint idea.

At last, we identified several questions for the model to answer with regard to the aims of the project and potential papers.