PLANT SURVIVAL
National Centre of Competence in Research

Université de Neuchâtel

Module 4 meeting, November 2, 2006

Timetable

Lunch: 12.00-13.30
13.30: Joe Perry (40 minutes talk + 10 minutes for discussion)
14.20: Roger Arditi (40 + 10)
15.10: break
15.30: Louis-Félix Bersier (40 + 10)
16.20: Antoine Guisan (40 + 10)
17.10: end

ABSTRACTS

Design of experiments and analysis of data concerning GM crops
Joe N. Perry, *Plant & Invertebrate Ecology Division*, *Rothamsted Research, Harpenden, Herts. AL5 2JQ*

My research on GM crops has largely involved collaboration on the design and analysis of the UK Farm Scale Evaluations (FSE) of genetically modified herbicide-tolerant (GMHT) crops. Results concerning the effects of herbicide management practices on farmland wildlife for three spring-sown crops (beet, spring oilseed rape and maize) were published in autumn 2003 and spring 2004; results from the fourth crop, winter oilseed rape, were published in Spring 2005. A very brief summary will be given of the results published to date. Also, two papers will be described that reassess the analysis, and the estimates made of statistical power. Work following on from the FSE, and other GM work will be described. Simple mathematical models can be used to show how the adverse effects of GMHT systems on the wildlife in sugar beet crops might be mitigated. Other studies involves mathematical modelling of relevance to the issue of coexistence between GM crops and organic or conventional crops. This focuses on issues around the distances proposed to separate GM and other crops and on spatial and temporal heterogeneity of crops in landscapes.

Evolution of pest resistance to transgenic insecticidal maize: demo-genetic approach
Roger Arditi (Paris-XI)

We have developed a reaction-diffusion model of the development of resistance to transgenic insecticidal crops in pest populations. Kostitzin's demo-genetic model describes local interactions between three competing pest genotypes based on a susceptible and a resistance alleles to transgenic plants, while the spatial spread of insects is modelled based on diffusion. We used this model to estimate the effects of spatial factors, including pest dispersal and the size and shape of the refuge, on the efficiency of the "high dose-refuge" strategy, which was designed to prevent the development of resistance in populations of insect pests and notably in those of the European corn borer, Ostrinia nubilalis Hübner (Lepidoptera, Crambidae). We also show that the formal coupling of classical Fisher-Haldane-Wright population genetics equations with diffusion cannot adequately describe the development of resistance in a spatially heterogeneous pest population.

Functional responses: from theory to experiments, and back again
Louis-Félix Bersier (Fribourg)

Authors:
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Functional responses describe the per capita consumption rates of predators. They quantify the energy transfer between trophic levels and play a key role in the dynamics of predator-prey interactions that scale up to whole communities. There has been a debate about the relative merits

of so-called prey- versus predator-dependent theories. The former assumes that the functional response is a function of prey density only, while the latter also includes predator density. Here, we will expose the debate, present the results of experiments in unconfined conditions aimed at disentangling both theories, and expose new developments about stochastic versions of functional responses.

Predicting species distributions: an overview and some new thoughts
Antoine Guisan (Lausanne)

In the last two decades, interest in species distribution models (SDMs) of plants and animals has grown dramatically.
Recent advances in SDMs allow to forecast potential anthropogenic effects on patterns of biodiversity at
different spatial scales. However, some limitations still preclude the use of SDMs in many theoretical and practical
applications. Here, I provide an overview of past and current practices and recent advances in this field. I
particularly discuss the ecological principles and assumptions underpinning SDMs. I give particular emphasis
to the use of SDMs for the assessment of climate change impacts and issues of predicting biological invasions. I
finally suggest some new avenues for improving SDMs.

Thank you for your contribution.