Population models in ecological risk assessment – current results and potential for future use

Galic[1], N., Van den Brink[1], P.J. Baveco[1], J.M., Hommen[2], U., Schaefers[2], C., Thorbek[3], P. and Bruns[4], E.

Evaluation of existing POpulation models for their potential application in ecological risk assessment of CHemicals - **EPOCH**

Introduction

- The need for and potential of population and ecosystem models in risk assessment for certain important questions is recognized
- This project aims to assess the current state and approaches in ecological models that can directly answer to chemical risk assessment schemes

Methods

- review of EU chemical RA directives (e.g. plant protection products, biocides, chemicals under REACH)
- review and data base development on population models of potential use for chemical RA focusing on general and specific model characteristics, availability, usability, and application areas

Results of the comparison of EU directives and model review

- type of **data required** and **risk characterization** approaches are similar under different directives
- **protection goals** for the environment are formulated generally
- Five **application areas** of ecological models in ERA of chemicals are identified:

1. **Population level relevance of effects observed on the individual level**
2. **Extrapolation of effects of a tested exposure to other untested exposure patterns**
3. **Extrapolation of recovery processes to include recolonization** (Fig. 1 and 2)
4. **Analysis and prediction of possible indirect effects**
5. **Prediction of bioaccumulation and biomagnification within food chains or food webs**

- 100 publications on population models were reviewed
- freshwater and terrestrial habitats are equally represented, differential eq. types mostly found (Fig. 3)
- 78% of models include toxicological effects
- all reviewed population models add to ecological relevance of toxicological effects
- final product: database of existing, published population models readily available for use

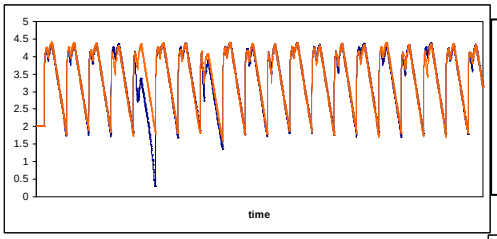

Figure 1. Output of an individual-based model of 20 year *Asellus* bivoltine population dynamics (log scale); 2 pesticide applications per year. Blue: population without recolonizers, orange: population with recolonizers following the first pesticide event.

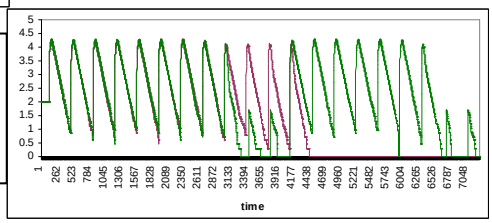

Figure 2. IBM output of an univoltine *Asellus* population dynamics (log scale); 1 pesticide applications per year. Purple: population without recolonizers, green: population with recolonizers following pesticide application.

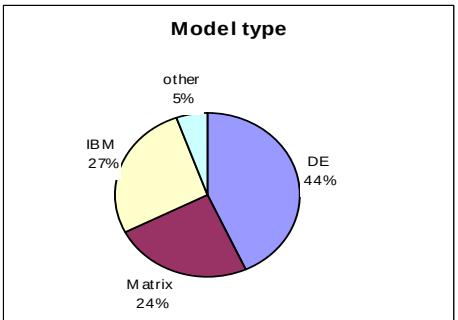

Figure 3. Representation of different model types present in the EPOCH database.

1 nika.galic@wur.nl, tel: 0031-317 484598, Alterra and Wageningen University, Wageningen University and Research center, Wageningen, The Netherlands
2 Fraunhofer IME, Schmallenberg, Germany
3 Syngenta Ltd, Bracknell, UK
4 Bayer CropScience, Monheim, Germany

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