MODELINK - A SETAC EUROPE WORKSHOP

How to use ecological models to link ecotoxicological tests to specific protection goals?

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Background

- Recently a **framework based on an ecosystem services approach for deriving specific protection goals** for environmental risk assessment of pesticides was developed (EFSA Journal 2010; 8(10):1821).
- Within this framework **ecological modelling** is identified as a promising tool to link the results of ecotoxicological studies to such specific protection goals because it enables extrapolation from laboratory conditions and test species to population level or community level effects under field conditions.
- However, even when ecological models are available, there are currently no recommendations for how to apply them to risk assessments. Thus, there is a **need for guidance on how ecological models can be applied to address specific risk assessment questions.**

Scope

- Focus on the risk assessment of **plant protection products**
- Consider the groups of **organisms** covered in EC Reg 1106/2009 and the EFSA opinion on specific protection goals (i.e. algae, macrophytes, aquatic invertebrates, fish, soil invertebrates, non-target arthropods including honey bees, as well as birds and mammals).
- **Models** to be used will cover toxicokinetic/toxicodynamic models, population models, community and ecosystem models of different complexity.
- Up to 60 experts from diverse backgrounds (ecotoxicologists, modellers, regulatory scientists and policy makers) and representing the tripartite structure of SETAC (Academia, Business, Government) will **participate upon invitation**.

Objectives

- **The general objective is to provide guidance for when and how to apply ecological models to regulatory risk assessment.**

In particular, the following questions should be answered:

- How to **translate protection goals** (taking the new specific protection goals based on ecosystems services as a working example) **into workable problem formulations?**
- What are the **relevant scenarios** that cover risk assessment questions in terms of species choice (e.g. focal, surrogate or indicator species) and spatial and temporal scales?
- What are criteria for **deciding whether ecological models can improve risk assessment** for a case at hand, e.g. when standard data cannot answer the risk assessment questions but ecological models can?
- How **to choose the model type** to be used to link standard/higher tier test data to protection goals?
- **How to use ecological model outputs in regulatory risk assessment?**

Schedule

Workshop Preparation
- Looking for case studies
- Proposal for scenarios to be modelled
- Identification of suitable models 'ready to use' in the homework period

Workshop 1
- **Autumn 2012 in Rennes, France**
- Translation of protection goals into concrete/workable problem formulations
- Discussion of approaches to defining relevant scenarios to be modelled (e.g. temporal and spatial scales)
- Introduction to the models to be used during the homework period

Homework
- Application of a set of models to concrete risk assessment questions (workshop case-studies) and / or daily work problems by workshop participants

Workshop 2
- **Spring 2013 in Aachen, Germany**
- Feedback / discussion of homework experience
- Recommendations on how to apply ecological models in risk assessment, on a case by case basis (i.e. one question – one/several appropriate solutions)

Reporting
- Workshop report as a SETAC book
- Publication of a workshop summary in a journal
- Dissemination of workshop recommendations to relevant and interested groups

An example: Questions to solve for the protection of fish in edge-of-field water bodies

(see PhD project Fish-2 by Lara Ibrahim on www.cream-itn.eu)

1. Defining protection goals

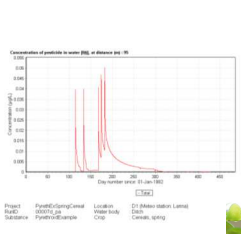
Examples of specific protection goals for vertebrates (EFSA J 2010; 8(10):1821)

key driver	ecosystem service	legal requirement	specific protection goal	ecological entity	attribute	scale		
						magnitude of impact	spatial scale of impact	temporal scale of impact
vertebrates (aquatic and terrestrial)	food	no unacceptable lethal and sublethal effects	negligible effect on population structure of harvestable species	population	abundance, biomass, demographic structure	negligible to small effects	(edge of) field to watershed/ landscape	days to weeks acceptable locally (if caused by avoidance behaviour)
		no unacceptable effects on ongoing behaviour	healthy appearance of individuals used for human consumption	individual to population	frequency of tumours and other abnormalities in harvested individuals	negligible effect	depending on the home range of species	not applicable
		acceptable human health risks	no secondary poisoning by food consumption	individual to population	internal concentrations	negligible to small effect	(edge of) field to watershed/ landscape depending on the home range of fish species	variable depending on life cycle of fish species
vertebrates (aquatic and terrestrial)	- genetic resources - education and inspiration - aesthetic values	no unacceptable lethal and sublethal effect no unacceptable effects on ongoing behaviour	no decline in biodiversity species: negligible effects on population structure negligible visual unacceptable effects on behaviour	individual to population	behaviour and abundance (as affected by survival, growth and reproduction)	negligible to small effects	(edge-of) field to watershed/ landscape depending on the home range of species (special attention should be paid to spawning and nursery sites)	only if caused by avoidance behaviour temporal effects (days to weeks) acceptable

Thus, negligible to small effects on abundance on the edge-of-field to watershed level of days to weeks can be acceptable.

2. Getting valuable data for risk assessment

The standard risk assessment might provide exposure profiles and acute/chronic effects data e.g. expected exposure in a ditch and acute and chronic data for the zebrafish.



Thus, risk assessment is based on exposure estimation for realistic worst-case scenarios and effect data for survival, growth and reproduction of an exotic species under artificial, static exposure.

3. How to extrapolate to effects on populations in the field?

By means of population modelling, but…

Which species should be modelled?

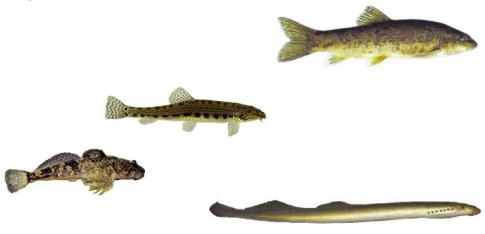
What is the appropriate temporal and spatial scale for the assessment?

What population level effects can be tolerated?

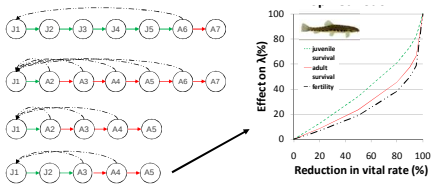
Which type of model should be used?

MODELINK should provide guidance in order to help solving these questions.

Four examples of fish living in edge-of-field water bodies in the EU



For example, matrix models can identify vulnerable species



Life-cycles for different species

Example for spined loach: Elasticity of population multiplication rate λ