

The STREAM:com model – Simulating chemical effects on stream macroinvertebrate communities

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Aims and scope

- Effect extrapolation at population and community level.
- Consideration of life histories, functional traits and habitat characteristics in the effect assessment.

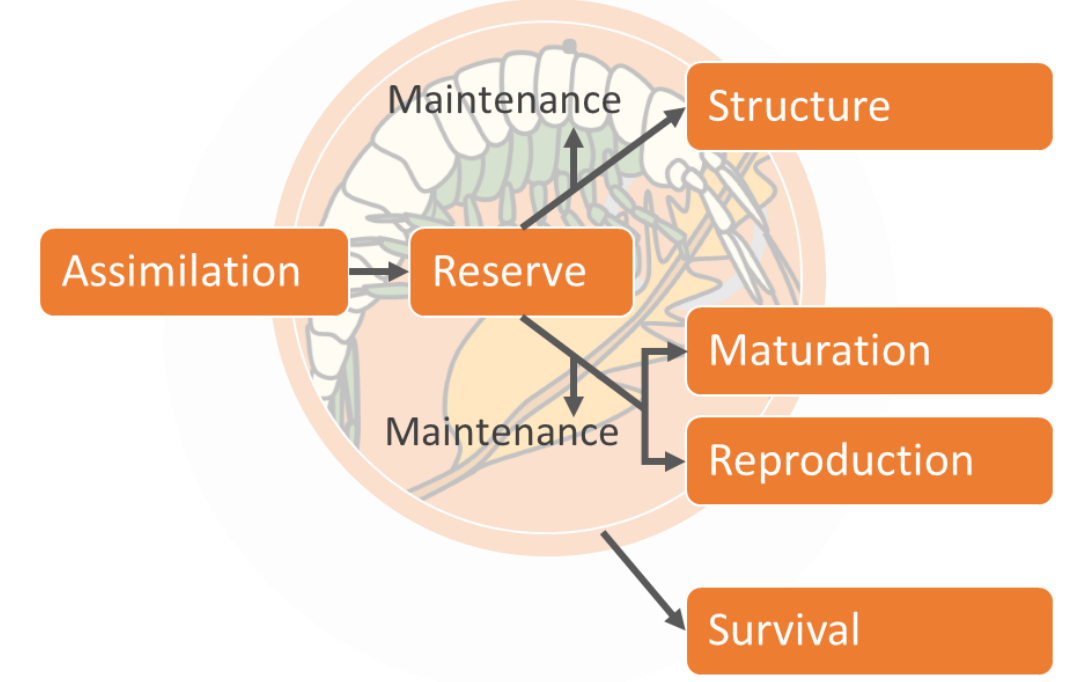
In a scenario analysis, we illustrate the effect of biotic interactions.



STREAM:com
Individual based model for stream macroinvertebrate communities

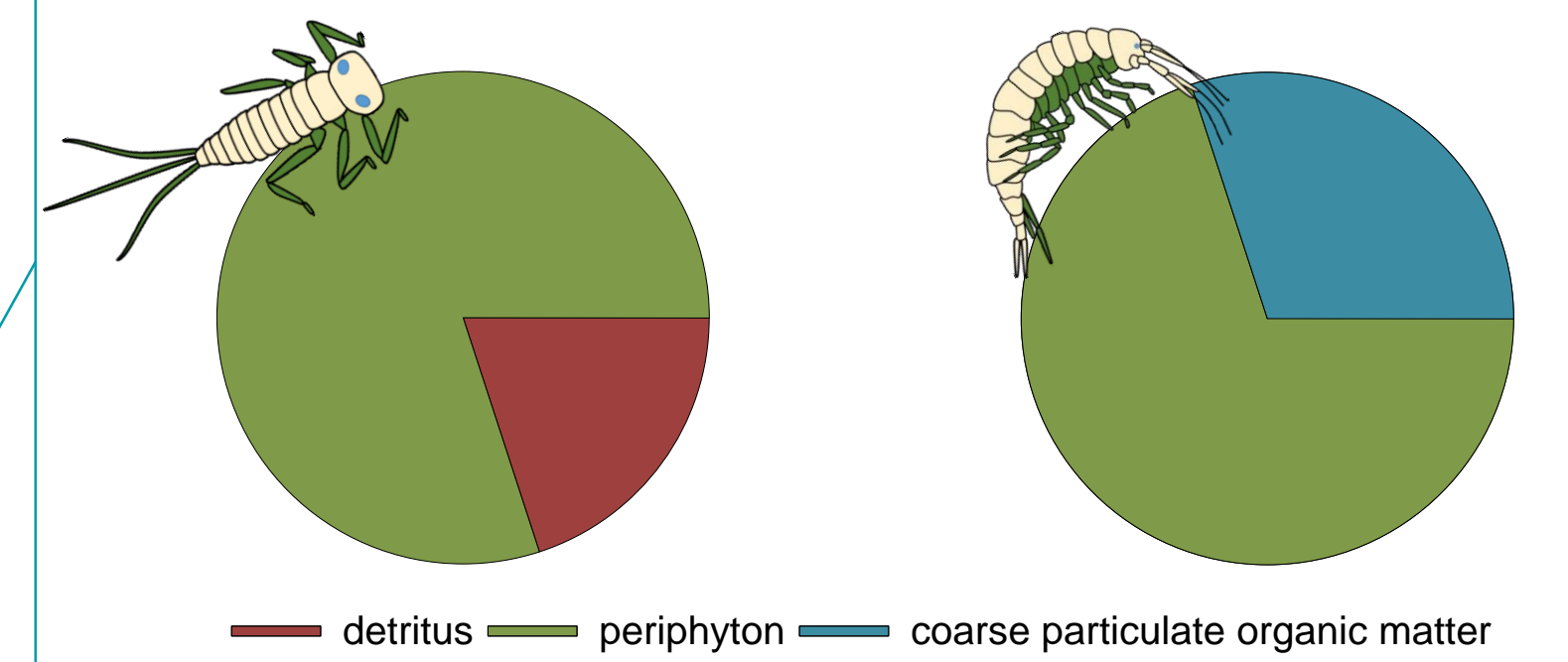
Dynamic energy budget models

www.bio.vu.nl/thb/deb/debiab/add_my_pet/



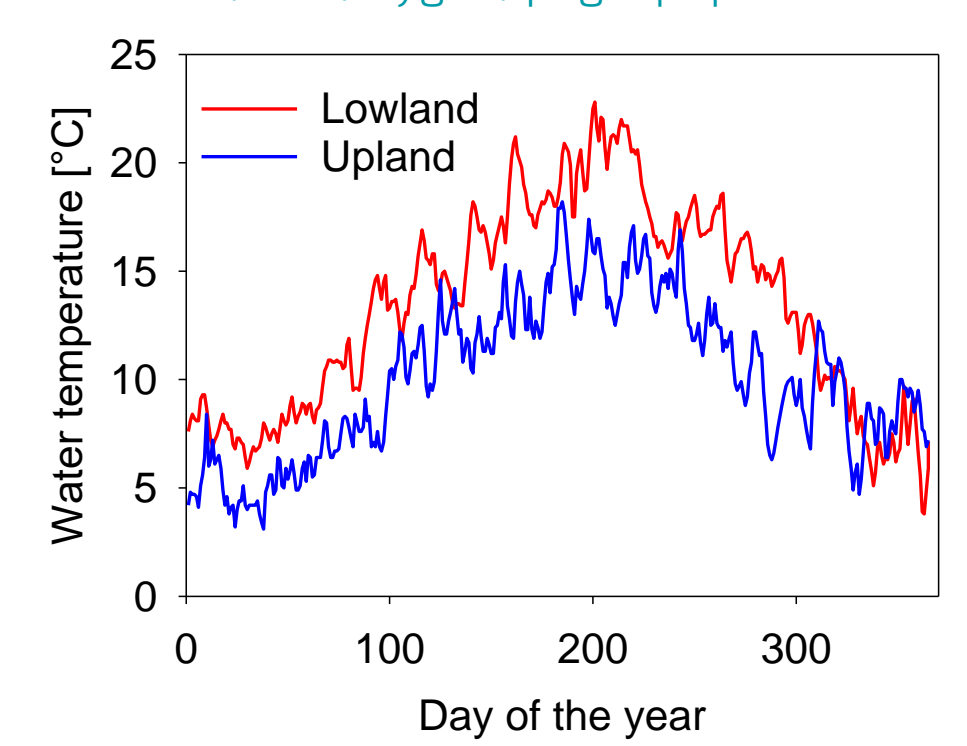
Functional traits (e.g. food preference)

www.fliessgewaesserbewertung.de/en/

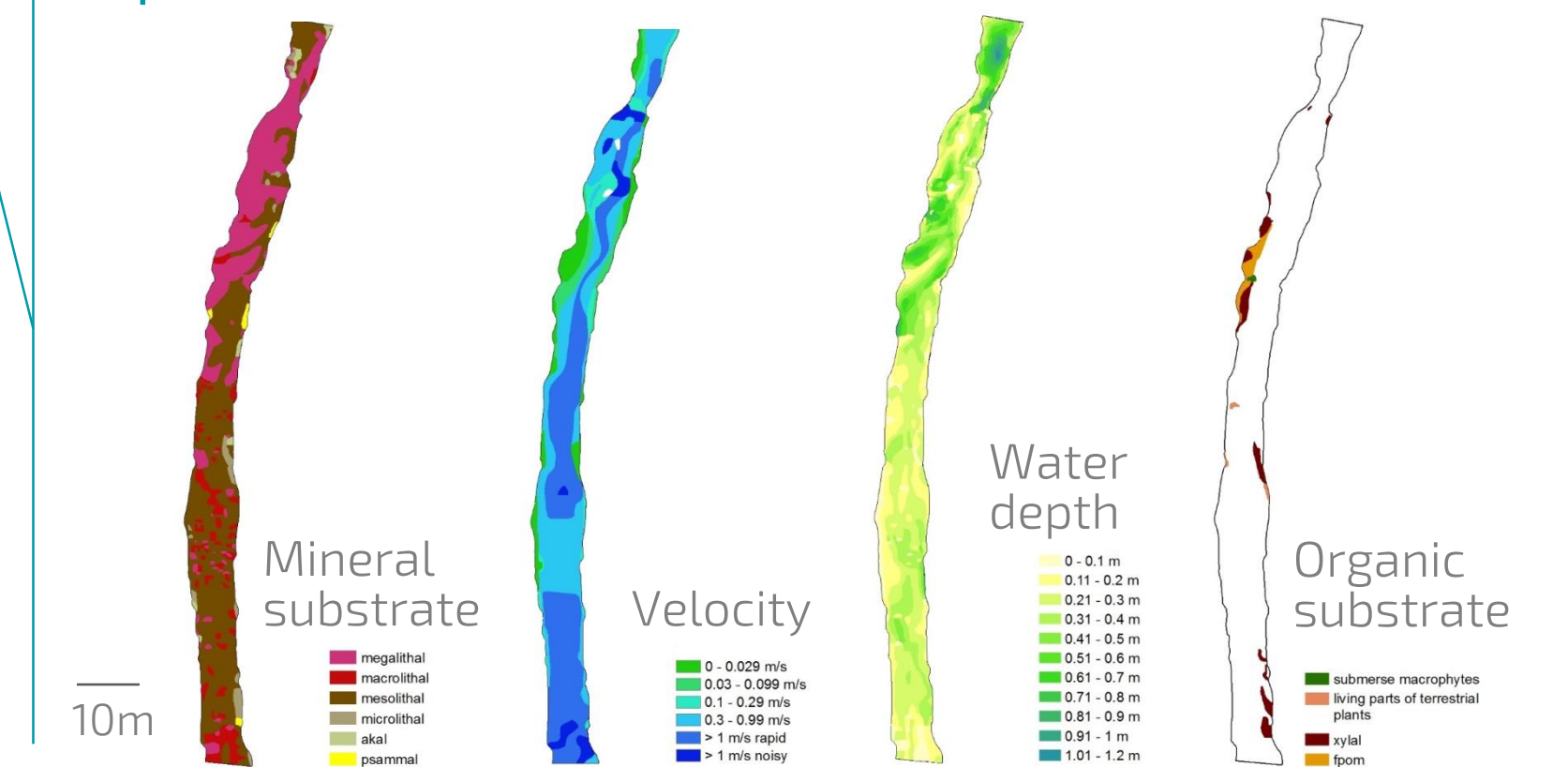


Seasonal temperature scenario

<http://luadb.lids.nrw.de/LUA/hygon/pegel.php>



Spatial habitat scenario



Validation examples

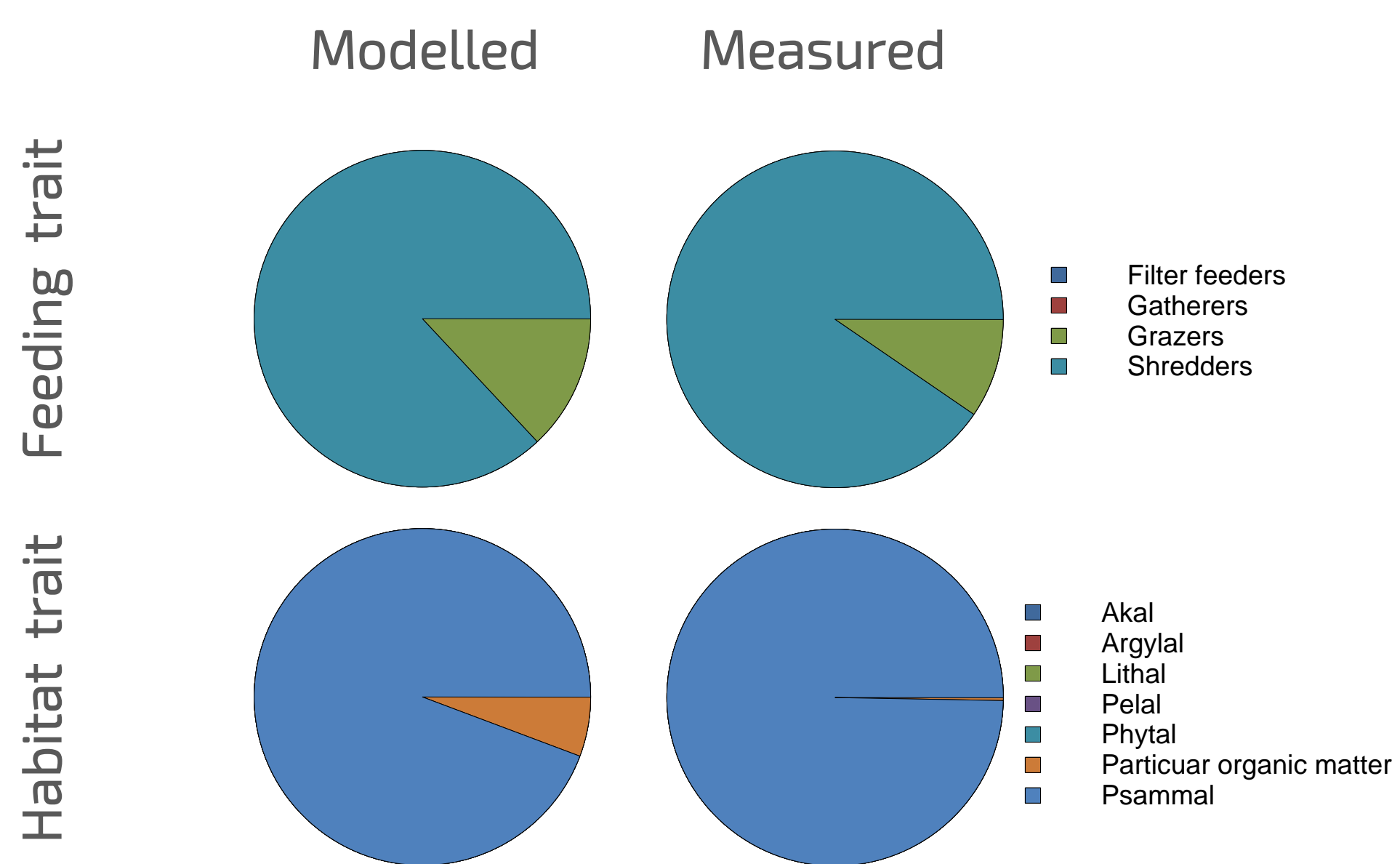


Figure: Simulated and field trait community composition for an upland stream section.

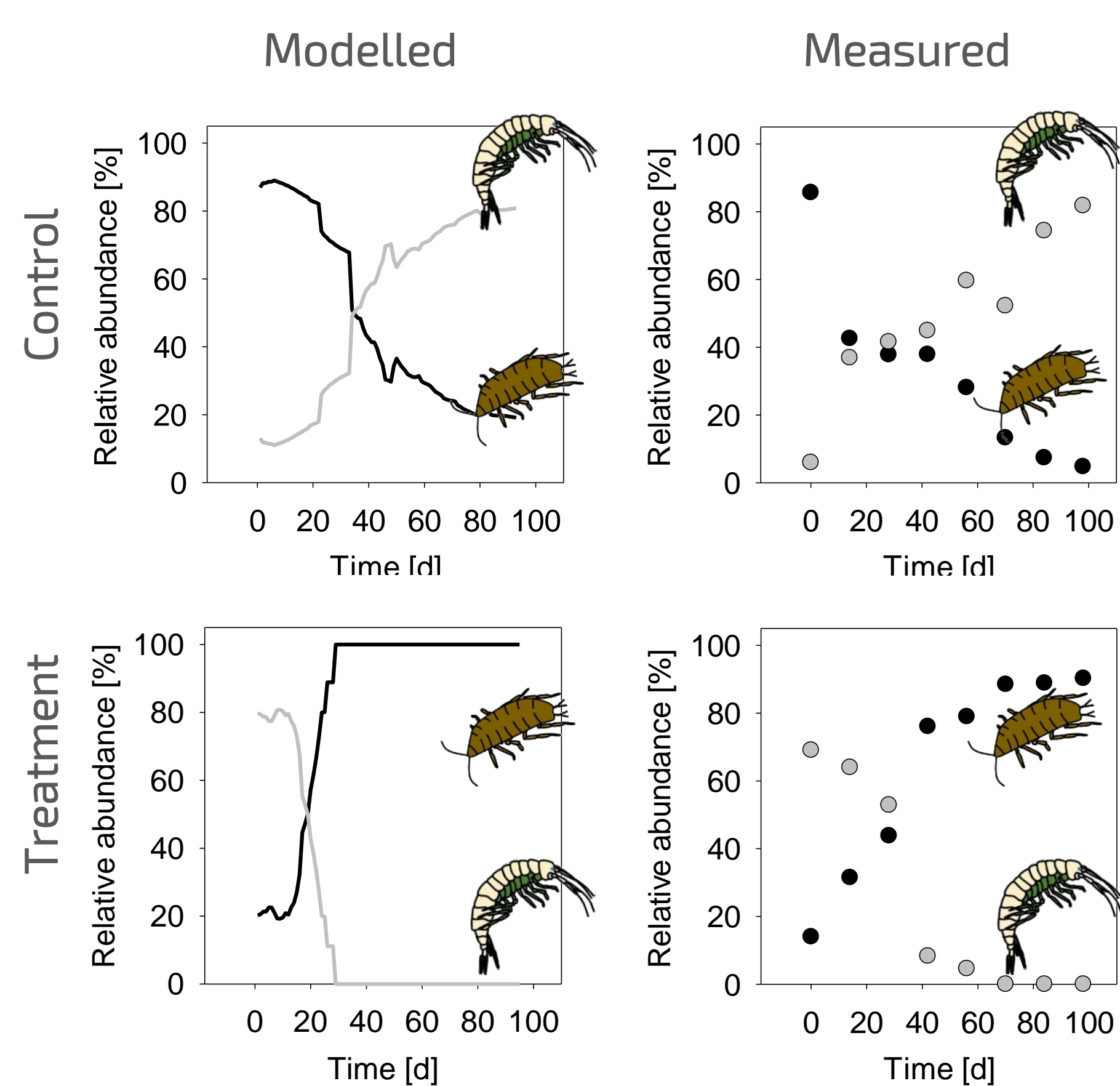
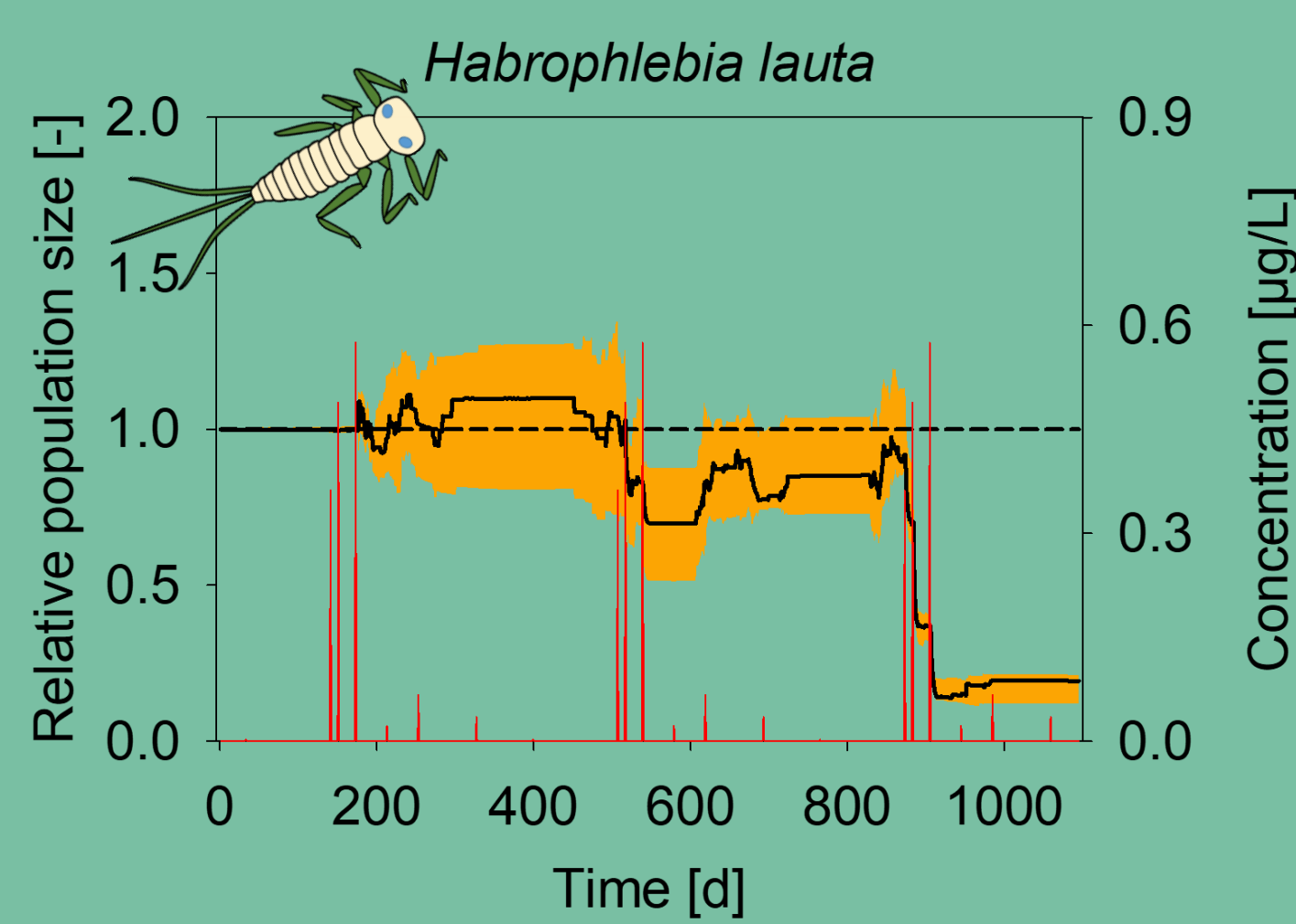


Figure: Simulated and stream mesocosm dynamics of amphipods and isopods in a control system and upon chlorpyrifos exposure. For simulations, the STREAM:com model was integrated with the General Unified Threshold model of Survival. Data: Eaton et al. (1985). Aquatic Toxicology and Hazard Assessment, Eighth Symposium, ASTM STP 891, 85-118.

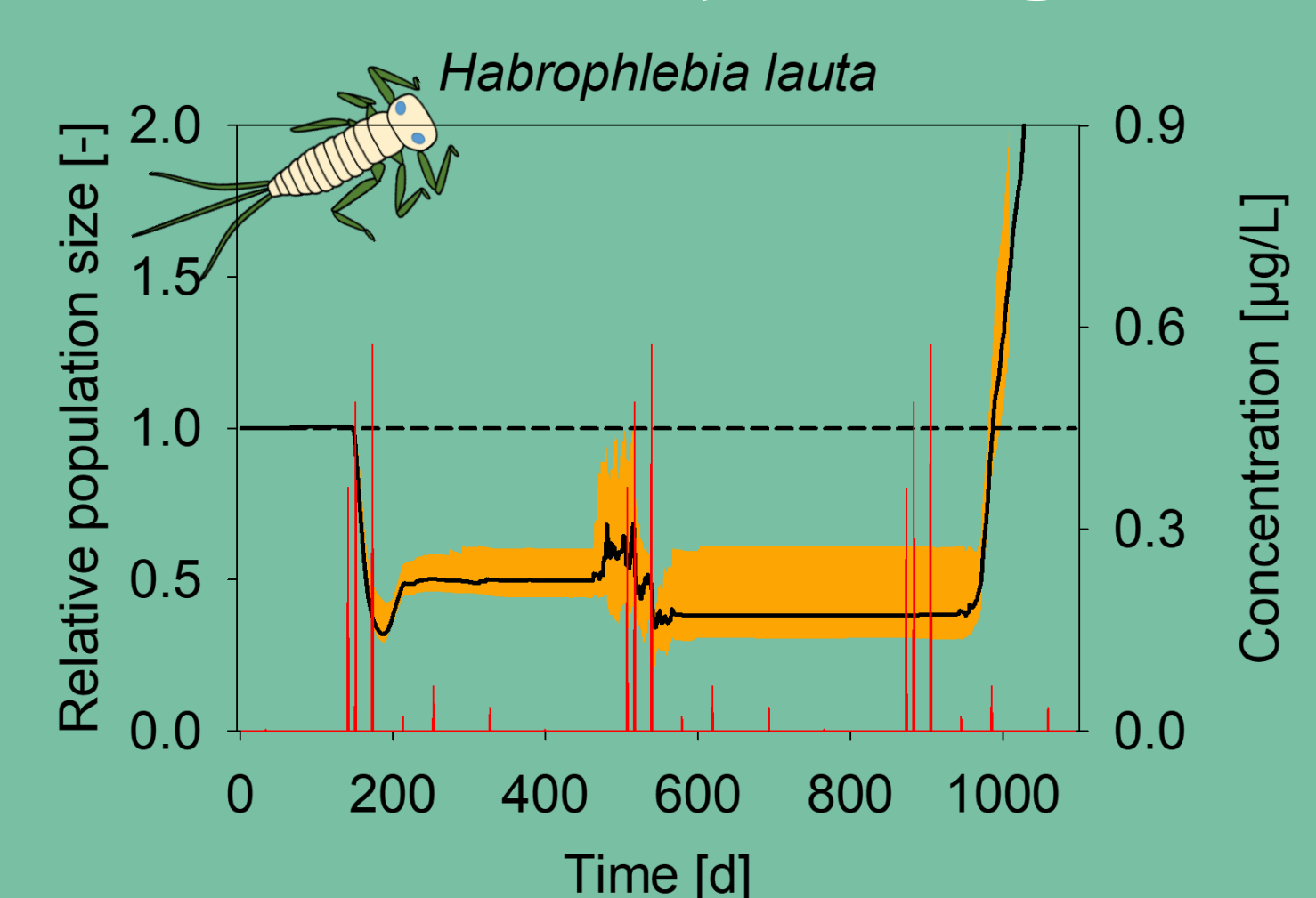
Scenario analysis

Figures: Simulated population sizes in chlorpyrifos treatment relative to control for an upland stream section. Different settings were used: a single population of *Habrophlebia lauta*, a *H. lauta* population under predation by *Salmo trutta* and *H. lauta* population in a community setting considering interspecific competition. Exposure concentrations derived from FOCUS-R1 Step 4 calculations, and multiplied by a factor of 270.

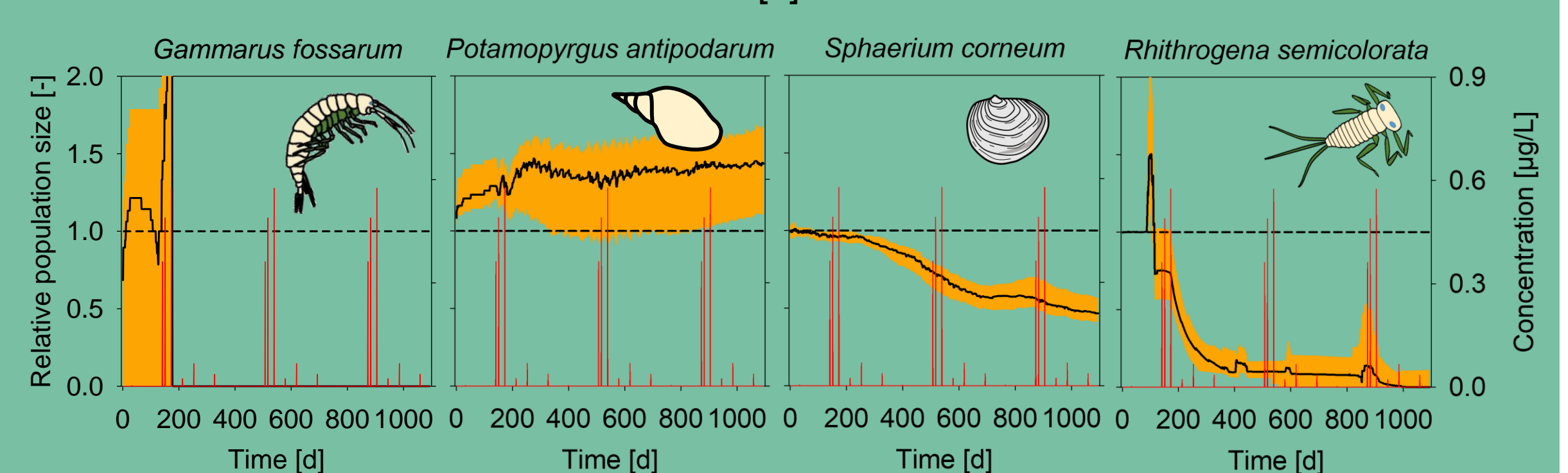
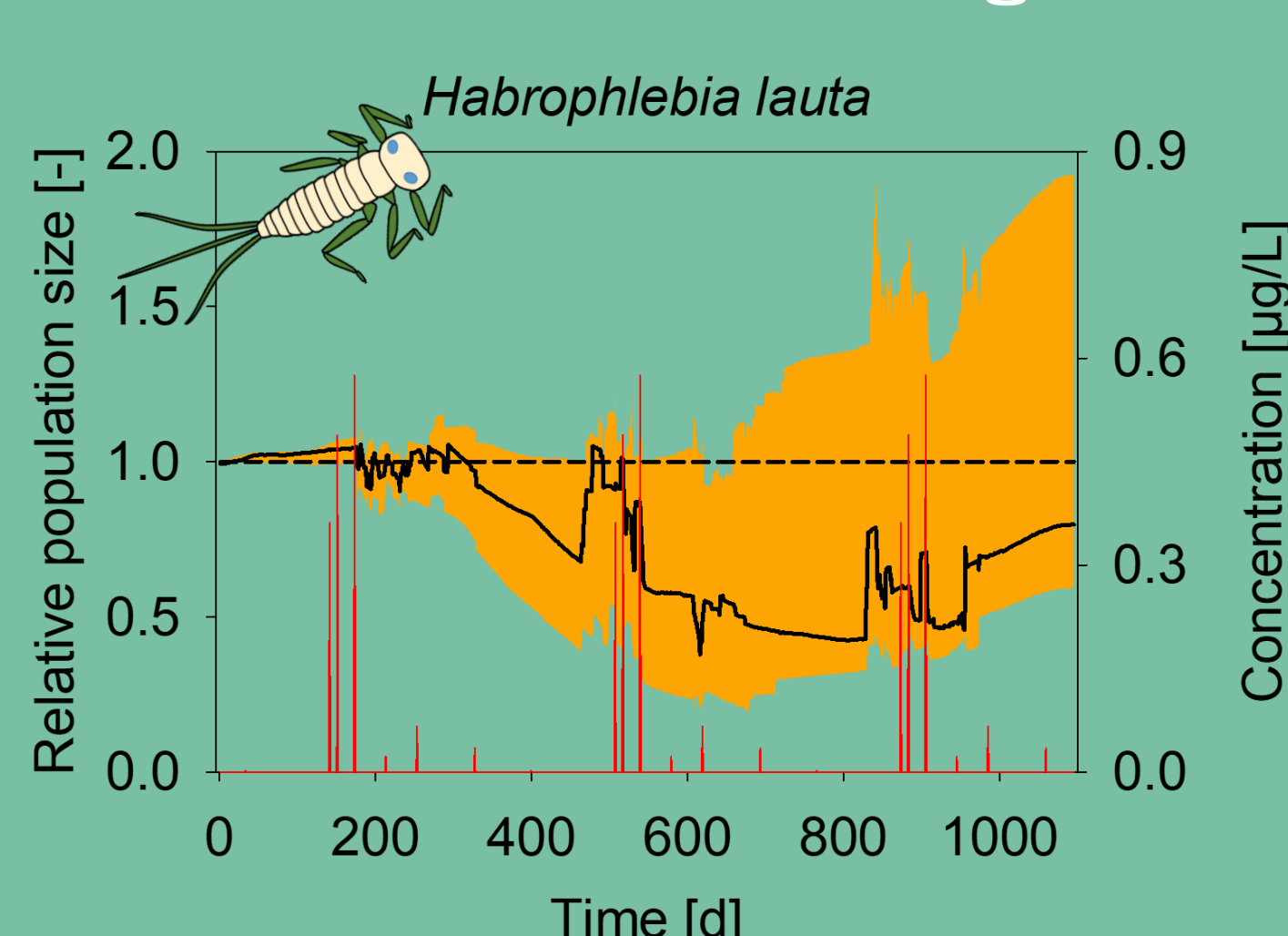
Single population setting



Community setting



Predation setting



— Model predictions (25, 50, 75 percentiles)
— Exposure concentration

- Biotic interactions, such as competition and predation, can considerably add to the chemical effect at higher biological levels.
- The STREAM:com model allows the quantification of this multiple stressor effect based on scenario analyses.