Assessing Chronic Effects of Chemical Pollution on Biodiversity Using Mean Species Abundance Relationships

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Introduction

- Long-term effects of **chemical pollution** on **biodiversity** need to be assessed further
- Prediction of **Species Sensitivity Distributions (SSDs)** is possible with the presented methodology
- Methodology was extended to arrive at **Mean Species Abundance (MSA)**
- The Mean Species Abundance Relationship (MSAR) **links biodiversity to chemical concentration**
- **Predicting MSARs for chronic levels** provides insights into long-term impacts on species number
- **Predictive tool** to estimate chronic effects based on acute data is presented

Material and Methods

- Validated with data from a case study with 6 freshwater arthropods exposed to imidacloprid

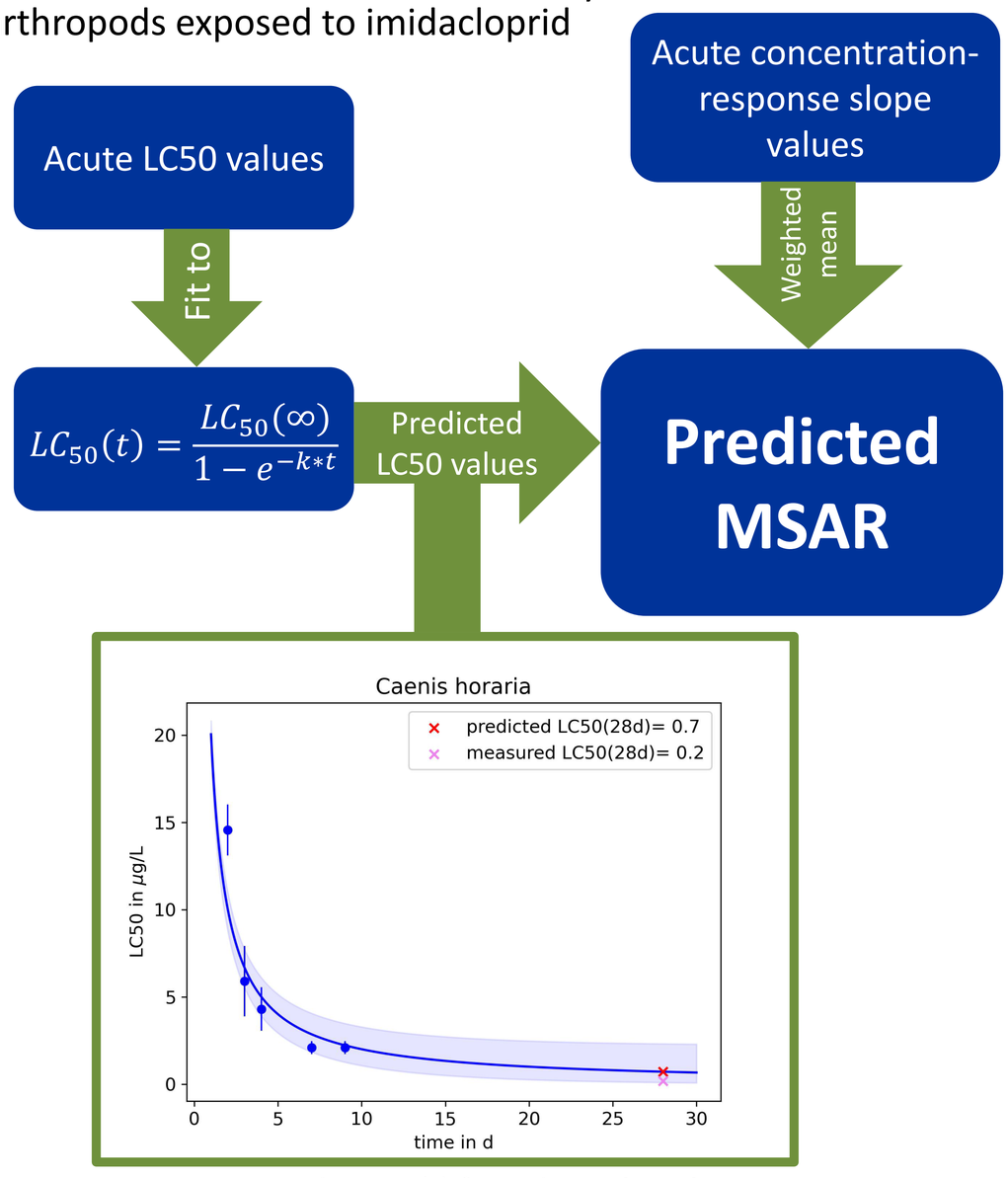

Figure 1: Example LC50(t) fit with predicted vs. measured LC50 values for day 28

Results

- Predictions show similar curves compared to the calculated MSARs & 1-PAF
- Predictions underestimate the effect of imidacloprid
- Confidence Intervals (CIs) overlap completely with calculated MSARs
- Mean difference between calculated and predicted MSAR:
  - 21 days: 6%
  - 28 days: 6%
- Calculated MSARs lay below 1-PAF

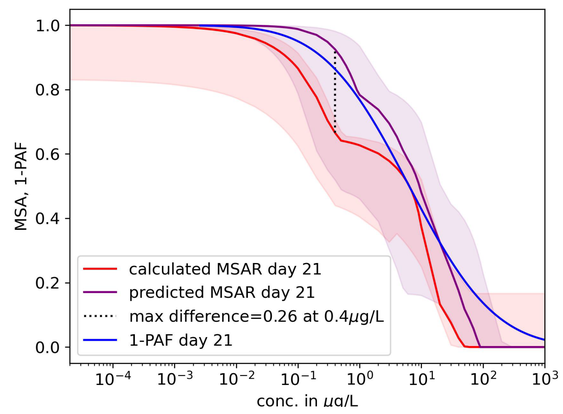

Figure 2: Predicted MSAR vs. Calculated MSAR & 1-PAF for day 21

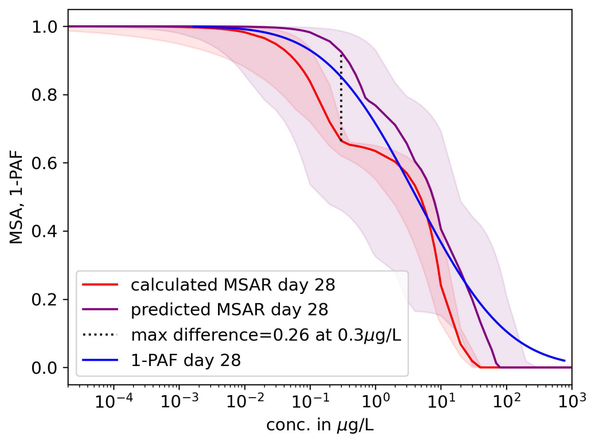

Figure 3: Predicted MSAR vs. Calculated MSAR & 1-PAF for day 28

Discussion

- MSARs could be a better indicator for the effect of chemicals than the 1-PAF
- MSAR also includes reproduction
  - No EC50 data available
- Chronic LC50 prediction accuracy is species dependent
- Imidacloprid biotransforms into imidacloprid-olefin
  - Is hypothesized to bind irreversible
  - Accuracy of prediction could be affected
- Chronic effect of imidacloprid on MSA still observable in prediction

Conclusion

- Predictions were able to represent the calculated MSARs with a mean difference of 6%
- Uncertainty should be taken into account for risk assessment
- Testing on more species and chemicals is advised

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Funded by the European Union

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