Experiences from a suite of higher-tier laboratory tests on aquatic larvae of four potentially-sensitive insects, and an amphipod, with the aim of comparing sensitivity to an insecticide

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Cambridge Environmental Assessments

Celebrating 15 Years 2001-2016

Structure

- Background
- Selection of taxa for tests
- Sources of organisms
- Test design and method
- Results
- Conclusions

Background

- EU Aquatic Guidance Document (2013):
  - Microcosm studies aka 'model-ecosystem' experiments
  - Potentially sensitive and vulnerable invertebrate species included for acceptable and protective risk assessments
  - e.g. **E**phemeroptera, **P**lecoptera, **T**richoptera (EPT), Amphipoda
  - All taxa may not be represented in a particular microcosm study
  - Option: '**Refined exposure studies with additional test species**'
- A series of higher-tier lab tests to reduce uncertainty in **R**egulatory **A**cceptable **C**oncentration

Which taxa were most sensitive to the tested insecticide?

Selection of Taxa for Tests

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Diptera	Amphipoda	Plecoptera	Megaloptera	Trichoptera
Chaoborus sp.	Crangonyx	Stonefly	Alderfly	Caddis

Previously-tested in microcosm studies, and very sensitive. Included in tests as a 'bridge'

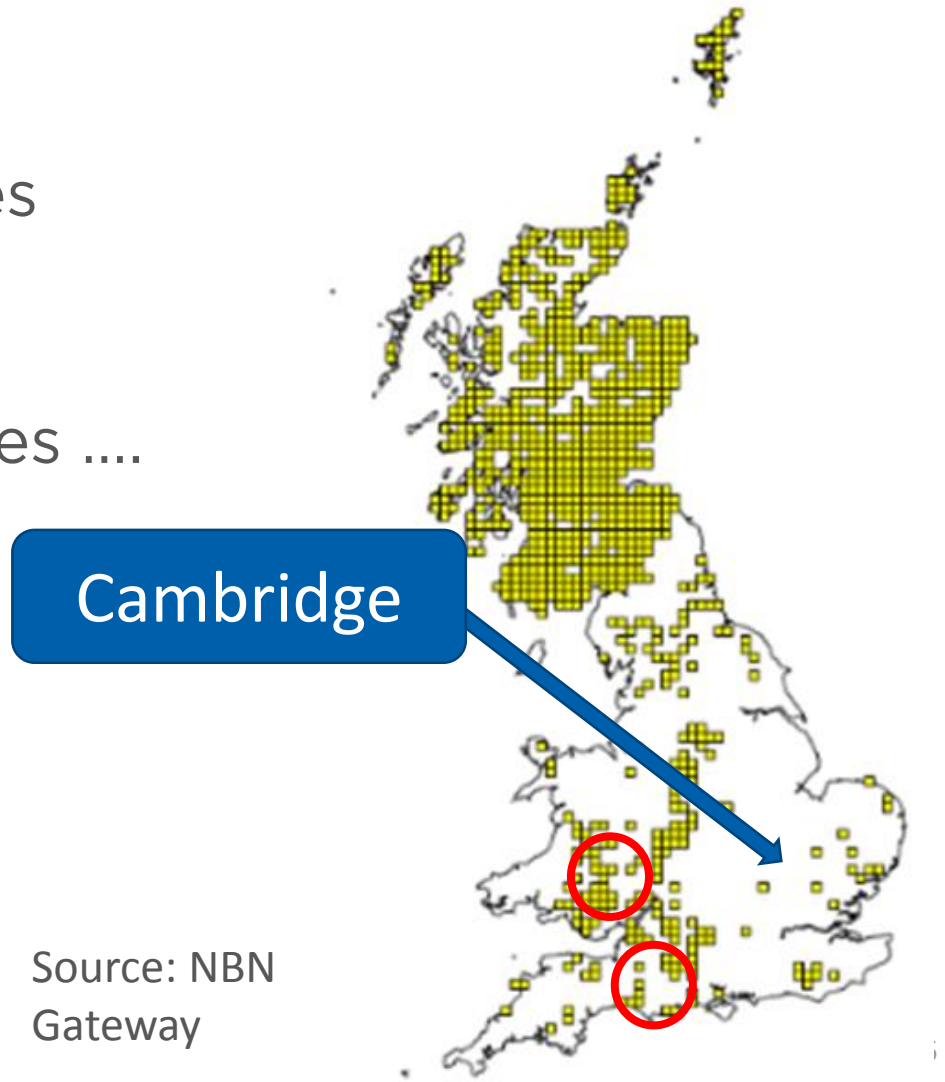
Not in previous microcosm studies; potentially sensitive/vulnerable; but actual sensitivity unknown

Sources of organisms

- *Chaoborus*, Caddis, *Crangonyx*, were available at our outdoor microcosm site but....
- Alderfly and stonefly larvae needed to be sourced from wild populations

Organism collection

- Identified sites
  - Used literature searches
  - shape maps
  - survey data
  - Visited a number of sites ….
- Stoneflies from Devon
- Alderfly from Suffolk
- Kick sampling
- Acclimatisation



Source: NBN Gateway

Test Design and Method

Realistic representation of a small water body

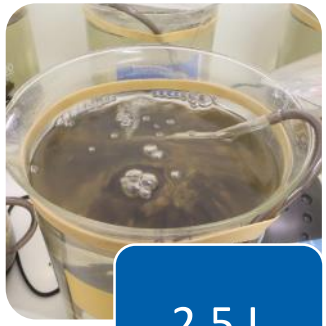
Each of the 5 taxa was tested separately
All taxa were exposed to the same insecticide concentration-series

Test Design and Method

Outdoor Microcosm

500 mL sediment

Gravel



2.5 L Water

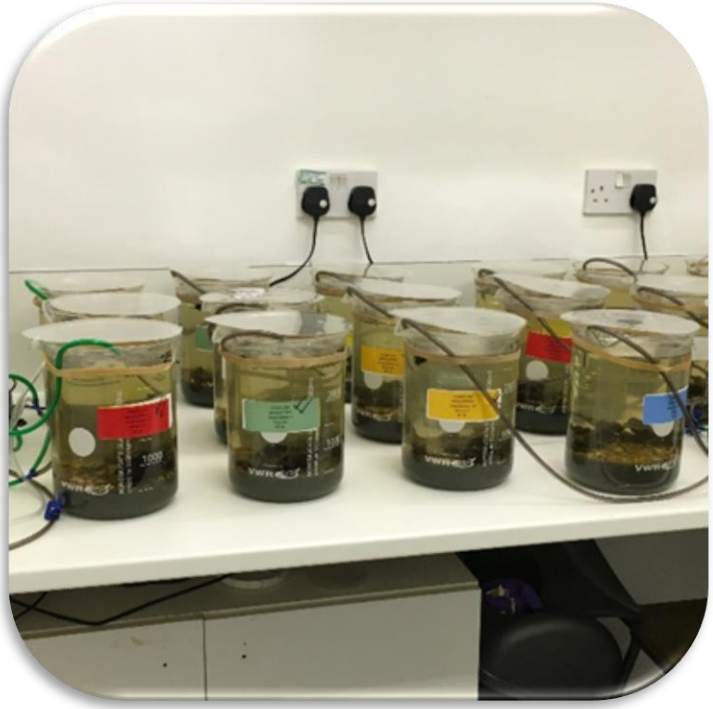
10 Organisms

Dosing

96 hrs

End of test sampling

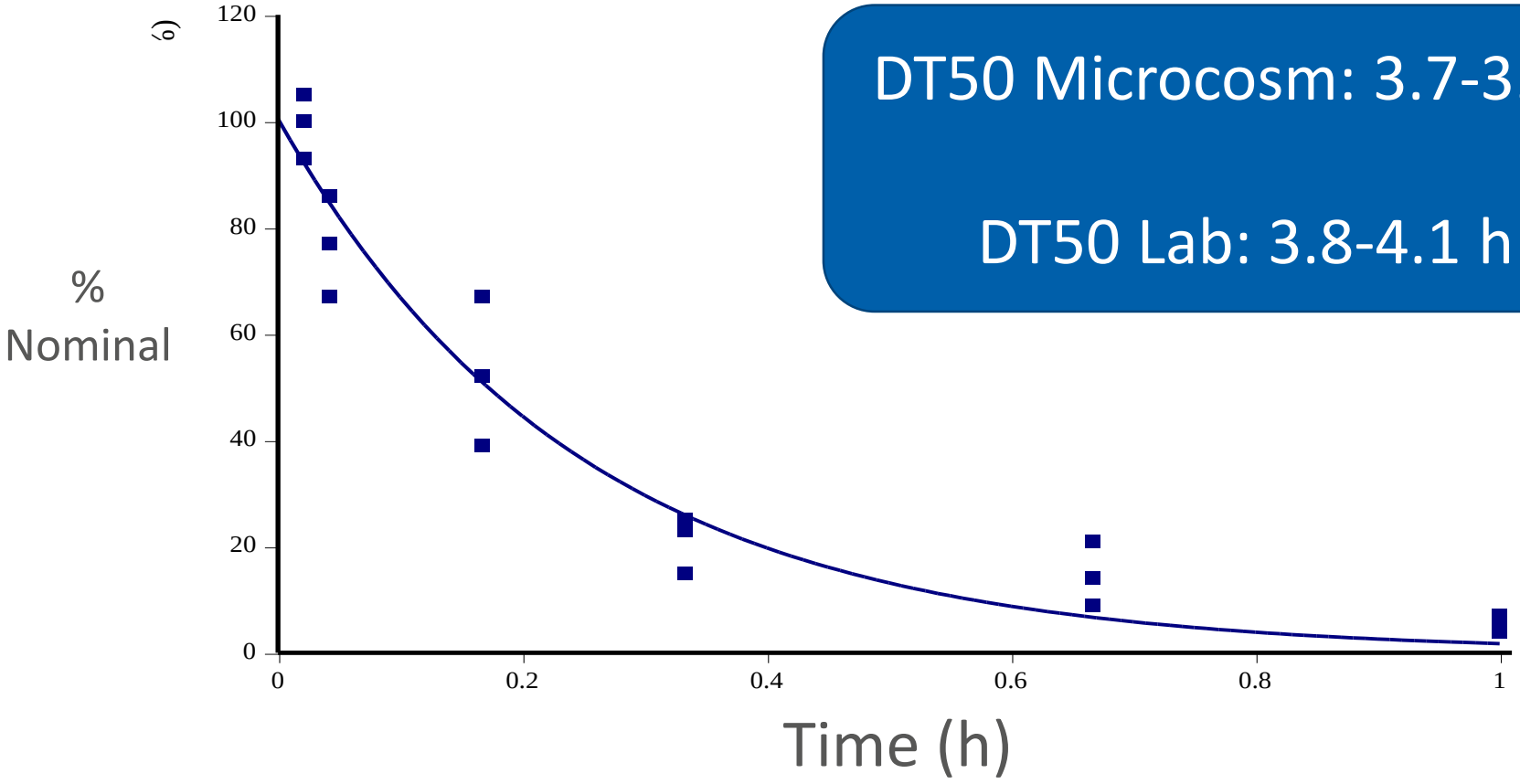
Results



1. Mortality/ immobility
2. NOEC
3. EC50/LC50 values

Comparative sensitivity

Dissipation rate and temporal exposure-profile

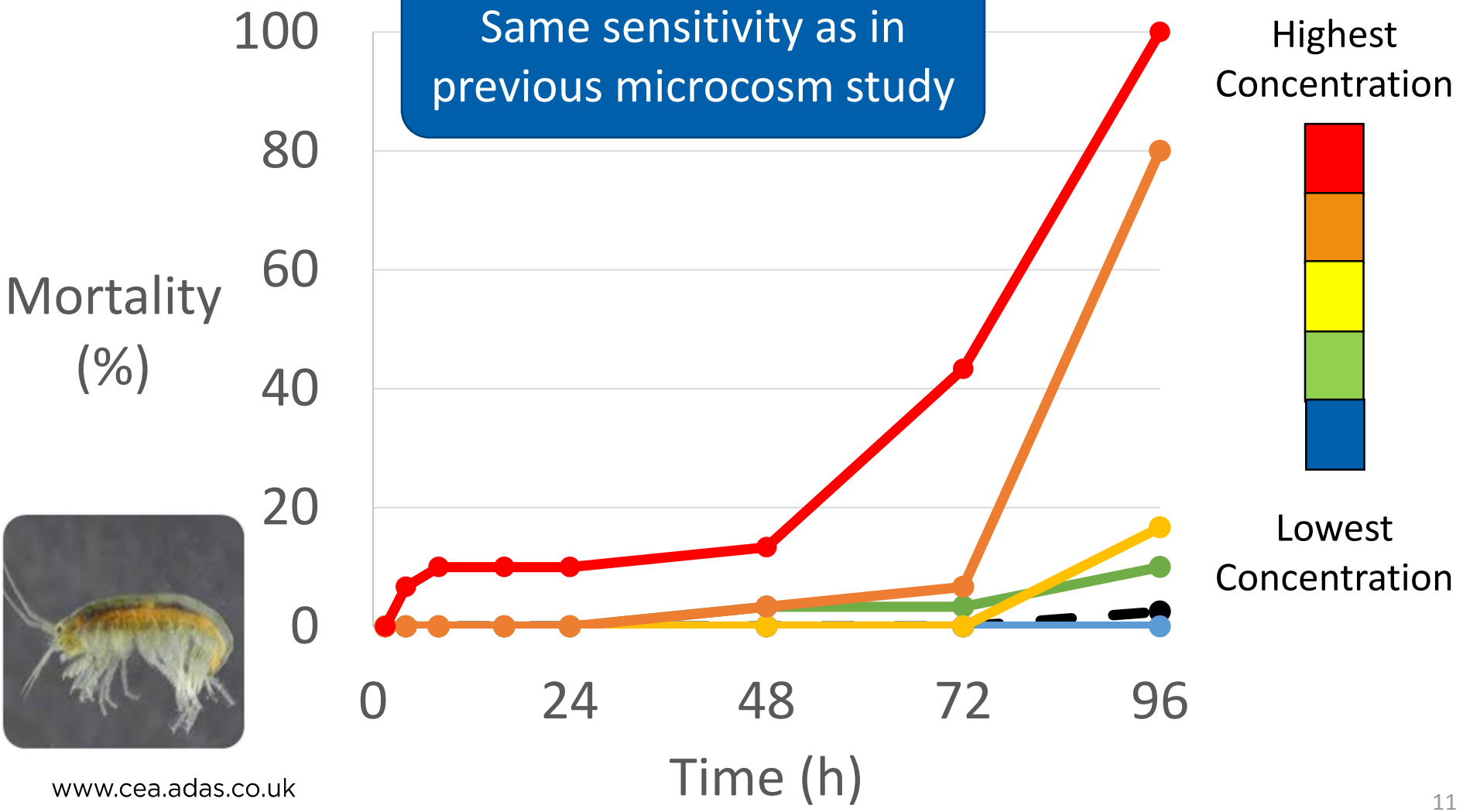


DT50 Microcosm: 3.7-3.9 h

DT50 Lab: 3.8-4.1 h

Results 1: *Crangonyx*

Same sensitivity as in previous microcosm study



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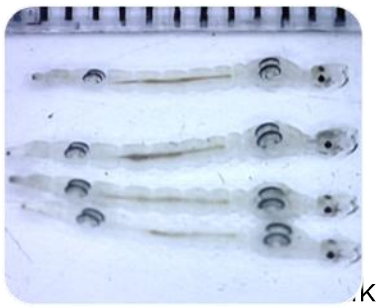
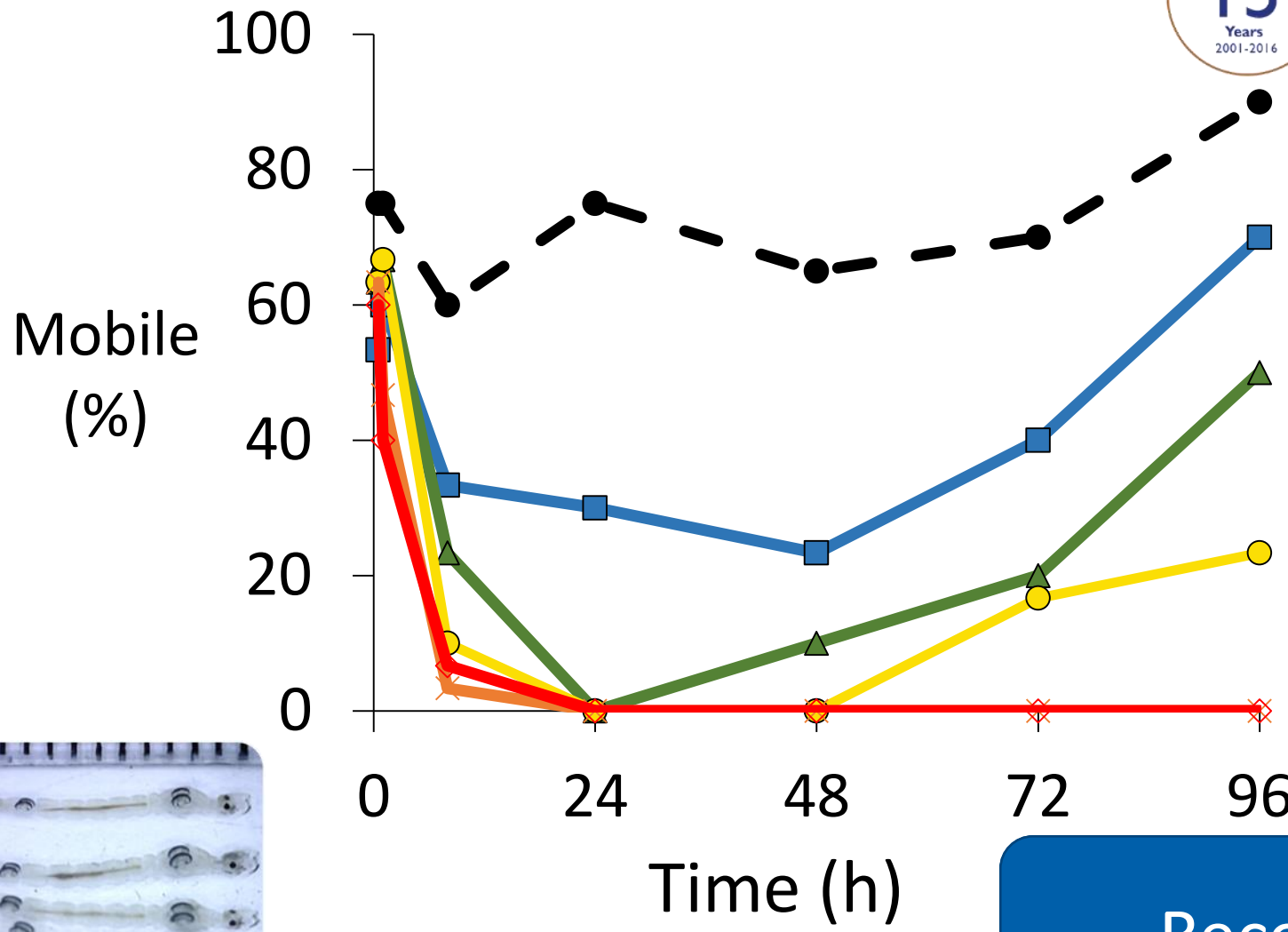
Results 2: *Chaoborus*





Highest Concentration

Lowest Concentration

Recovery

Results 3: Stonefly

Lower mortality and no clear dose related response

Mortality (%)

100
80
60
40
20
0

0 24 48 72 96

Time (h)

Highest Concentration

Lowest Concentration

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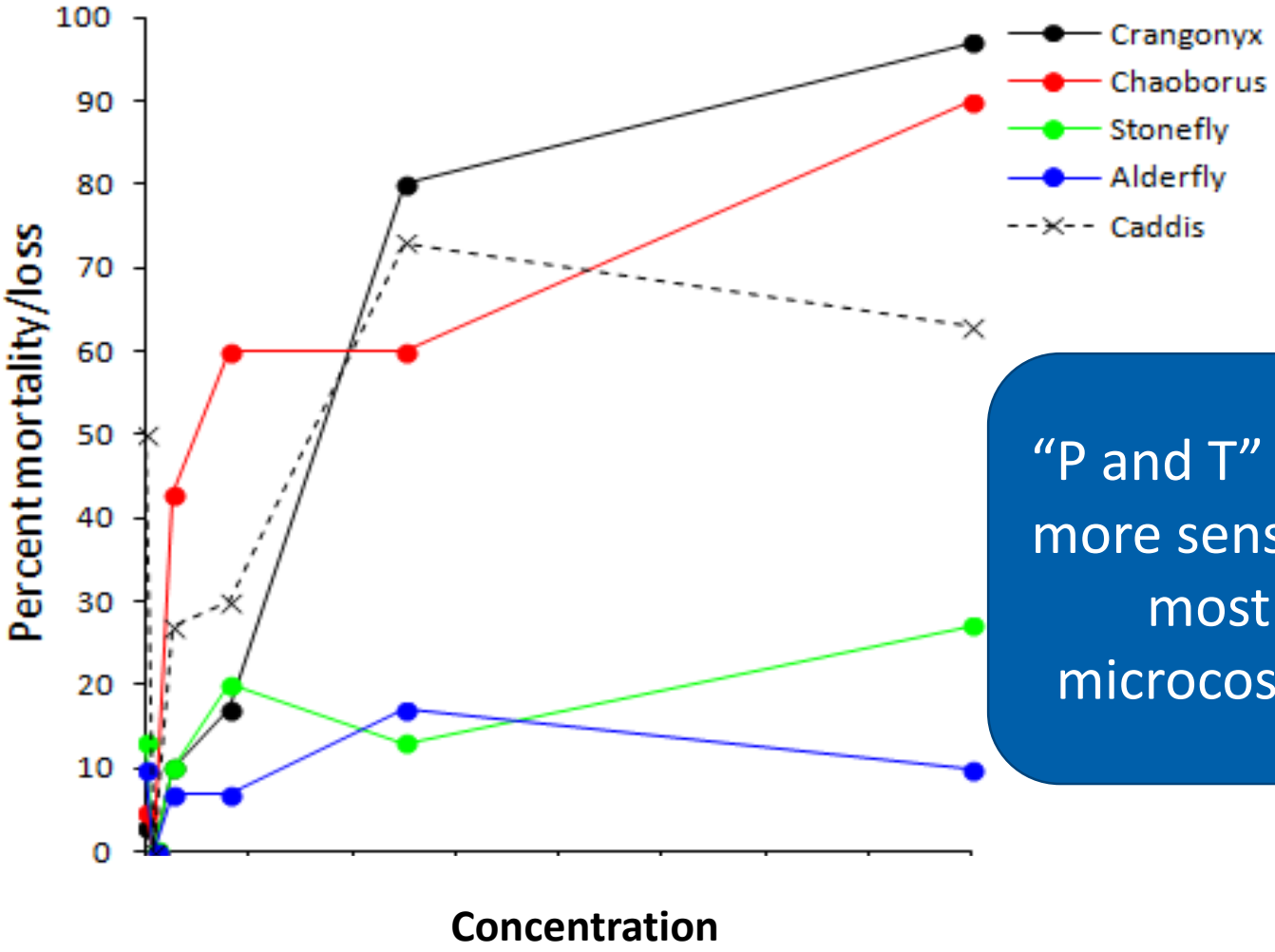
Results 4: Comparative sensitivity



"P and T" taxa were not more sensitive than the most sensitive microcosm organisms

Conclusions

- The methodology was successful in testing these non-standard test species
- Our work with a single insecticide found that the tested ‘P’ and ‘T’ taxa were not more sensitive than those more typically found in microcosms (*Crangonyx* and *Chaoborus*)
- For the tested insecticide, the results reduced uncertainty for deriving the microcosm-based Regulatory Acceptable Concentration

Contributing Scientists

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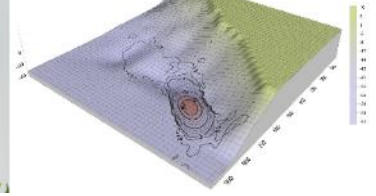
RidgewayEco
Integrating Ecotoxicology & Sustainable Crop Protection

Richard Jenkins

Steve Norman



Thank you! Any questions?

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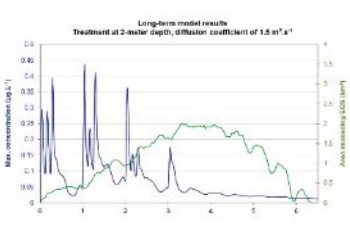
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