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Metals Bioavailability

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

Metal toxicity to macroinvertebrates in mine-affected streams, related to chemical speciation

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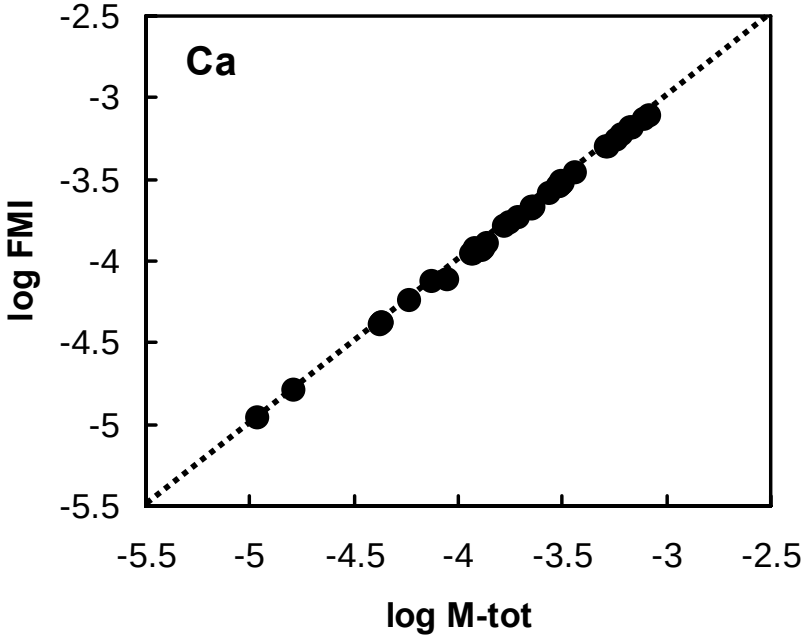
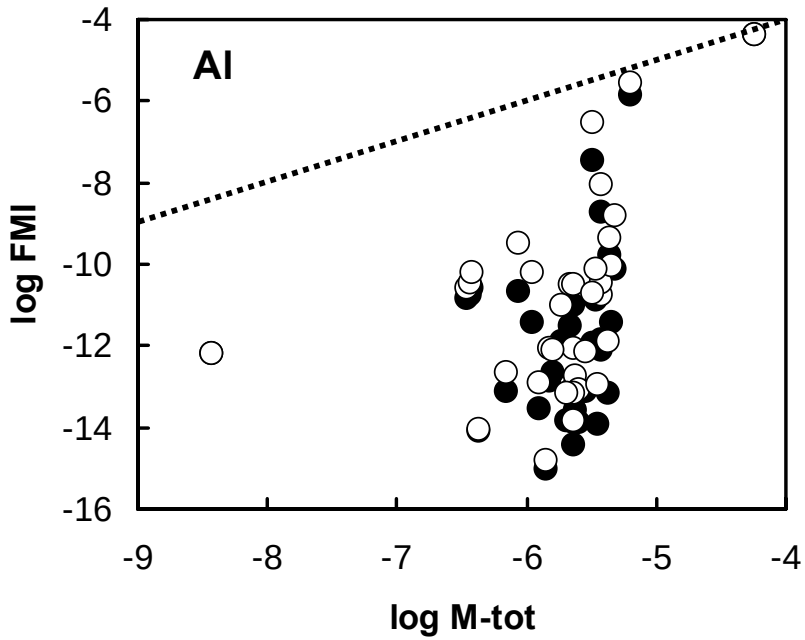
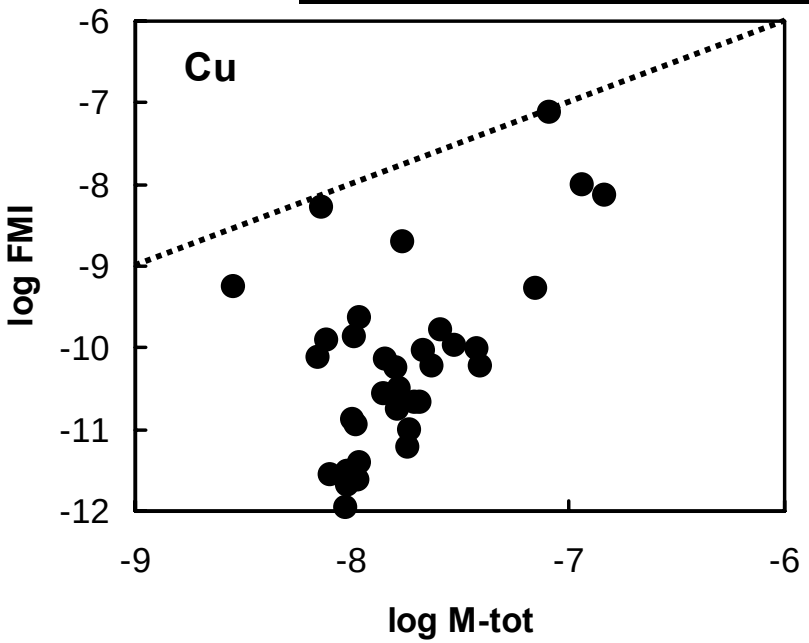
International Cadmium Association
International Zinc Association (Europe)
European Nickel Industry Association

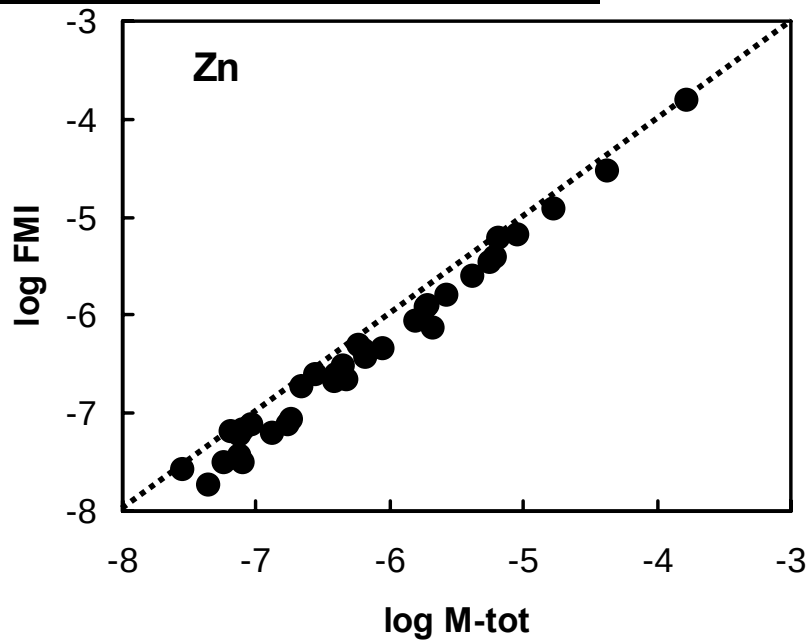

33 sites used for
toxicity evaluation
Headwaters, free of contaminants other than metals
Sampled before and during spring 2006,
for full chemistry and benthic invertebrates





Metal free ion concentrations (WHAM)

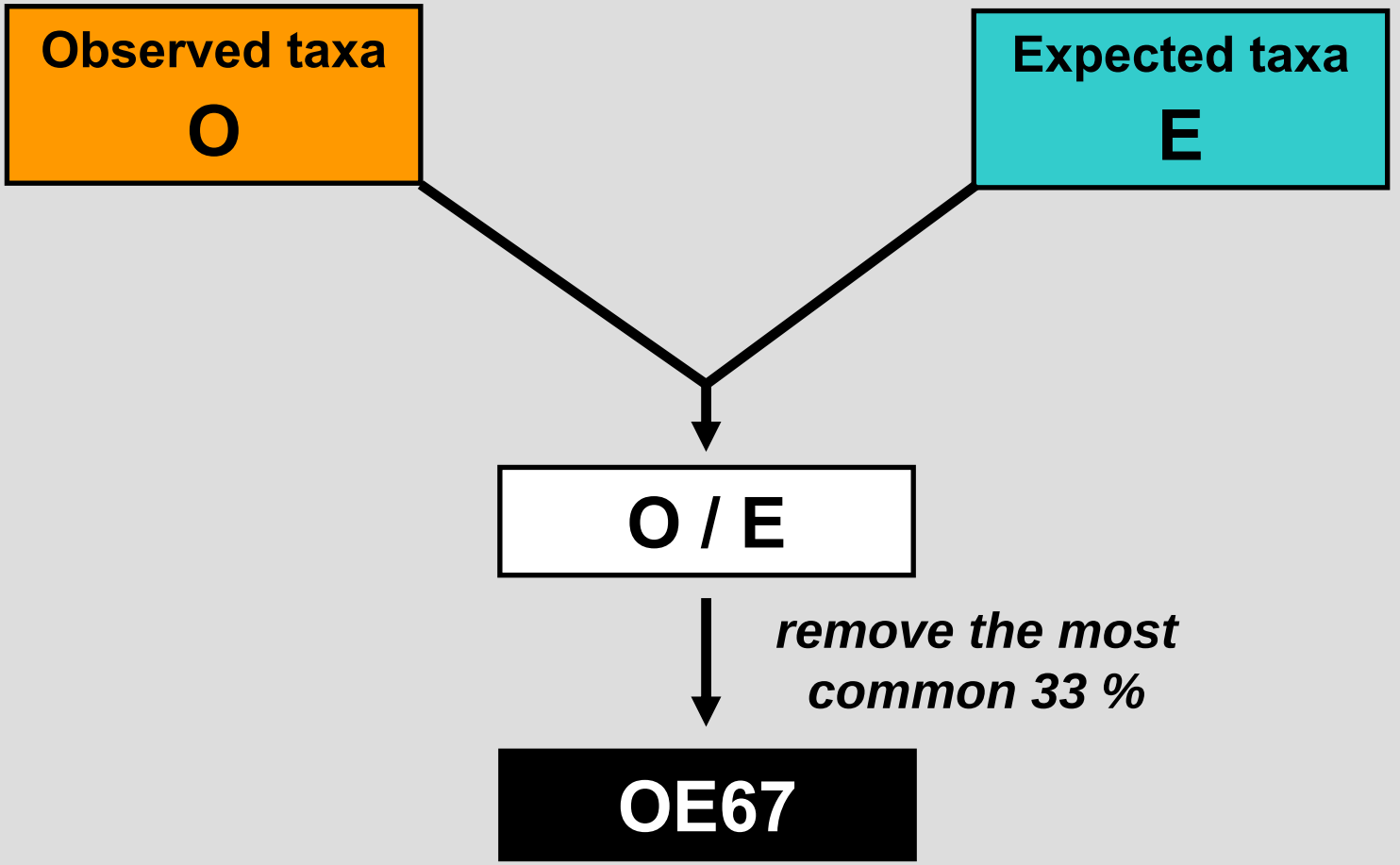




Ecological variable

OE67

River Invertebrate Prediction and Classification System (RIVPACS)



T oxicity

B inding

M odel

protons and metals bound to non-specific sites on/in the organism

estimated with WHAM

$$Ftox \equiv \alpha_H \nu_H + \Sigma \alpha_M \nu_M$$

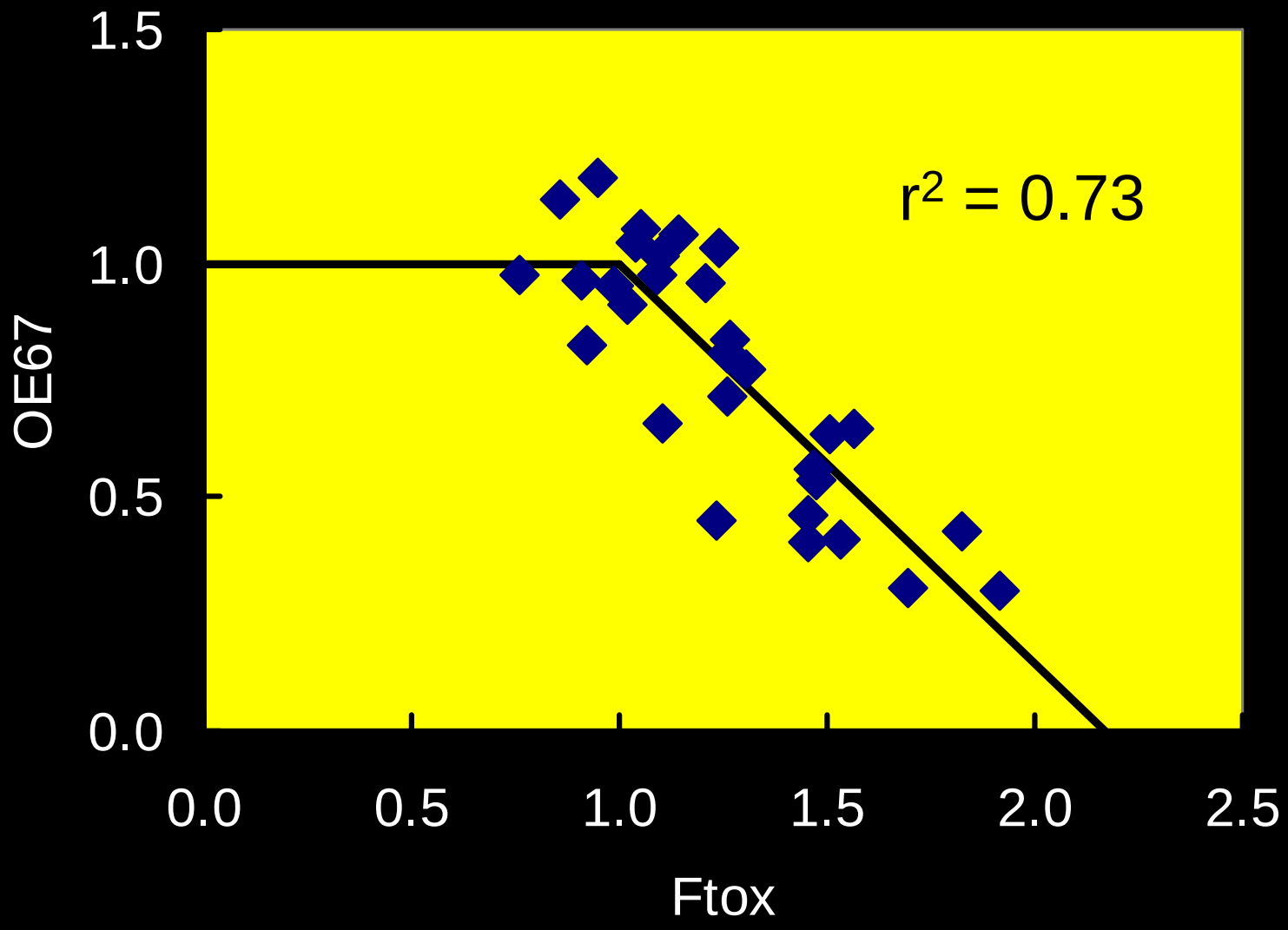
toxicity function

(linear)

toxicity coefficients

fitted to the data

TBM fitted to OE67



α_{Al}	***1.0***
α_{Cu}	**3.2**
α_{Zn}	**1.6**
α_{H}	**0.5**

Key conclusions

- Speciation-based metrics are superior to [total dissolved metal]

- Mixture effects operate (Al + Zn) or (Al + Cu + Zn + H)

- Dose-response relationships operate in the field