Functional endpoints as perspective for the definition of protection goals in regulatory ecotoxicology

Meet us at booth 25

Michael Faupel[1], Sebastian Höss[2], Arne Haegerbaeumer[3], Walter Traunspurger[3]

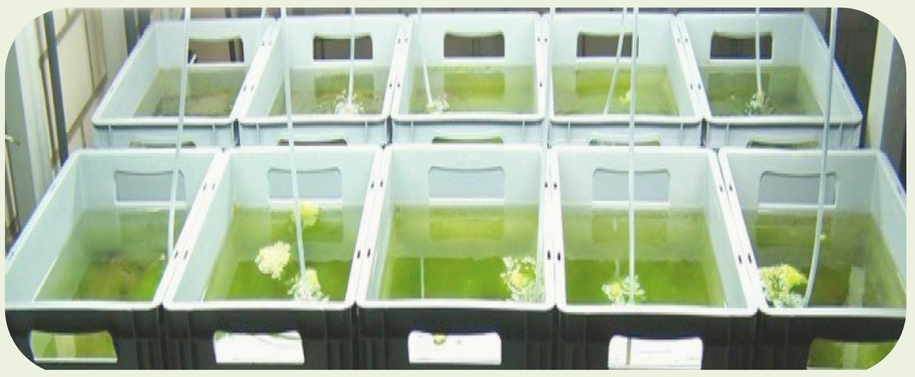
[1] RIFCON GmbH, Goldbeckstraße 13, 69493 Hirschberg, Germany (michael.Faupel@rifcon.de), [2] Ecossa, Giselastrasse 6, 82319 Starnberg, Germany, [3] Bielefeld University, Animal Ecology, Konsequenz 45, 33615 Bielefeld, Germany

Introduction

- The development of guidance documents by EFSA for regulatory ecotoxicology under regulation (EC) 1107/2009 is lacking by the definition of specific protection goals
- We provide data highlighting the importance to use structural and functional endpoints
- Data of freshwater Nematoda and Annelida, tested under metal stress in long-term indoor microcosms, is provided
- Specifically, structural parameters *abundance* and *biomass* as well as the functional parameter *secondary production* was studied

Materials and methods

- Indoor freshwater microcosms including sediment; spiked either with Cd, Cu, Ni or Zn
- Effects on benthos were studied against control treatments over 6-7 months
- Abundance was determined by direct counts
- Biomass was estimated based on size classes and taxon-specific parameters
- Secondary production was determined based on size classes and development times



Results

Tab. 1: Differences in sensitivities of structural and functional endpoints of Nematoda and Annelida to model pollutants (metals)

		Abundance	Biomass	Secondary Production	Test Substance	Reference
	**Nematoda**	III	I	II	Cd	Faupel et al., 2011 and 2012; Faupel and Traunspurger, 2012
		II	III	III	Zn	Haegerbaeumer et al., 2016
		III	II	I	Cu	Haegerbaeumer et al., 2018
	**Annelida**	II	III	I	Cd	Faupel et al., 2011 and 2012; Faupel and Traunspurger, 2012
		I	II	III	Zn	Haegerbaeumer et al., 2017
		II	III	III	Ni	Haegerbaeumer et al., 2017
		I	II	II	Cu	Haegerbaeumer et al., 2017

Sensitivity ranking (relative) for each study: I (high sensitivity) II (medium sensitivity) III (low sensitivity)

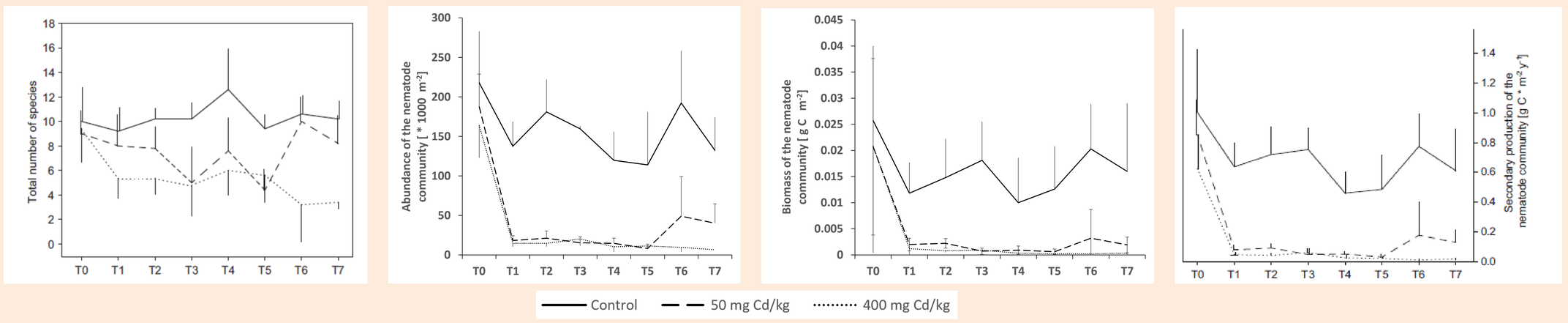


Fig. 1: Sensitivity of Nematoda towards Cd stress (No. of species, abundance, biomass, secondary production)

Regulatory Conclusion

- Structural and functional endpoints show different sensitivities
- The concurrent investigation of structural and functional endpoints give insight into general ecosystem functioning
- Functional endpoints can complement structural endpoints and should be considered in the definition of specific protection goals

REFERENCES

Faupel, M. et al. 2011 *Biomass estimation across the benthic community in polluted freshwater sediment—a promising endpoint in microcosm studies? Ecotoxicology and Environmental Safety 74, 1942–1950*
Faupel, M. et al. 2012 *The functional response of a freshwater benthic community to cadmium pollution. Environmental Pollution 162, 104–109*
Faupel, M. and Traunspurger, W. 2012 *Secondary production of a zoobenthic community under metal stress. Water Research 46, 3345–3352*
Haegerbäumer, A. et al. 2016 *A comparative approach using ecotoxicological methods from single-species bioassays to model ecosystems. Environmental Toxicology and Chemistry 35 (12): 2987–2997*
Haegerbäumer, A. et al. 2017 *The use of meiofauna in freshwater sediment assessments: Structural and functional responses of meiobenthic communities to metal and organic contamination. Ecological Indicators 78: 512–525*
Haegerbäumer, A. et al. 2018 *Response of nematode communities to metals and PAHs in freshwater microcosms. Ecotoxicology and Environmental Safety 148: 244–253*