JEP> Vol.3 No.7, July 2012

OPEN ACCESS

Active *in Situ* Biomonitoring of Pesticide Pulses Using *Gammarus* spp. in Small Tributaries of Lake Constance

PDF (Size:663KB) PP. 573-583 DOI: 10.4236/jep.2012.37069

Author(s)

Almut Gerhardt, Margie Koster, Frank Lang, Vera Leib

ABSTRACT

Gammarids are important members of a stream ' s macrozoobenthos biocoenosis and food web. Moreover, they proved to be very sensitive towards different types of pollution. GamTox^{TM} is a new *in situ* ecotoxicity test, based on survival and feeding behavior of caged gammarids for active monitoring of small streams in agricultural areas. GamTox^{TM} has been applied in two streams with specific pollution problems in the catchment of Lake Constance. Ten organisms were exposed in 5 replicates in flow through test tubes containing one conditioned alder leaf, placed in baskets which were attached in the stream bottom and on the banks. Each week, the number of living animals was counted, the percentage of leaf skeletized estimated in semi-quantitative classes and a new elder leaf provided. Dead organisms were removed. Simultaneously, chemical analyses of pesticides and nutrients (N-compounds, P) were performed on cumulative water samples over one week. Moreover, macrozoobenthos was collected and determined according to the IBCH method, and the SPEAR index calculated. GamTox^{TM} proved to be very sensitive to detect pesticides, copper as well as nutrients, both during acute pollution pulses and chronic exposures of up to 6 weeks. Survival turned out to be a more sensitive and less variable parameter than feeding. GamTox^{TM} is easy to perform and directly provides a measure of ecotoxicological effects of toxicant/nutrient mixtures, which cannot be predicted by biological indices based on macrozoobenthos data such as IBCH and SPEAR-index. This study was co-financed by the InterReg IV project " Ökotoxikologischer Index im Bodenseeraum ", no. 227 (2011-2013) supported by the EFRE.

KEYWORDS

Active Biomonitoring; Gammarus; Field Test; Ecotoxicology

Cite this paper

A. Gerhardt, M. Koster, F. Lang and V. Leib, "Active *in Situ* Biomonitoring of Pesticide Pulses Using *Gammarus* spp. in Small Tributaries of Lake Constance," *Journal of Environmental Protection*, Vol. 3 No. 7, 2012, pp. 573-583. doi: 10.4236/jep.2012.37069.

References

[1] A. Gerhardt, L. Janssens de Bisthoven and A. M. V. M. Soares, " Macroinvertebrate Responses to Acid Mine Drainage: Community Responses and Online Behavioural Toxicity Bioassay, " Environmental Pollution, Vol. 130, No. 2, 2004, pp. 263-274. doi:10.1016/j.envpol.2003.11.016

[2] A. Gerhardt, L. Janssens de Bisthoven and A. M. V. M. Soares, " Evidence for the Stepwise Stress Model: Gambusia holbrooki and Daphnia magna under AMD and ACID Stress, " Environment Science & Technology, Vol. 39, No. 11, 2005, pp. 4150-4158. doi:10.1021/es048589f

[3] A. Gerhardt, " GamToxTM: A Low-Cost Multimetric Ecotoxicity Test with Gammarus spp. for in and ex situ Application, " International Journal of Zoology, 2011, Article ID: 574536.

[4] M. Bundschuh, J. P. Zubrod and R. Schulz, " The Functional and Physiological Status of Gammarus fossarum Exposed to Secondary Treated Waste Water, " Environmental Pollution, Vol. 159, No. 1, 2011, pp. 244-249. doi:10.1016/j.envpol.2010.08.030

[5] O. Geffard, A. Chaumot, B. Ferrari and B. Montuelle, " Les Expérimentations in Situ: Principes et Perspectives, " Sciences Eaux et Territoires, Vol. 1, 2010, pp. 20-25.

- Open Special Issues
- Published Special Issues
- Special Issues Guideline

JEP Subscription

Most popular papers in JEP

About JEP News

Frequently Asked Questions

Recommend to Peers

Recommend to Library

Contact Us

[6] M. Bloor and C. J. Banks, “An Evaluation of Mixed Species in Situ and ex situ Feeding Assay: The Related Responses of Asellus aquaticus and Gammarus pulex,” Environment International, Vol. 32, No. 1, 2006, pp. 22-27.

[7] L. Maltby, S. A. Clayton, R. M. Wood and N. McLoughlin, “Evaluation of the Gammarus pulex in Situ Feeding Assay as a Biomonitor of Water Quality: Robustness, Responsiveness and Relevance,” Environmental Toxicology & Chemistry, Vol. 21, 2002, pp. 361-368. doi:10.1897/1551-5028(2002)021<0361:EOTGPI>2.0.CO;2

[8] P. Kunz, C. Kienle and A. Gerhardt, “Gammarus spp. in Aquatic Ecotoxicology and Water Quality Assessment: Towards Integrated Multilevel Tests,” Environmental Toxicology & Chemistry, Vol. 205, 2010, p. 76.

[9] A. J. Garmendia Tolosa and B. Axelsson, “Gammarus, Their Biology, Sensitivity and Significance as Test Organisms,” Swedish Environmental Research Institute, Stockholm, 1993.

[10] A. Gerhardt, “Biomonitoring of Polluted Waters-Reviews on Actual Topics,” TTP, Zürich, 1999.

[11] A. Gerhardt, “Gammarus spp., Rückgang oder Fehlen von Bachflohkrebsen (Gammarus spp.) in B?chen,” AquaPlus, 2010.

[12] R. Coulaud, O. Geffard, B. Xuereb E. Lacaze, H. Quéau, J. Garric, S. Charles and A. Chaumot, “In Situ Feeding Assay with Gammarus fossarum (Crustacea): Modelling the Influence of Confounding Factors to Improve Water Quality Biomonitoring,” Water Research, Vol. 45, No. 19, 2011, pp. 6417-6429. doi:10.1016/j.watres.2011.09.035

[13] A. Alonso and J. A. Camargo, “Toxic Effects of Unionized Ammonia on Survival and Feeding Activity of the Freshwater Amphipod Eulimnogammarus toletanus (Gammaridae),” Bulletin of Environmental Contamination and Toxicology, Vol. 72, No. 5, 2004, pp. 1052-1058. doi:10.1007/s00128-004-0350-z

[14] W. H. Baur, “Gew?ssergüte Bestimmen und Beurteilen” Paul Parey, Hamburg, 1987.

[15] W. Reuter and L. Neumeister, “Die SCHWARZE LIste der Pestizide II,” Greenpeace, Hamburg, 2010.

[16] T. Gildemeister, “Toxikokinetische Untersuchungen von Fenoxycarb bei Ausgew?hlten Organismen,” Diplomarbeit, TU Dresden, Fakult?t Mathematik und Naturwissenschaften, Institut für Hydrobiologie, 2000.

[17] A. Gerhardt, “Monitoring Behavioural Responses to Metals in Gammarus pulex with Impedance