



Review of USB FFPW PhD thesis

First name(s), surname, titles of the PhD student: Marek Let, Dipl.-Ing.	First name(s), surname, titles of supervisor: Assoc. Prof. Dipl.-Ing. Martin Bláha, Ph.D.
Title of PhD thesis: Communities of aquatic macroinvertebrates affected by human activities	

REVIEWER:

Surname: Graf	Institution: - Institut für Hydrobiologie und Gewässermanagement (IHG), Wien, Austria
Name: Wolfram	
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Please describe your professional relationship to the PhD student: no relationship at all	Please describe your field of expertise: Ecology and taxonomy of benthic invertebrates, assessment systems

QUESTIONNAIRE

Originality, scientific importance, perspectives and impacts of results presented in the PhD thesis for basic and/or applied research

Evaluate competitiveness of the PhD thesis in the international context and compare its level with the current state of the art in the field (**extent ¼ – ½ page**):

The topics tangled within the thesis are of high relevance both on scientific and on socioeconomical level. As stated in the Introduction macroinvertebrates play a decisive role in freshwater ecosystems and are under increasing pressure by anthropogenic activities. Aquatic invertebrates contribute significantly to overall biodiversity and due to their feeding activity, they reduce organic content and purify their environment.

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he thesis contains a General Introduction followed by two published papers (Let, M., Špaček, J., Ferenčík, M., Kouba, A., Bláha, M., 2021. Insecticides and Drought as a Fatal Combination for a Stream Macroinvertebrate Assemblage in a Catchment Area Exploited by Large-Scale Agriculture. *Water* 13, 1352. and Let, M., Černý, J., Nováková, P., Ložek, F., Bláha, M., 2022. Effects of Trace Metals and Municipal Wastewater on the Ephemeroptera, Plecoptera, and Trichoptera of a Stream Community. *Biology*, 11, 648.) as well as one manuscript (Ložek, F., Let, M., Kouba, A., Buřič, M., Bláha, M., 2022. Overlooked biodiversity losses – crayfish ecto-commensals eliminated due to the establishment of an invasive species) ending with a General Discussion and Conclusions, followed by the Reference section.

The candidate and his co-authors describe within the submitted and published papers in detail effects of insecticides and drought as well as land-use characters and trace metals and wastewaters on invertebrates respectively.

The mentioned pressures and effects are well known, the innovative aspect of the published papers is the multipressure approach in these papers, which sheds a new light on combined effects. Used metrics and indices as SPEAR, functional feeding types, species number etc. are state of the art within assessment approaches and



indicated best aspects of degradation of sites based on community changes. That's a valuable contribution to applied research as the development of assessment systems within the Water-Framework-Directive of the European Union dealing with the ecological status of surface waters.

Further, a manuscript dealing with basic research focuses on the distribution of branchiopods of native and invasive crayfishes indicating a biodiversity loss of specific species associated with native organisms. The very detailed field and experimental analyses enabled to detect this so called "overlooked" loss, which might happen unnoticed in various ecosystems. Therefore, this study is all the more remarkable and should be published soon.

The publications are scientifically sound, and study design, methods and discussion are state of the art; they are of high relevance regarding applied sciences. The submitted ms contains interesting basic research on biodiversity loss based on detailed field and experimental studies.

The scientific journals have a relatively high impact factor (water 3.5; Biology 5.1, respectively).

Overall the papers are well implemented within the overall topic „Communities of aquatic macroinvertebrates affected by human activities“.

Both applied and basic research done within the framework of this thesis have a high relevance in hydrobiological and biodiversity sciences.

Elaboration of the PhD thesis, objectives of the work and deliverables

Evaluate the overall level of elaboration of the PhD thesis (structuring of the main text, comprehensibility, logicity of the chapters and their ordering) and the originality of the selected approaches to solve the objectives; evaluate publications and whether the results described correspond to objectives of the PhD thesis (extent ¼ – ½ page):

The PhD gives a rough overview on disturbances in freshwater systems and responses of benthic communities focusing on anthropogenic stressors and cover the following topics: Role of aquatic macroinvertebrates - Functional feeding groups - Anthropogenic disturbances and human-induced environmental gradients - Types of disturbances and biotic responses - Human activities and aquatic macroinvertebrates - Alterations in hydrological regime - Alterations in habitat and food resources - Changes in quality of water - Spreading of nonindigenous species and Experimental approach.

The structure of the thesis follows a logical order, anyhow some parts are not holistically interconnected and overall comprehensibility and a red line to follow up is not always given. For example the chapter "Types of disturbances and biotic responses" – although very interesting – is quite theoretical and not linked well to own results. Chapter „Experimental approach“ consists more or less of one table lacking explanation.

OVERALL COMMENTARY ON THE PhD THESIS

Please write in the box specific comments concerning the PhD thesis in extent of 1-2 pages:



In conclusion the thesis gives a rough and acceptable overview of the broad topic dealt with, but the different parts could be better interlinked and there are few shortcomings.

As disturbance is one chapter of the thesis, I miss a general introduction to ecological terms like resilience or resistance of organisms as potential responses to environmental changes.

The title „Communities of aquatic macroinvertebrates affected by human activities“ somehow suggests a close connection to assessment approaches, but this topic is hardly mentioned. Within the introductory part several responses of macroinvertebrates as examples to environmental changes are given, but well developed indicators like the manifold metrics implemented in ecological status assessment of the WFD are lacking (Birk et al. 2012: Three hundred ways to assess Europe's surface waters: An almost complete overview of biological methods to implement the Water Framework Directive. Ecol. Ind., 18: 31-41).

Within the chapter „Change in water quality“ organic pollution saprobity is largely missing (which was elaborated by two Czech scientists, Zelinka & Marvan, 1961), which has a long tradition; the relevance of table 1 within an introduction is neglectable.

The chapter „Experimental approaches and particular trade-offs“ is not well embedded within the context and explanations to table 2 are not very clear or are even missing just giving a link to literature for self-study („For insight into terminology and understanding of especially two-way (first-order) interactions between environmental variables in factorial ecological studies, I can recommend, e.g., the publication of Piggott et al. (2015)“).

Apart of these minor flaws within the framework of the thesis and taking into account that the papers were published in peer reviewed journals with high impact factors and have a profound scientific basis and a high relevance regarding applied hydrobiological issues, the thesis fulfills the scientific requirements for a PhD.



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FINAL RECOMMENDATION

- ☒ **PhD thesis can be recommended for defence**
- ☐ **PhD thesis can be recommended for defence with reservations**
- ☐ **PhD thesis cannot be recommended for defence**

7.7.2022, Vienna, Austria

Assoc Prof. Dr. Wolfram Graf