



Confidential

Review of USB FFPW PhD Thesis

First name(s), surname, titles of the PhD student: Lipták Boris, Mgr.	First name(s), surname, titles of supervisor: Dipl.-Ing. Antonín Kouba, Ph.D.
Title of PhD thesis: Non-indigenous crayfish species in Slovakia	
REVIEWER:	
Surname: Pârvulescu	Institution: Faculty of Chemistry, Biology, Geography West University of Timisoara Romania
Name: Lucian	
Titles: Dr.	E-mail: lucian.parvulescu@e-uvt.ro
Please describe your professional relationship to the PhD student: I met Boris in some conferences.	Please describe your field of expertise: Freshwater ecology, biogeography of European crayfish species, mechanisms of invasion

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):

Biological invasions in general, and invasive crayfish species expansion in Europe, in particular, represent one of the most challenging problem in nowadays ecology and conservation research fields. I found the PhD thesis entitled „*Non-indigenous crayfish species in Slovakia*” elaborated by Boris Lipták under the supervision Ing. Antonín Kouba, Ph.D. University of South Bohemia in České Budějovice, Faculty of Fisheries and Protection of Waters, Research Institute of Fish Culture and Hydrobiology, Zátiší 728/II, 389 25 Vodňany, Czech Republic being well fitted in the state of the art of biological invasions field. The author focused on the problem generated by the pet-shop trade, highlighting the amplitude and potential of the marbled crayfish for further deliberated introduction into the wild. The author brings valide arguments for those already established populations of marbled crayfish as being capable to sucessfully pass the cold season and natural breeding. More than that, the author is a pioneer in depicting the trophic position of marbled crayfish and its role in wild ecosystems.



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 most recent and challenging issues were approached by modern scientific techniques, including stable isotopes and molecular investigations. The output is sound, fully citable published articles being already in the scientific flow in prominent journals.

The evaluated PhD thesis is well structured, the objectives are sound and clearly presented. The training plan reveals good planning and preparation of the activities. The chapters are logically ordered starting with the a general introduction in the field of biological invasions and invasive crayfish species from Europe. The core of the thesis are the four papers published in peer-review scientific relevant journals. Each paper is a stand alone valuable scientific asset, altogether consisting a comprehensive overview over one of the most sensitive nowadays challenge in crayfish conservation: the spread of non-indigenous crayfish species.

OVERALL COMMENTARY ON THE PhD THESIS

Please write comments in extent of 1-2 pages:

The PhD Thesis entitled „*Non-indigenous crayfish species in Slovakia*” elaborated by Boris Lipták under the supervision Ing. Antonín Kouba, Ph.D. University of South Bohemia in České Budějovice, Faculty of Fisheries and Protection of Waters, Research Institute of Fish Culture and Hydrobiology, Zátíší 728/II, 389 25 Vodňany, Czech Republic is structured in 6 chapters, with a total of 90 pages.

Chaper 1 is a general introduction into the problem of biological invasions, the author pointing the most important aspects such as the health of the global biodiversity and socio-economic relevance. However, among the affected habitats, freshwaters appears to be one of the most impacted not only by the invasions, but also due to pollution and overexploitation. In the same rationale, freshwater biodiversity is prone to severe degradation, particularly European indigenous crayfish species being currently one of the most susceptible. The author presents a list of the current problems encountered by crayfish, highlighting the state of the art in the field. A very informative and comprehensive review is presented in this respect, with sound and recent literature cited. The author introduce readers to know the crayfish in Slovakia, in respect to native species, followed by the introduction of the most threatening three invasive species: the spiny-cheek crayfish, the signal and marbled crayfish. Finally, the author made a presentation of the important aspects in conservation, targeting the native crayfish species. The chapter 1 ends with a concise list of objectives for the thesis.



Chapter 2 is presenting, with the agreement of publisher, the article „Lipták, B., Vitázková, B., 2015. Beautiful, but also potentially invasive. *Ekológia (Bratislava)* 34: 155-162”. The contribution of the thesis author on this article was 60%. The article is a study focused on both, aquarium pet trade traditional and online shops. 26 crustacean taxa were found available. This paper is also a public alert for responsible handling animals, particularly to keep safe indigenous European fauna.

Chapter 3 is presenting, with the agreement of the publisher, the article „Lipták, B., Mrugała, A., Pekárik, L., Mutkovič, A., Gruľa, D., Petrusek, A., Kouba, A., 2016. Expansion of the marbled crayfish in Slovakia: beginning of an invasion in the Danube catchment? *Journal of Limnology*, 75: 305-312”. The contribution of the thesis author on this article was 40%. The article describes three new marbled crayfish populations in Slovakia, but also active dispersal (including overland), floods, zoochory or anthropogenic translocations being the major drivers facilitating the marbled crayfish colonization. The crayfish plague pathogen was not detected in any of the investigated populations.

Chapter 4 presents, with the agreement of the publisher, the article „Lipták, B., Mojžišová, M., Gruľa, D., Christophoryová, J., Jablonski, D., Bláha, M., Petrusek, A., Kouba, A., 2017. Slovak section of the Danube has its well-established breeding ground of marbled crayfish *Procambarus fallax* f. *virginalis*. *Knowledge and Management of Aquatic Ecosystems*, 418: 40”. The contribution of the thesis author on this article was 35%. The article is a report on a marbled crayfish population that is likely to become a seed for further colonisation of the Danube in Slovakia. This population is located in a channel of Danube within the Slovak capital Bratislava. The authors conclude that this population is well established, with a high growth potential. The investigated specimens were found free of *A. astaci*.

Chapter 5 presents, with the agreement of the publisher, the article „Lipták, B., Veselý, L., Ercoli, F., Bláha, M., Buřič, M., Ruokonen T.J., Kouba, A., 2019. Trophic role of marbled crayfish in a lentic freshwater ecosystem. *Aquatic Invasions*, 14”. The contribution of the thesis author on this article was about 25%. This research paper brings the first insight into the trophic ecology of marbled crayfish in lentic freshwater ecosystems. The authors found that algae and detritus are the most common food sources for the marbled crayfish, while zoobenthos and macrophytes were less important. Moreover, the marbled crayfish was found to be a relevant food source for top fish predators, but marginal for omnivorous fish. The authors concluded that the marbled crayfish, thanks to its life history, can be a highly adaptable invader.

Chapter 6 summarise general discussions and conclusions around the subject of pet trade and the risk of non-indigenous species introductions. Easy access to a high number of species, corroborated with low level of public information, scarce legislation and easy access to freshwater habitats, are the facilitating pathways to initiate biological invasions. The invasion of marbled crayfish in Europe is an excellent scientific niche still revealing insights of the mechanisms of invasions. In addition, the references are well presented among the thesis chapters.

The presented training plan for this doctoral study reveals good planning and preparation of the



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Czech Republic

activities. The publications list is also presented in the thesis, including a total of 10 peer-reviewed articles in journals with impact factor, 10 papers in journals without impact factor, and 3 conference proceedings.

In conclusion, the evaluated thesis is a comprehensive and high level scientific work, completely satisfying the international requirements for being accepted for public defence.

FINAL RECOMMENDATION

- PhD Thesis can be recommended for defence
 PhD Thesis can be recommended with reservations for defence
 PhD Thesis can not be recommended for defence

.....27.06.2019.....
Date and place

.....Lucian Pârvulescu.....
Name and signature



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Review of USB FFPW PhD Thesis

First name(s), surname, titles of the PhD student: Boris Lipták, Dipl.-Ing.	First name(s), surname, titles of supervisor: Dipl.-Ing. Antonín Kouba, Ph.D.
Title of PhD thesis: Non-indigenous crayfish species in Slovakia	
REVIEWER:	
Surname: Patoka	Institution: ČZU Praha
Name: Jiří	
Titles: Assoc. Prof, Dipl.-Ing., Ph.D., DiS.	E-mail: patoka@af.czu.cz
Please describe your professional relationship to the PhD student: No relationship	Please describe your field of expertise: Biology, ecology, ethology and taxonomy of crayfish, biological invasions, risk assessment, pet trade

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 presented thesis is a nice addition to our knowledge about „new“ non-indigenous crayfish species spreading according to their exploitation as ornamental species. The topic and findings are in the line with previous studies focused on the ornamental trade and invasive crayfish which established wild populations when introduced to new localities. Moreover, Slovak market with ornamental crayfish and other decapods has been surveyed for the first time by the author and this is very important for correct wildlife management on the European scale. Data about the spread and diet of the marbled crayfish should be of a high attention of many stakeholders like scientists, conservationists and decision-makers not only from Slovak Republic but also from other European countries with an overlap to the both local and international regulations. Simply, the presented thesis and papers have a scientific merit and include also data useful for further applied research activities.



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 text and incorporated chapters are sorted logically and the text is structured correctly. Since all findings were published in scientific journals, there is no doubt about the quality of presented data. I highly appreciate a relatively wide spectrum of the journals. The text is generally interesting and I have just a few comments: do not use the term “aquarist”, it is not English but German word (use “ornamental trade”, “ornamental crayfish”, “ornamental keeping” and so on); some information from the introduction section are repeated also in the discussion (e.g. the distribution of the marbled crayfish); it is really unusual to cite the own publications which are also listed as the papers in the thesis.

OVERALL COMMENTARY ON THE PhD THESIS

Please write comments in extent of 1-2 pages:

International pet trade with aquatic species including freshwater crayfish has been identified as one of the main sources of invasive species globally. Thus the presented thesis titled “Non-indigenous crayfish species in Slovakia” is a perfect addition to the set of similarly focused papers previously published by not-only European authors. Therefore, the thesis and particularly the papers included have a potential to be cited in ongoing publications dealing with this topic. It is obvious, that the author found a gap in Slovak hydrobiology and has harvested and subsequently published interesting and important data. The PhD student has to work as a researcher, indeed in the cooperation with the supervisor and other colleagues. I assume that Boris Lipták showed a perfect ability to do this, which so important for scientific career. Moreover, there are also listed papers not incorporated in the main text of the thesis, mainly focused on rats. This is surprising for me but Boris is probably able to work on more not so-related topics and this is also promising for future carrier even if I prefer more strictly focused the scientific interests. My recommendation is to continue in the invasive crayfish risk assessment which is so important for the conservation of indigenous endangered species. Simply, there is no other astacologist directly interested in this topic in Slovakia and I see many potential opportunities how to cooperate with the scientific community at least from the European perspective. Also the spread and impact of the crayfish plague pathogen is a very important topic and even if it has not been detected yet in the marbled crayfish in Slovakia, the continuous monitoring seems to be crucial in this regard. Moreover, there are more decapods pet-traded also in Slovakia, as the author mentioned a recorded, and invasive potential of some of them has been poorly studied. Therefore, the cooperation in this regard is also likely, especially together with the supervisor Dr. Antonín Kouba and his team. Among others, the running cooperation on this topic with Hungarian colleagues like Dr. András Weiperth should



be interesting for the author. I assume that the both presented and future findings and outputs must be more intensively highlighted in some international conferences. I see the possibility how to do it next year in 23rd IAA conference in Hluboká, Czech Republic. Since Boris Lipták published numerous scientific papers (partly also as the first author), in which he presented novel data and findings, I perceived the thesis to be sufficient. For that reason, I recommend it for defence.

Questions:

- 1) Is the marbled crayfish farmed/cultured in Slovakia commercially?
- 2) Are the ornamental crayfish kept also in outdoor ponds in Slovakia? If yes, do you see any related risks?

FINAL RECOMMENDATION

- PhD Thesis can be recommended for defence
 PhD Thesis can be recommended with reservations for defence
 PhD Thesis can not be recommended for defence

9. 7. 2019, Tolmin, Slovenia
Date and place

Jiří Patoka
Name and signature

