



Review of USB FFPW PhD thesis

First name(s), surname, titles of the PhD student: Kifayatullah Mengal, M.Sc.	First name(s), surname, titles of supervisor: Hamid Niksirat Hashjin, M.Sc. Ph.D.
Title of PhD thesis: The cellular and molecular characteristics of hemolymph in crayfish	

REVIEWER:

Surname: Jussila	Institution: University of Eastern Finland, Kuopio, Finland
Name: Japo	
Titles: Dr.	E-mail: japo.jussila@uef.fi
Please describe your professional relationship to the PhD student: It is neutral with having discussed with him during IAA24 in Czech.	Please describe your field of expertise: Crayfish biologist, with emphasis on ecology, pathology, and management of wild stocks.

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**):

I find the PhD thesis, and the publications it is based on, rather good quality science in the context of international scientific works been published on issues related to crayfish, and wider crustacean, immune system functioning and hemocyte nature and dynamics. In General Introduction, the PhD candidate Kifayatullah Mengal presents a bulk of research been carried out previously with some of the publications dating back 40+ years. This is a benefit and shows that the PhD candidate Kifayatullah Mengal has studied also the earlier crustacean immunity studies when the methods have been rather different and simple compared to contemporary means.

The experimental designs are robust with a sophisticated preparation of the samples and data processing are up-to-date.

The methods applied are mostly contemporary and definitely valid for the research in question. The electron microscopy is a more traditional method but a good choice and has given informative results.



The publication in Chapter 3 listing the different stages of hemocyte dynamics during leg trauma and hemolymph clotting is of high quality with the figures clearly and graphically presenting the main findings. This is one of high points of the PhD thesis.

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 structuring of the thesis' main text is logical and the chapters relevant in introducing both the outcome of the PhD investigations and their connection to the previously published works. In places, it is hard to understand which of the findings are part of PhD investigation itself and which are previously published works. Also, the PhD candidate Kifayatullah Mengal quite often focuses on highlighting what should be done next, while one would have expected further discussions and speculations on the scientific value of PhD candidate's research outcome.

The thesis contains three publications out of which one is a review article presenting relevant background information for the research been carried out and introduced in the PhD thesis. Thus, there are only two publications introducing the research outcome, one of which is a manuscript. Two of the included publications (Chapter 2 and Chapter 4), with the latter in a manuscript form, are written in review style. Chapter 2 contains a true review, while Chapter 4 is a manuscript based on an experiment, but its combined Results and Discussions section has been written in a review-like style. This is a bit puzzling since the research on which the manuscript is based is a traditionally designed investigation. I would have expected the PhD candidate Kifayatullah Mengal to focus in this text more on the fine results he has obtained and speculations based on these findings, but the text focuses more on information from publications by other groups.

Overall, the results presented in the PhD thesis are in line with the objectives, as should be expected. After all, the objectives are welldefined and robust. Furthermore, a short list as part of conclusions (part of Chapter 5) on PhD investigation outcome against the objectives might have been relevant in this case.



OVERALL COMMENTARY ON THE PhD THESIS

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

My further comments and notes, I hope, will be taken as positive encouragement by the PhD candidate Kifayatullah Mengal since my sole purpose is to encourage him to further improve his skills in the field of scientific research and writing. This is especially important because of the unfortunate trend of shrinking European freshwater crayfish scientists community. Also, it is of utmost importance to focus our attempts to understand and improve the situation of aquatic resources. We all depend on the wellbeing of nature and freshwater crayfish have been shown to have a crucial role in the European aquatic ecosystems. Thus, the PhD candidate Kifayatullah Mengal should take my critical notes as my true attempt to encourage him for staying within the scientific community of freshwater crayfish researchers. I am sure that he will make a substantial contribution in this field.

The PhD thesis is based on three publications, but one of them is a review of the background information on crayfish immune system and its structural components. It covers wide range of publications and topics, but is in parts written in a simplified manner stating in text only that certain aspects of crayfish immune system are changing due different environmental disturbances. A more detailed description of the role of the change would have been more informative, while I understand that it might have overly complicated the publication. The actual PhD research outcome is presented in two publications of which one is in a form of a manuscript (it would have been informative to state the status of this text with its bibliographic details). This manuscript also reads review-like, which I have already noted in previous sections. This makes the scientific contribution of the three publications towards PhD thesis rather thin, even though the results presented are products of good quality investigations and make a valid contribution to the understanding of the crayfish innate immune system, especially the role and dynamics of the hemocytes as important part of the immune system functioning.

In parts, there are indications of hasty writing of the text, with some minor but scientifically relevant hiccups. These include lack of italics in some of the scientific names, inconsistent usage of the common names and scientific names and their combinations. The candidate also, in some cases, uses abbreviations of common names of the species he discusses, while common names must be written out in full (not 'noble and signal crayfish' but 'noble crayfish and signal crayfish'). Also, Söderhäll's name, him coming from Sweden, should always be written with scandinavian alphabets 'ö' and 'ä', him being one of fundamental researcher in the field that the PhD candidate is now also part (well, there are some hiccups within Söderhäll's work this century but nothing wrong with the first works). These details, sometimes referred to as minor, when used properly give a true impression of scientific preciseness. This, of course, is part scientific writing.

The results of the PhD studies been carried should have been more clearly presented, in other words, the PhD candidate Kifayatullah Mengal should have been more proud of the



fine outcome of his PhD investigations and studies. In the present form, the PhD thesis presents the findings in a rather shy manner and in places the outcome seems to be hiding among findings from other studies and suggestions for the future studies. This makes it hard to read and truly understand the relevance of the current study.

It would have been a merit if the referred background results, especially if contrasting among each other, would have been thoroughly discussed and the possible reasons behind differing outcomes of the previous research would have been more clearly speculated. This would have been especially beneficial in case of candidate's PhD investigations' results diverting from previously reported outcome, as the PhD candidate Kifayatullah Mengal is the master of his work and would have opened avenues for readers' to better understand the validity of his PhD investigations.

Quite often the PhD candidate Kifayatullah Mengal tends to recommend further studies in the fields that have been studied here. This is quite obviously one of the outcomes of any kind of good quality research: it reveals novel avenues and raises questions which could not be seen when the research was planned. The limitations of all planned research is them being within a limited time frame and limited resources and thus not answering all the questions in one go. In this thesis, there seems to be a tendency to rise these future study question in spotlight, while they should not be in such a big role and thus they are somewhat shadowing the fine outcome of the thesis itself. Once again: be proud of the fine work you have done and try to emphasise your findings more, as they are definitely valid.

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**

29.6.2023, Kuopio, Suomi-Finland
Date and place

Japo Jussila
Name and signature