Fakulta rybářství
a ochrany vod
Faculty of Fisheries
and Protection
of Waters

Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice
Czech Republic

Review of USB FFPW PhD thesis

First name(s), surname, titles of the PhD student: Hung Quang Tran	**First name(s), surname, titles of supervisor:** **Vlastimil Stejskal**
Title of PhD thesis: Insect meal as feed source in nutrition of percids, Eurasian perch (*Perca fluviatilis*) and pikeperch (*Sander lucioperca*)	

REVIEWER:

Surname: Valente	**Institution**: CIIMAR | Interdisciplinary Centre of Marine and Environmental Research of the University of Porto
Name: Luísa	
Titles: assoc. prof.	**E-mail**: lvalente@icbas.up.pt
Please describe your professional relationship to the PhD student: No profession relationship	**Please describe your field of expertise:** Fish Nutrition; sustainable aquaculture

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 research conducted in this thesis is Excellent as it is innovative and makes a major contribution towards the use of insects in feeds for relevant farmed fish species (Eurasian perch and pikeperch). Insect species were recently authorised in aquafeeds in EU, and the obtained results will contribute for a better understanding of the feasibility of using such biomass in diets for two fish species of high economic importance. So the topic is very actual and relevant.

The thesis addresses not only basic research related to fish physiological responses, including nutrient utilisation, gut microbiota, antioxidant status and fatty acid deposition, but also considers environmental approaches. The economic and environmental sustainability of fish production using insect meals as protein sources in aquafeeds is also addressed and this is of great relevance for the industry. The scientific quality of the various chapters is Very good. This Mr Tran is the first author in 7 of the 8 published papers in international journals. The selected journals for publications are also among the best ones in the scientific area (Fisheries).

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, logicality 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)**:

This doctoral dissertation comprises a timely general introduction that provides an overview of the topics covered in the thesis, followed by seven chapters prepared in the form of manuscripts, two reviews on the topic (2 and 3) and 5 research papers (4-8).

Overall, the text is very well structured and written in a clear and comprehensive manner.

The introduction is a good summary of the state of art information concerning the production and use of insects as protein sources in diets for carnivorous fish species. At the end of the introduction, the objectives are clearly stated although the order should have followed the sequence of the following chapters. There is a single study focused on pikeperch and the use of *Hermetia illucens* (chapter 6). So, this chapter might have fited better after chapter 8 that deals with the very same insect species, leaving all chapters focused on *P. fluviatilis* in a sequence.

The two first chapters dedicated to the systematic review and meta-analysis of fish production using insect meal in terms of performance and environmental consequences are of great importance for synthesising the major advantages/challenges related to this novel ingredient. Besides, these articles were published in a top quality journal of the area supporting the relevance and originality of the approach. The selected methodologies used in each chapter generally followed classical nutritional approaches, with well-designed experimental studies. However, in chapter 5 stable isotopes were used to unravel the role of dietary components in perch tissues, and in chapter 7 fish swimming capacity, energy expenditure and physiological responses were assessed, using a quite innovative and original approach.

A final discussion of all obtained results is included. The discussion clearly describes the objectives of the work; main achievements are summarized in a critical way, and confronted with existing knowledge.

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OVERALL COMMENTARY ON THE PhD THESIS

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

This doctoral dissertation comprises a general introduction that provides an overview of the topics covered in the thesis, followed by a collection of seven manuscripts that are already published: two reviews on the topic (2 and 3) and 5 research papers (4-8). Mr Tran is the first author in 7 of the 8 published papers.

In terms of scientific quality and outcomes, this thesis can be considered of high level, under an international standard, for the scientific area. The selected journals for publications are among the best ones in the scientific area (Fisheries) confirming the originality and relevance of the work.

In brief, this thesis provides a holistic evaluation of the use of black soldier fly and yellow mealworm on two fish species of interest for aquaculture, Eurasian perch and pikeperch, using physiological and environmental approaches. The topic is very relevant and important for the aquaculture and the obtained results may contribute for a better understanding of the feasibility of using insect species in diets for Eurasian perch and pikeperch.

The approach and methodology are appropriate and the results are generally sound and clearly discussed. The number of methodologies employed is high, some of them are innovative in terms of fish nutritional studies, and adequate for each objective.

The thesis is well-written and the text is easy to follow, figures are easy to interpret and grammatical or spelling mistakes are scarce. Reading is enjoyable. The dissertation represents a unified collection of scientific articles. The conclusions are generally supported by the data.

The thesis fulfils the formal requirements for a doctoral degree.

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**

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Luisa Maria Pinheiro Valente

Porto, 4th July 2022 — Luísa Maria Pinheiro Valente

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Date and place — Name and signature