



Confidential

Review of USB FFPW PhD Thesis

First name(s), surname, titles of the PhD student: Martin Prchal, Dipl.-Ing.	First name(s), surname, titles of supervisor: Assoc. Prof. Dipl.-Ing. Martin Kocour, Ph.D.
Title of PhD thesis: Estimation of genetic variation of performance traits in common carp to predict potential of selective breeding under pond management conditions	
REVIEWER:	
Surname: Dupont-Nivet	Institution: INRA, France
Name: Mathilde	
Titles: Dr.	E-mail: Mathilde.Dupont-Nivet@inra.fr
Please describe your professional relationship to the PhD student: I have absolutely no relationship with the student	Please describe your field of expertise: Fish quantitative genetics

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**):

This PhD thesis deals with quantitative genetics of carp, more precisely quantitative genetics of overwintering performance, yield traits and fatty acids and also evaluation of genomic selection and QTL detection.

Genetic approaches are now classical methods used in livestock species but also in fish species. However the broad range of methods used and developed in this thesis must be underlined even if the student is less involved in the chapters dealing with QTL detection and evaluation of genomic selection.

Moreover, quantitative genetics work in carp are still scarce thus this work brings new results which are really original in the literature. Finally, the most important is the applied impacts of this work. Breeding programs are not largely developed in carps, and this work brings new, in-depth and really useful results to help the development of breeding programs in carps. This work will help to take right decisions to optimize the future breeding program so that they can be efficient and target the right traits with the adequate methods.



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 overall level is very good. For a French reader, the introduction is too short. I would have liked more details on carp rearing and probably genetics parts are a little short for non familiar reader. However, the whole introduction is very clear and concise and brings essential information. It is also easy to read even if, from what I can say with my French English (☺), the English is not perfect. The chapters with published or submitted papers are in a logical order. All papers are also easy to read and bring clear and original information. I was more frustrated by the discussion which is only a summary of the papers. The perspectives are cited but only in 3-4 lines, this is definitely too short !

The methods used in the different chapters are appropriate considering the questions asked. They are classical methods. However we must underline that the candidate use a large range of different methods which is a great effort. The number of publications (5) is quite satisfactory, while two are still in the manuscript form. But I think they should be accepted. The quality of journals is very heterogeneous. The candidate is not the first author of the last two papers and is involved in these last two studies only for 10 %.

Finally, the different chapters perfectly correspond to the objectives of the PhD thesis.

OVERALL COMMENTARY ON THE PhD THESIS

Please write comments in extent of 1-2 pages:

This PhD thesis, presented by Martin Prchal, is entitled 'Estimation of genetic variation of performance traits in common carp to predict potential of selective breeding under pond management conditions'.

It is composed of 7 chapters: one introduction, 5 chapters each constituted of one published or submitted paper and a final chapters with discussion-conclusion-perspectives.

The general introduction related history of culture and breeding in common carp, selective breeding in aquaculture and selective breeding in common carp. This chapter is well written and easy to read (even if probably a native English speaker should correct it). It gives a nice overview of the background. However, it is a very short chapter to describe all the chosen concepts. Thus, I think it is sometimes hard to follow for someone non familiar and also, sometimes the explanations of concepts are a little approximative. Moreover, it would have been useful to know more about carp rearing to fully appreciate the chapter on overwintering performance and fatty acids.



The five next chapters are published or submitted papers.

The first chapter is about genetics of overwintering performance in two years old common carp and its relation to performance until market size. The share of the candidate on this work is about 40%. The paper has already been published in Plos One. The problematics about overwintering performance is quite specific to common carp and extensive rearing in ponds. The study used a classical but efficient experiment and adequate statistical methods. It gives reliable results on genetic parameters of the different traits considered. It brings an in-depth general picture of the interrelations between all traits. A drawing could help to apprehend more easily all the implications. This is a key study to optimize the choice of traits to put in the selection goal and the best period to measure them. One drawback is the rearing environment: I understand that the conditions were very good thus maybe not representative of classical rearing conditions in carp? Thus more work to obtain more robust picture could be useful. Genetic*environment interactions could be important to study now.

The second paper is about genetic improvement of the main slaughter yields in common carp using in vivo morphological predictors. The share of the candidate on this work is 40 %. This paper was submitted but the journal is not precised. This paper presents an original way to introduce yield traits in breeding programs. This way has already been tested in rainbow trout, seabass and seabream by the coauthors of the paper. Thus this is not a totally new methodology invented by the candidate but this is an interesting approach. Experimental approach and statistical analysis are well planned and carried out and represents a significant amount of work. Again, the discussion is sometimes hard to follow because of the relations between many parameters. A figure would help. This paper has potentially high applied impact by improving the efficiency of breeding programs.

The third chapter deals with estimation of genetic parameters for fatty acids profile in common carp. The share of the candidate on this work was about 30 %. The paper has recently been published in Czech J. Anim Science, a journal with impact factor under 1. I wonder how interesting is the carp flesh in terms of EPA/DHA compared to other fish (salmonids, sea fish)? The main drawback of this paper is the small sample size (158) to estimate genetic parameters. However, I understand that fatty acids analysis is expensive and this problem is well described in the paper. Moreover the authors had a good reflexion on how to choose samples. Again, except this small size, methodology used is adequate. I found very interesting the discussion dealing with the interactions with natural and supplementary food. This first study could pave the way to many others on genetics*nutrition studies.

The next two chapters, chapter 4 and 5 deals with estimation of interest of genomic selection for juvenile growth in carp (chapter 4) and QTL detection for resistance to Koi herpesvirus in common carp (chapter 5). The share of the candidate on these studies is low, 10 %. The candidate benefited of collaborations with Roslin institute and I do not criticize this, it is a good thing to take advantage of collaborations, but it is difficult to evaluate really how the candidate masters



these high throughput methodologies.

Finally, the chapter 7 was the discussion. I was quite frustrated, as it is mostly a summary of the previous discussions with some but very little new insights. And at the end there is a summary of the summary ! The perspectives are really too short while all the interesting work of the candidate raises many new questions. I would have liked to read which ones are the most important for you and how one could studied these new questions.

Overall, in this PhD thesis, there is a lot of work, on both experimental and analysis sides (however it is hard to know exactly the real work of the candidate). The work brings many new and really interesting results. It leads to potentially five papers.


Thus I present you my congratulations for this hard work and I recommend the PhD thesis for defence without any hesitation.

Mathilde Dupont-Nivet
The 15th of July, 2018

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

Elanowk, 15th of July 2018
Date and place

Mathilde DUPONT-NIVET, 
Name and signature



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Review of USB FFPW PhD Thesis

First name(s), surname, titles of the PhD student: Martin Prchal, Dipl.-Ing.	First name(s), surname, titles of supervisor: Assoc. Prof. Dipl.-Ing. Martin Kocour, Ph.D.
Title of PhD thesis: Estimation of genetic variation of performance traits in common carp to predict potential of selective breeding under pond management conditions	
REVIEWER:	
Surname: Janhunen	Institution: Natural Resources Institute Finland (Luke)
Name: Matti	
Titles: Ph.D.	E-mail: matti.janhunen@luke.fi
Please describe your professional relationship to the PhD student: We have been involved in the same EU-project (FISHBOOST), but we do not have shared works or common publications. Martin has also been visiting my previous research team in Jokioinen, Finland.	Please describe your field of expertise: Fish biology, aquaculture production, selective breeding of farmed fish

QUESTIONNAIRE

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

The present studies add a substantial amount of new, valuable information concerning the heritable basis of production and health traits in a farmed fish, the common carp. Both conventional and modern tools of measurements and genetic/genomic predictions are used efficiently to address the study questions. The chosen methods in the study are justified, though not novel, and fulfill scientific criteria. In a way the present thesis involves pioneering work, as the systematic selective breeding programmes for common carp are yet to be started.

The theoretical background to each study and research questions is clearly documented both in the summary chapters and separate articles. The obtained results do not have pure scientific interest, but they also form a tight link to the development of carp culture. The common carp is an important food fish species to local, national and international cultures and markets, and by conducting the project on carp genetics the candidate has been able to address questions of direct importance to breeding programmes. The knowledge gained from the present studies will easily generate ideas for further research. Moreover, the present findings form an excellent basis to be applied directly into practise



when the genetic improvement schemes are developed for the study species in European rearing conditions.

I consider this thesis internationally competitive, and the quality of the work as a whole is high, even when compared to the current state of the art in the field.

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

The subject as well as the aim and background of all the studies have been sufficiently defined. The approaches designed to address the study questions are appropriate, and involve, to some extent, modern technique. The relevant literature of the field has been extensively and critically reviewed. The results are presented clearly and they have been compared to the relevant results from other studies.

The different parts of the thesis are presented in a balanced way, the relative space allocated to each study being fairly equal. The main text and different chapters also follow a logical order. The length of the thesis is appropriate in relation to the results and also corresponds to the amount of work done. Each of the five studies fit well under the title of the thesis, and they are in accordance with the objectives of the thesis. In other words, the research is truly driven by the research questions. The work forms a comprehensive and coherent scientific entity.

OVERALL COMMENTARY ON THE PhD THESIS

The candidate has submitted for external assessment an article-based doctoral thesis, which is the standard format for a PhD thesis in natural sciences. The thesis comprises i) general introduction describing the background information and aims of the work (Chapter 1), ii) three papers published in peer reviewed scientific journals and two manuscripts which are in the peer review process of scientific journals (Chapters 2–6), and iii) general discussion summing up the most salient results and conclusions from each individual article (Chapter 7). Mr. Prchal has clearly showed the necessary ability to produce scientific text in a clear manner.

The thesis covers an important theme which is undoubtedly of interest for many fish breeding programmes and aquaculture units working with common carp. By applying both conventional and modern methods of measurements and analyses, the work yields new interesting information on the genetics of production and health traits in this species. Because the selective breeding programmes for the study species are only beginning, the project is highly timely and reflects an excellent choice of approach. Yet, the early phases of selective breeding in the study species are also reflected in the modest size of study data (i.e., measurements were available on only one



generation). This fact may have affected, to some extent, the accuracy of genetic parameters, though the candidate surely recognizes this problem. However, larger data can be used in the future to confirm and expand the present findings.

Based on the authorship of the articles, the present studies were carried out by teams of investigators, which is typical in this kind of research involving considerable amount of field and laboratory work in data collection. It is therefore important to clearly show the involvement of the candidate in each of the studies. The candidate has identified his relative contribution to each article, and in three out of five studies the contribution can be seen to be substantial (30–40%). In these three papers Mr. Prchal is also the first author. In other two studies involving genomic data, the candidate's role is clearly minor (10%), though he may be justified in including also these articles in his thesis.

I congratulate the candidate for developing very useful and productive international collaborations in this project with research partners from several countries. I am also convinced that Mr. Prchal has worked as an independent researcher.

The conclusions and their possible applications have been clearly and critically drawn from the obtained results. Perhaps some potential weaknesses in the study design (e.g., relatively small data structure) could have also been outlined in general discussion of the results. Yet, the candidate seems not to over-interpret his results or to overstate the significance of the findings. The literature review has been broadly yet concisely written. The candidate has got acquainted with the general animal breeding literature as well as with more fish-specific papers. Even though all papers in the thesis focus on a single study species, the taxonomic coverage of the studies cited is wider.

The language of the thesis is mainly fluent and easily understood, with a few exceptions. Nevertheless, I suggest that the English in Chapters 1 and 7, in particular, is revised one more time to correct for some writing errors (including the use of articles) and linguistic clumsiness.

In my opinion, the quality of the entire study is very good and the work undoubtedly has a great significance within its field. I am unconditionally pleased to recommend that the candidate is given permission to print the work.

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



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

Jokioinen 27th June, 2018

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Date and place

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Matti Janhunen