



Confidential

Review of USB FFPW PhD Thesis

First name(s), surname, titles of the PhD student: Markéta Prokešová, Dipl.-Ing.	First name(s), surname, titles of supervisor: Dipl.-Ing. Vlastimil Stejskal, Ph.D.
Title of PhD thesis: Effect of temperature and light intensity on early development of African sharptooth catfish in commercial production	
REVIEWER:	
Surname: Žarski	Institution: 1- Department of Lake and River Fisheries, University of Warmia and Mazury, Olsztyn, Poland 2- UR AFPA, Team Domestication in Aquaculture, University of Lorraine, Vandoeuvre-lès-Nancy, France
Name: Daniel	
Titles: Dr.	E-mail: danielzarski@interia.pl
Please describe your professional relationship to the PhD student: I was a host of Marketa Prokesova during her 2-months internship in Poland	Please describe your field of expertise: My field of expertise includes reproductive biology and physiology of finfishes (including controlled reproduction, gamete management), larviculture of freshwater fish species, general aquaculture production science.

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 PhD Thesis refer to a very important aspect of aquacultural production, which is the determination of the optimal values of the most important abiotic factors affecting larviculture effectiveness, i.e. temperature and photoperiod. The topic, although being already studied in a number of species by many scientific groups worldwide, is still an important field of research. This regards especially the species which, for different reasons, must be cultured in intensive systems, such as African sharptooth catfish being the model species in this Thesis. Especially, as the PhD Candidate clearly stated in her Thesis, that the effect of temperature and photoperiod was considered in this species in a very general manner, so far. This has led to the development of the main research priorities within this Thesis. However, it should be highlighted, that the experiments



performed is not a simple repetition of the studies performed on other species and they were designed in a very precise way (high thermal range, precise determination of every developmental step and larval performance), what is an added value to the overall quality of the work presented. From this point, the experiments undertaken were an original research with high scientific importance to the aquaculture-related production sciences. This is additionally proven by the publication of the results obtained in two respected scientific Journals in the field.

It can be clearly seen, that the overall PhD Thesis of Marketa Prokesova was aimed at having a direct practical importance in the field with high potential impact to the commercial production of the African sharptooth catfish. And it should be emphasized, that the Thesis generally met this approach in a clear way, which was proven by the important contribution of the PhD Candidate and some of her results obtained in the practical handbook on commercial production of the species studied.

In summary, the Thesis of Marketa Prokesova is an original contribution with high enough scientific value to be promoted to a PhD in fisheries and/or aquaculture-related sciences. The Thesis has a very practical sound with high perspective of being implemented in the commercial production, having a direct potential impact on the development of the sector.

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 Thesis is consisted of 5 Chapters constituting the typical structure of the PhD Thesis based on the already published materials. First Chapter is the general Introduction with comprehensive description properly explaining the main research problem undertaken in the view of the relevant scientific literature. The Introduction part is ended with presentation of the Thesis objectives, which were presented as a main general objective supplemented with the concise indication of the specific objectives. The latter are later addressed by the next three Chapters, being the main part of the Thesis. In Chapters 2 and 3 two original articles are incorporated, which were published or accepted for publication in scientific Journals with current Impact Factor of 0.867 and 1.376 (for Chapters 2 and 3, respectively). In Chapter 4 the practical handbook is included, in which the entire production technology for the species studied is presented, highlighting the practical approach of the entire Thesis. The Thesis is concluded with the Discussion Chapter (Chapter 5) closed with appropriate conclusions and practical recommendations.

In general, the Thesis is a well structured elaboration. All the parts are meeting the general criterions expected to be met by a PhD Candidate. The Entire thesis constitute the logic whole, with properly determined objectives, which are later addressed by respective chapters and later concluded in a Discussion part.



OVERALL COMMENTARY ON THE PhD THESIS

Please write comments in extent of 1-2 pages:

The Thesis of Dipl.-Ing. Markéta Prokešová is consisted of a two original research articles, published in a well-recognized Journals in the field of aquaculture-related sciences and practical handbook. The Thesis is supplemented by brief and concise Introduction (Chapter 1), where all the relevant information concerning the justification of the study undertaken were presented. In this Chapter clear information on the biology and aquaculture of the species studied (African sharptooth catfish) are provided in relation to the research objectives of the entire Thesis, i.e. temperature and photoperiod. I would like to point out, that in the Chapter 1 my attention paid high dose of objectivity of the PhD Candidate, which proves her ability of self-criticism being important virtue in science. The entire Thesis is closed with a brief general Discussion (Chapter 5), ended with concise conclusions and practical recommendation resulting from the scientific aspects being studied. Besides the main body of the Thesis Dipl.-Ing. Markéta Prokešová provided clear enough Summaries (presented in English and Czech) and an overview over her research experiences and Curriculum Vitae.

In general, the Thesis is well structured and its content is relevant scientific contribution. The main strengths of the Thesis is the applied character of the research. The experiments described in Chapters 2 and 3 are interesting and really precisely performed biological observations. By reading the papers being the main scientific contribution to the Thesis, it can be easily seen, that Dipl.-Ing. Markéta Prokešová has focused mainly on the practical aspects of her research as she has chosen typical indices being within the interest of commercial fish farming. However, besides the dry reporting the PhD Candidate made also some attempts on possible explanation of the mechanisms underlying the biological processes observed, which makes the study more attractive from the scientific point of view. In the articles incorporated in the Chapters 2 and 3 Dipl.-Ing. Markéta Prokešová is the first and corresponding Author, which proves her most important contribution to the papers. Also, it indicates, that PhD Candidate have already twice went through the publication process, including MS preparation, revision as well as open discussion with the Reviewers of those papers, which is very important part of the scientific work.

Another important part of the Thesis is the practical handbook incorporated (Chapter 4), which is somehow a complex manual for the fish farmers. This Chapter includes extensive description of production technology of African sharptooth catfish, where all the steps of aquaculture process are carefully described. The PhD Candidate is not here a first Author, but the entire handbook is much more broader elaboration than the topic of the Thesis. Therefore, it is clear enough that Dipl.-Ing. Markéta Prokešová was involved in the process of preparation of this handbook from perspective of her field of interest, especially when some data presented in this Chapter can be also found in the former chapters. Having in mind practical attitude of PhD Candidate to the aquaculture-related sciences, I would generally consider Chapter 4 as rare and valuable contribution to the overall experience of her as a researcher.

Dipl.-Ing. Markéta Prokešová did not avoid several lingual clumsiness and ambiguous sentences in her Thesis. Although I realize that English is not a mother tongue of PhD Candidate, which justifies such errors, I feel obliged to mention that I had some problems to understand what the Author had in mind in few parts of Chapters 1 and 5. Nonetheless, this should be considered as a really minor issue. Another point, which in my view could improve the entire Thesis, would be to get to know the opinion of PhD Candidate in the Discussion (Chapter 5) about the future trends and priorities in research on



African sharptooth catfish as well as on the photo-thermal aspects in embryology and larviculture of freshwater finfishes.

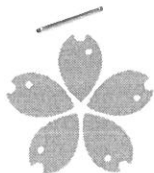
For me it is clear that the entire Thesis was planned to be a suitable compromise between the scientific quality and practical character of the studies, which is difficult task in and of itself. The two aspects (science and practice) are very often hard to join due to the different priorities of the two. In this regards, in my view, the Thesis of Dipl.-Ing. Markéta Prokešová fulfilled this mission correctly. Therefore, with full confidence I can recommend the candidature of Dipl.-Ing. Markéta Prokešová for further evaluation process and 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

Nancy
Date and place

David Zohr
Name and signature



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

Jihočeská univerzita
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Review of USB FFPW PhD Thesis

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Title of PhD thesis: Effect of temperature and light intensity on early development of African sharptooth catfish in commercial production	
REVIEWER:	
Surname: Kamler	Institution: Institute of Inland Fisheries, Olsztyn, Polan, Emeritus Professor
Name: Ewa	
Titles: Prof. Dr. hab.	E-mail: jacekamler@yahoo.co.uk
Please describe your professional relationship to the PhD student: None	Please describe your field of expertise: Biology, ecology and bioenergetics of fish early development

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 Ph.D. thesis by Markéta Prokešová is her personal achievement. This is a scientifically sound study, well placed in the mainstream of modern ichthyobiology and responding to demands of aquaculture. The work testifies about the Author's extensive knowledge of general biology of fishes, demonstrates a special proficiency in experimental work, and reveals her strong motivation to scientific research. The thesis has a rare feature: basic aspects of the results are at a high level, and, at the same time, they are conveyed to aquacultural practice.

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):

I consider the structure of the thesis as a perspective one. I detected only minor flaws in it. Further detail about structure— see below.

I detected elements of novelty in the results.

The Candidate has co-authored publications in journals listed by the Journals Citation Reports (i.e.



with IF): one published, three accepted, one more is submitted. She participated in several international and national conferences; in some contributions she was the first author. The CE level B2 testifies about her English language proficiency. All these show that Ms Prokešová is well prepared to apply for the doctor's degree.

OVERALL COMMENTARY ON THE PhD THESIS

A. Aim of the thesis

The studies focused on two key factors that affect fish early ontogeny. The quality of science was positively tested during the peer-reviewed process of publication in JCR journals: temperature in Prokešová *et al.* (2015, published in *J. Appl. Ichthyol.*, IF₂₀₁₄ 0.867), light intensity in Prokešová *et al.* (2016, accepted by *Aquacult. Res.*, IF₂₀₁₄ 1.376). In addition, the results of scientific experiments were made available to aquaculture practice in a technology handbook (Kouřil *et al.* 2013). I think that this thesis present a modern approach to relevant problems.

B. Formal structure of the thesis

General Introduction (Chapter 1, pp. 6-25) is devoted to a review of *C. gariepinus* biology, followed by a presentation of controversial approaches to fish ontogeny. I especially appreciate that the Author proposed her own conclusion. Further, effects of temperature and light were discussed and gaps in their knowledge were shown. The three aims of the work were posed. Finally, a comprehensive list of references was presented in seven pages. The Introduction testifies about the Candidate's erudition and her ability to ask scientific questions.

Chapter 2 (pp. 26-39) includes the paper by Prokešová *et al.* (2015), while Chapter 3 (pp. 40-53) covers the work by Prokešová *et al.* (2016). These chapters show a good command of both, routine and advanced techniques, and the capacity for using them in an adequate way.

A copy of the handbook on intensive rearing of *C. gariepinus* (Kouřil *et al.* 2013) is presented in Chapter 4 (pp. 54-114). It is based on a multi-year experience of the team. This part of Ms Prokešová's thesis is of special value for hatchery practice in temperate climate.

Chapter 5 (pp. 115-137) includes General Discussion (pp. 115-126) after which English and Czech Summaries are provided, Acknowledgements, and information about the Candidate. General Discussion testifies for a deep knowledge of pertinent literature. It reveals the Candidate's ability to relate her own findings to existing knowledge. A brief Conclusion closes the General Discussion chapter.

Areas of further research were identified.

In summary, the thesis includes three published works co-authored by almost the same team. In early life of fish, especially warm-water ones, growth rate, developmental rate, feeding rate and metabolic rate are extremely fast. They cannot be studied properly by a single person. Two new chapters were added, General Introduction and General Discussion, of which the Candidate is an only author. Such a structure I first observed in Ph.D. dissertations from The Netherlands and Finland two decades ago, now it becomes more popular elsewhere. I consider the structure of this thesis as a perspective one, demanding more from the Candidate than the "traditional" thesis of several hundred pages in the native language.

D. The most relevant aspects of the thesis



I subjectively selected few aspects which, in my opinion, contribute to the scientific value of the thesis.

- 1) Although the response of *C. gariepinus* early stages to temperature had been repeatedly studied, the Ph.D. thesis offers several innovative data. Firstly, the elaborate experimental pattern and very broad experimental material made possible an accurate definitions of the zone of thermal tolerance, optimum temperature zone, suboptimal zones, as well as threshold lethal temperature; such accuracy was not possible in earlier works. Secondly, the time from hatching to beginning of external feeding was rigorously assessed for the first time. These results are of both, theoretical and applied values.
- 2) In earlier works the studies of light effect on *C. gariepinus* had been limited mostly to presence/absence of light and to the effect of photoperiod. In this thesis the next step was done in which embryos and yolk-feeding larvae were exposed to five light intensities.
- 3) The farming handbook firstly, covers all the aspects important in practice. Secondly, it is written in English, which makes it available to a broad range of users.
- 4) In the General Discussion I particularly appreciate her tendency to provide sometimes a short conclusion (one or two sentences) following lengthy presentations of detailed results.
- 5) In the light intensity experiments a generally slow growth in fed fish was found. The Author proposes an explanation (improper decapsulation of *Artemia* cysts), and concludes with care about light impact. That shows that the author is able to evaluate critically her own results. The critical evaluation of own results testifies about "scientific maturity" of the Candidate.
- 6) Rigorous statistical treatment is notable.
- 7) The thesis is written with care, I found only rare typesetting errors.

E. Weaknesses of the thesis

I detected only very few weaknesses in this thesis.

E.1. Specific criticism

- ✓ In p.50 is written: "...During egg incubation, the mortality of sharptooth catfish was proportional to light intensity, for reasons that remain to be elucidated...". In contrast, mortality of larvae was found to be much lower and light-independent. Also, In p. 120 we read: „In the present study, the mortality of African sharptooth catfish during the egg incubation period was proportional to light intensity, for reasons that remain to be clarified (Prokesova *et al.*, 2016)". The explanation may be found in Cai (1993) and Straehle, Jesuthasan (1993), who had documented elevated sensitivity to ultrafiolet radiation during fish very early ontogeny, where differentiation rate is at highest. Concentration of a substance acting as a sun screen increased with age (Hofer, Kaweewat 1998).
- ✓ Comment to page 117. Variety of responses of larval size at comparable development al steps was summarized in Tab.10 by Kamler (2008, Rev.Fish Biol.Fisheries 18, 143-200) with a discussion of mechanisms behind these variable results.

E.2. Minor flaws in the Ph.D. thesis structure

- General Discussion is the key chapter of a Ph.D. thesis , thus it deserves a separate chapter.
- Areas of further research are shown at the end of Summary. The end of General Discussion chapter would be the proper place.

These flaws in the style of presentation do not affect the quality of science.



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Czech Republic

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

7 June 2016
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Date and place

W. Müller
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Name and signature