Oponentský posudek

na disertační práci „*Assesment of Czech water-bodies ecological potential based on fish community*" RNDr. Petra Blábolila.

Předložená disertační práce je nadprůměrně kvalitní, založená na čtyřech pracích publikovaných v prestižních vědeckých časopisech ohodnocených IF a jedné práci odeslané. Z toho je student ve čtyřech případech prvním autorem. Student je rovněž spoluautorem dalších patnácti vědeckých prací, které dokazují jeho široký odborný záběr a vysokou publikační aktivitu. Z formálního hlediska je práce rovněž dobře zpracovaná a plně odpovídá požadavkům kladeným na autora.

Řešené téma je více než aktuální a významným způsobem propojuje základní a aplikovaný výzkum. Hodnocení ekologické kvality prostředí je důležitým nástrojem pro implementaci evropské legislativy, ale i pro hodnocení dopadů různých antropogenních činností. Úvod disertační práce je přehledný, dostatečně obsáhlý a dokazuje kvalitní teoretické znalosti autora o řešené problematice. Výsledky, vycházející z vědeckých publikací, jsou jasně formulované a založené na dostatečném množství dat i odpovídajícím zpracování. Kvalita získaných dat dokazuje nejen pečlivost samotného autora, ale odráží se v ní i zkušenosti a znalosti jeho školitelů. Diskuse odpovídajícím způsobem hodnotí získané poznatky a zamýšlí se nad jejich dalším využitím. Lze shrnout, že autor předloženou práci zpracoval na výborné úrovni. Zároveň dosáhl stanovených cílů a přinesl důležité poznatky v oblasti hodnocení ekologického potenciálu umělých vodních útvarů.

K celé práci mám několik drobných dotazů do diskuse:
- S ohledem k autorovým zkušenostem s hodnocením ekologického potenciálu nádrží bych se rád zeptal na jeho názor týkající se vlivu přirozené variability dat na zařazení lokality/nádrže do jednotlivých kvalitativních tříd. Jak stabilní je v tomto ohledu hodnocení nádrží? Po jaké době lze zařazení do odlišné třídy považovat za změnu stavu a ne za přirozenou variabilitu hodnocených společenstev? Mám na mysli zejména situaci, kdy se daná nádrž nachází na hranici mezi dvěma třídami a jeden rok bude těsně pod hranicí dobrého stavu/potenciálu, zatímco druhý rok jí překročí.

- Jakým směrem by autor rád dále rozvíjel studovanou problematiku? Je podle jeho názoru šance na zařazení dalších metod, jako je např. hydroakustika, do standardního monitoringu hodnocení ekologického potenciálu nádrží?

Závěr:

Obsah i forma zpracování disertační práce plně odpovídá nárokům kladeným na autora. Autor samotný svou publikační aktivitou několikanásobně přesahuje požadavky doktorského studijního programu Hydrobiologie. Lze tedy shrnout, že hodnocenou disertační práci jednoznačně doporučuji k obhajobě a autorovi přeji hodně štěstí a publikačních úspěchů v jeho další vědecké práci.

V Praze dne 22. 6. 2017

Ing. Pavel Horký, Ph.D.

Report on the review of a Ph.D. thesis

Thesis name: Assessment of Czech water-bodies ecological potential based on fish community

The candidate: RNDr. Petr Blabolil

University: School of Doctoral Studies in Biology Sciences, Faculty of Science, University of South Bohemia in České Budějovice.

The thesis consists of the following articles/manuscripts:

I.   Blabolil, P., Logez, M., Ricard, D., Prchalová, M., Říha, M., Sagouis, A., Peterka, J., Kubečka, J., Argillier, C. (2016) An assessment of the ecological potential of Central and Western European reservoirs based on fish communities. Fisheries Research 173: 80–87.

II. Blabolil, P., Říha, M., Ricard, D., Peterka, J., Prchalová, M., Vašek, V., Čech, M., Frouzová, J., Jůza, T., Muška, M., Tušer, M., Draštík, V., Sajdlová, Z., Šmejkal, M., Vejřík, L., Matěna, J., Boukal, D.S., Ritterbusch, D., Kubečka, J. (submitted) A simple fish-based approach to assess the ecological quality of freshwater reservoirs in Central Europe.

III. Poikane S., Ritterbusch D., Argillier C., Białokoz W., Blabolil P., Breine J., Jaarsma N. G., Krause T., Kubečka J., Lauridsen T. L., Nõges P., Peirson G., Virbickas T. (2017) Response of fish communities to multiple pressures: development of a total anthropogenic pressure intensity index. Science of the Total Environment 586: 502–511.

IV. Blabolil, P., Boukal, D.S., Ricard, D., Kubečka, J., Říha, M., Vašek, M., Prchalová, M., Čech, M., Frouzová, J., Jůza, T., Muška, M., Tušer, M., Draštík, V., Šmejkal, M., Vejřík, L., Peterka, J. (2017) Optimal gillnet sampling design for the estimation of fish community indicators in heterogeneous freshwater ecosystems. Ecological Indicators 77: 368–376.

V.   Blabolil, P., Ricard, D., Peterka, J., Říha, M., Jůza, T., Vašek, M., Prchalová, M., Čech, M., Muška, M., Seďa, J., Mrkvička, J. Boukal, D.S., Kubečka, J. (2016) Predicting asp and pikeperch recruitment in a riverine reservoir. Fisheries Research 173: 45–52.

and of a summary (overview) prepared by the candidate, titled:

Assessment of Czech water-bodies ecological potential based on fish community

The suitability and sufficiency of the thesis

P. Blabolil's thesis includes an overview, four published articles and one manuscript, which obviously fulfill the requirements for the extent of the thesis (at least one article, two manuscripts and an overview). All the articles were published in relatively high-quality journals (5 yr. impact factors 2.263-4.317) clearly exceeding the requirements for journal quality (at least one article in a journal with impact factor ≥ 0.5). The candidate is the first author in three of the articles and in the manuscript, which clearly shows that he had the main responsibility in almost all papers. In the article III, he is the 5th author, but the role of the candidate was substantial as he provided the national data and participated in the article processing and writing. P. Blabolil has participated in all levels of the scientific process from field sampling to analyzing the data and finally writing the papers. Therefore, the candidate's scholarly contribution clearly fulfills the requirements.

The importance and position of the study in terms of the field of research

P. Blabolil's thesis includes four sections covering the following thematic issues: (I) development of fish-based assessment methods to evaluate the ecological potential (EP) in heavily modified waterbodies (reservoirs), (II) identification of anthropogenic stressors and comparison of assessment methods both in large (Central and Western Europe) and national scale, (III) optimal gillnet sampling design in order to improve cost-efficiency and reduce fish mortality in sampling, and (IV) evaluation of fish recruitment from relatively short time series. The five papers of the thesis take versatile approaches to the research issues from defining and measuring the anthropogenic pressures (paper III), to methodological development of optimal sampling (paper IV) and recruitment assessment (paper V), and, finally, developing and validating assessment methods for EP (papers I and II). Besides focusing on reservoirs in Czech Republic, the work covers a wide geographical area in Central and Western Europe and the results are applicable in many circumstances. All the topics in the thesis are important and timely not only due to the requirements of Water Framework Directive (WFD) but also because of the omnipresent spatial effects of human intervention exacerbated by the global change. To understand the ecological quality of various kinds of waterbodies is extremely important acknowledging the increasing effects of human pressures. Artificial ecosystems are very important and form a substantial part of the waterbodies in Europe, but are largely neglected in restoration / ecological classification. Methods to detect EP in reservoirs on a large geographical scale are exceptional, and therefore the thesis results are pathbreaking. The results of the work help to define the environmental pressures, and give methods to assess ecological potential and implication for restoring the waterbodies. Surely, P. Blabolis's thesis is of high relevance to the present discussion concerning the detection of environmental problems in waterbodies in order to plan restoration activities.

The scope of the study, the sufficiency of the material

The scope of the thesis is strongly motivated by the urgent need to detect and resolve environmental problems. The thesis covers aspects from recruitment of a single species in a single lake to assessment of whole fish communities on large geographical scale. It provides indices based on both fish guilds and single species, which are applicable on a large geographical scale or useful for local fisheries managers. The material of the thesis is fully sufficient to answer the research

questions. It is exceptional to have such a large data set in a thesis including more than a hundred reservoirs (Paper I) and hundreds of lakes (Paper III) and time scale of over ten years (Paper II). The amount of fieldwork in this thesis is enormous. However, it would have been profitable to include all supplementary material printed in the thesis, because many parts in the papers are impossible to verify or hard to understand without the material.

The deduction of the results from the processed material

Overall, the interpretations and conclusions in the thesis summary (overview) and in the different papers are well supported by the methods used and results presented. The statistical methods used were sophisticated where the data allowed and well justified when the data were smaller. The candidate paid sufficient attention to the limitations of the data or methods when necessary.

The thesis summary provides a nice conclusion of the issues concerned including relevant background information on human born stressors and pressures, the history and development of ecological classification, general characteristics of reservoirs and fish as indicators. It provides an extensive overview of the related literature. The candidate has creditably condensed the essential results and interpretations. In the end of the summary, the candidate insightfully presents several important future research needs, challenges and possibilities. The structural logicality of the thesis is excellent.

I, however, have slightly critical comments on parts of the thesis summary. I think that the candidate's argument, gillnet survey sampling "has a very destructive impact on fish populations", is an overstatement in most cases. If you compare the fish abundance in a lake to the gillnet survey sample, the latter one is usually negligible. More like it is a moral question whether we should use lethal methods if there is a non-lethal option. And of course, waterbodies containing threatened species should not be sampled by lethal methods.

In the summary, the candidate argues that "Top-down restoration approaches are primarily represented by biomanipulation, i.e., the addition of top predators". However, removal of planktivorous and benthivorous fish is a much more common biomanipulation method than piscivore stocking (e.g. Bernes et al. 2015). In fact, mere piscivore stocking seldom has significant effects on water quality (Bernes et al. 2015).

The following sentence in the summary is unclear / erroneous: "Classification based on both indices were compared with the main difference in the assessment being stricter in Paper I was than in Paper II." If I understood right, the national method CZ-FBI (in Paper II) was stricter than was the "central European" method CWE-FBI (Paper I).

In the discussion, optimal gillnet sampling design has too much results repetition (1st paragraph) and too little actual discussion. The beginning of "Development of population recruitment predictive models" starts with too long repetition of study aims and methods. The 3rd last paragraph with morphological effect of stressors on fish lacks a conclusion.

In addition, there are some small issues in the in the five papers that are unclear or could have been discussed more thoroughly. In Paper I, I would have liked to see discussion concerning the unreliability of fish as indicators. E.g. commercial or recreational fishing can have major impacts on the fish community thus reducing the reliability of fish as indicators. In the end of the first paragraph it is said that "…reservoirs… usually do not have an undisturbed reference state." Can

reservoirs have an undisturbed reference state at all? It is unclear whether "TP" and "Agri A" are considered as indicators of one pressure or two separate pressures? There is no explanation for equal class widths in the class boundaries, is there any biological reason for this?

Paper II was the only manuscript included and I have several suggestions how to improve it. The development of assessment methodology and the selection of the indicators need some clarification. E.g. literature review (L 160) should be described shortly and setting of class boundaries need more reasoning (I have attached pdf file with detailed comments).

The validation procedure included some controversial issues that need more explanation. It seems that the CZ-FBI was developed to detect eutrophication pressure (lines 159-160). You should better justify, how an assessment system that responds to eutrophication can be validated by its response to other pressures. More reasonable option would be to validate the assessment system by using another measure of eutrophication e.g. nutrient load or % of arable land in the catchment, or independent data set (CWE-FBI data?). Of course, it is profitable that the assessment system can detect multiple pressures but that does not necessary validate its ability to detect eutrophication. This issue should be at least discussed.

The independent pressure index included the pressure "water level fluctuation". Please clarify why you can use this as a pressure in heavily modified waterbodies, because, as you stated in lines 82-84, "many negative effects cannot be considered as pressures if they cannot be mitigated without compromising the primary reservoir functions"? Isn't flood control primary function of these reservoirs?

The results include a lot of results that are not referred to any Table or Figure and have no numerical evidence. Those need to be corrected, and it would also help to make the selection process of the indicators easier to understand (see suggestions in the attached pdf-file).

In Paper III it is stated that "construction of single pressure-response relationships has failed in many cases, necessitating the development of multiple pressure models (e.g., Breine et al., 2015)." However, there are also many examples of successful assessment against one pressure (e.g. Kelly et al. 2012, Olin et al. 2013). I argue that the multipressure assessment methods don't function well/are unresponsive in cases the pressures have opposite effects on fish community (e.g. eutrophication vs. acidification) unless weighted properly. Therefore, in order to develop valid multipressure assessment methods, it has to be known what indices are sensitive to specific pressures. This issue could have been discussed. Colours of the circles in Fig. 2 could have been explained. Table 7 contains a rather restricted comparison of single-pressure assessment tools vs multi-pressure assessment tools. I'm sure more assessment methods could have been included taken into account the high number of developed methods.

In paper IV it could have been explained in more detail how the reduction of the dataset was done. It also lacks discussion on the possible bias the data reduction might cause in the results in relation to a situation where there is separate sampling occasions for the different scenarios. The random variation in different strata could have been estimated in order to direct the data reduction: more gillnets in the stratum with high variation etc. In addition, I miss discussion what kind of comparability problems with CEN standard this kind of optimal sampling might induce. You could have mentioned that all gillnets don't produce equal workload or fish mortality, i.e. gillnets close to

littoral have much higher CPUE compared to gillnets in deep benthos. Therefore comparing just the amount of gillnets in different scenarios does not a give true picture of the workload or mortality differences.

In Paper V it is not clear why these two species were selected? Are they good indicators?

Overall, despite the small criticism, the thesis is excellent and the contribution by P. Blabolil is more than adequate. I can, without a doubt, recommend the thesis to be defended.

15th June 2017

Date

Signature

MIKKO OLIN

Clarification of name