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To:
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Mondsee, Aug. 13, 2020

Evaluation and review of the dissertation thesis entitled "Observation of fish schooling behaviour in open-water habitat of a man-made reservoir via visual census" submitted by Michaela Holubova.

Michaela Holubova impressively demonstrated that she developed her data analysis skills as well as writing and publication skills excellently during her PhD project. To present a collection of three peer-reviewed and already published papers as a first author is well above the usual requirements for a PhD degree. Furthermore, she presented a fourth paper in preparation which has very similar potential to be published in a high-ranking international journal.

Each of the papers has went through a stringent quality assurance procedure encompassing evaluation by expert reviewers and editors. In reading the thesis I found no sign whatsoever that raises any doubts on the quality of the papers and I am fully convinced that each of the three papers is a very valuable contribution to fish biology.

Her first paper on species specific schooling behaviour in a temperate reservoir brings new information to the community. This is a very valuable addition to information available for the use of the open water habitat by various species and size classes. She used a creative and innovative system to visually assess and analyse swimming and schooling behaviour including group sizes.

The second paper relates many aspects of species and size specific schooling behaviour to the overall density of fishes in the epipelagic habitat. Notably the identification of a threshold density in triggering the onset of school formation is a real highlight of the thesis and improves the knowledge in freshwater fish schooling behaviour considerably.

The third paper is given as a manuscript in preparation and highlights the relationship of fish density, as assessed visually i.e. a passive "sampling gear", with various abiotic and biotic factors. While I found this approach valuable and interesting it leaves some doubt if the focus of the study should be on fish density exclusively (as the present title indicates). There are inherent problems with density estimates based on passive sampling gear which could to be taken into consideration more seriously.

The fourth paper takes up the topic of density estimates and compares visually assessed estimates to hydroacoustic density estimates and to an active netting method, i.e. purse seining. These comparisons are very important to elaborate on the pros and cons of the visual density estimates which might have the potential to be elaborated even deeper.

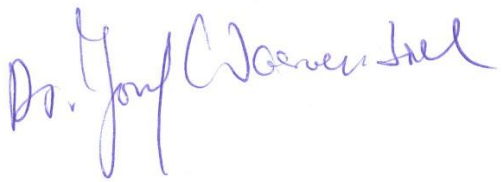
The general, summarizing section before the research papers gives a general overview of the topic and nicely integrates the detailed parts of her studies. The general discussion relates her finding excellently to the current research in the field and provides the general context of her work within our present knowledge.

Overall, I found the main strength of her thesis to

1) explore the possibilities of a relatively new (for freshwaters) method for fish habitat use and behaviour,
2) be use the latest "state of the art" statistical evaluation methods for this dataset for which adequate treatment is certainly difficult,
3) deliver ground-breaking new knowledge on freshwater pelagic fish schooling behaviour depending on a critical density.

In summary, I evaluate the thesis of Michaela Holubova with the highest mark or class available. I definitively recommend the thesis to be defended.

Sincerely,



J. Wanzenböck