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Review Report to the Thesis

"Water régime of Pinus rotundata dominated peatbogs in the Třeboň Basin and water relations of their dominant species"

presented by Andrea Kučerová as a thesis for awarding her the title Ph.D.

The present thesis brings original and new valuable information on the ecohydrology of the *Pinus rotundata* dominated peat bogs in the Trebon Basin Biosphere Reserve. The peat bogs belong to precious and endangered ecosystems being centers of biodiversity often being habitats of endemic and rare species. The peatbog hydrology properties determine spreading, abundance and survival of plant species harbored in a peat bog and vice versa – physiological properties of vegetation, particularly evapotranspiration dependent on stomatal conductance among other determine hydrology of a peatbog. Thus, the knowledge on hydrology regime and vegetation properties and composition are crucial for a proper management to preserve these protected environments. Particularly, the long-term records on water regime of peat bogs bring indispensable information for prediction or modeling of their future development. The peatbogs belong to the very prone ecosystems to anthropogenic-induced changes. The present study was performed at two nice examples of the bog pine peatbogs, which are supposed to be a final stage of continental raised bog development - the Cervene Blato bog and the Zofinka peatbog.

The present study consists of so-called composed type of thesis including original scientific text and four scientific, already published peer-reviewed papers.

Study I (Kucerova et al. 2010) ***is*** published in impacted journal Trees and brings a field, experimental study on transpiration of *P.rotundata* in the Cervene Blato peta bog performed by sap flow technique conducted during 2-year study. The study brings a valuable knowledge on seasonal tree transpiration, its correlation to meterological factors, seasonal pattern of water balance in the P. rotundata stand and estimation of evapotranspirtation (ET) from the simple soil water balance. The study was performed in collaboration with Czech, well-established experts on international level in this field – prof. Cermak and Dr. Nadezdina from the Mendel University. I regard this paper as a nice example and very valuable contribution to the P. rotundata ecophysiology. Being a physiologist and anatomist myself – I greatly value this approach of sap flow measurements and upscaling to a stand level. A small remark – I would appreciate myself in the paper, in case of being a reviewer fo the manuscript before publishing if conclusion section would be included there.

Study II (Kucerova et al. 2008) published in Folia Geobotanica performed on the Zofinka peatbog contributes to the knowledge on vegetation changes connected with environmental disturbances and describes different effects of windthrow, bark beetle and fire on vegetation composition and soil water quality.

Study III (Kucerova et al. 2000) is published in the journal Priroda and brings geobotanical study on vegetation changes in the Zofinka peatbog.

Study IV (Kolmanova et al. 1999) published in the monography edited by our foremost expert on wetlands, Dr. Vymazal brings the initial study bringing the long-term (1995-1998) hydrological measurements in the Cervene Blato bog monitoring water discharge and groundwater

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table. In my opinion, the very valuable idea is presented in the end of the paper, about role of the mires in the short water cycle and discussing arguments for bog preservation argumenting that bogs do not serve as simple reservoires for water storage. Though it is not a custom to have notes to already published, peer-reviewd papers – I miss the abstract or summary in this paper.

My description now will focus in more detail on the original introductory scientific text presented 38 pages - 1-page abstract, Introduction given in 14 pages, 1- page Aims of the thesis, 3-page Material and methods, Results and discussion presented in 8 pages and references in 9 pages.

In **1-page abstract** I miss "the big picture" view into the present study composed of four papers. It is more desription of the contents of individual presented papers rather than a story describing developemnt of a scientific view and progress in the scientific work. I think there should be emphasize given to the originality of the study showing the progress of the study from initial description of the 5 –year hydrological measurements in the *P.rotundata* dominated peatbog leading to the interest about connection of hydrological regime and vegetation composition and its changes under environmental disturbanecs presented in two prevalently geobotanical study coming to the latest, ecophysiological study IV, going to principles and mechanisms of importance of *P.rotundata* sap flow measurements enabling upscaling to a stand level.

Introduction is presented on 14 pages. In the Introduction section I miss subchapter devoted to the climate change. There is only presented a chapter on a Human impact (page 18) though climate change – surprisingly to me - is not mentioned there. Though I think drainage does not have to be caused only by direct human activity.

Discussion topic 1:

Generally, peatlands belong belong to highly endengared ecosystems exposed to the whole range of severe environmental conditions making them prone to climate change. In the present thesis the effect of climate change connected with ever increasing CO2 concentration is not taken in focus or discussed. Though the human impact is How do you expect that the ever increasing CO2 concentration will affect ET rates of vegetation in a peat bog and *P. rotundata* in particular? And what is your opinion about the effect of changed ET rates affected by increased CO2 concentration in a scale of a small water cycle in a peat hydrological regime? What do you think is going to be a response of the water regime of *P. rotundata* dominated peatbogs to ever increasing CO2 concentration - what do you expect in a future horizon, e.g. 25, 50 or 100 years?

Discussion topic 2:

In the subchapters "Water balance of a peatbog" and "Hydrology and peatbog development" the references cited are prevalently older than the 1990's with few exceptions younger. I wonder if there has been no progress made during the last decade. Could you tell us your opinion?

Minor remark - in the chapter Estimation of (evapo)transpiration several systems for measuring sap flow velocities (page 24) are mentioned, but only names of authors are given, not references. Could be better specification given?

Discussion topic 3:

1-page Aims of the thesis is given the particular aims in a "hidden" form: it lists four papers included and lays down studied questions. Though aims themselves are not explicitly stated. Nor hypotheses tested. Could be aims of the thesis explicitly though briefly defined together with the hypotheses tested and be presented answers to hypotheses validity? I am very looking forward to this to obtain a view at the complexity of the thesis and the progress from the formulation of the aims to coming to a more complex, though more detailed approach.

Discussion topic 4:

In the chapter Results and discussion the conclusion chapter is missing. I wonder, if you could summarize in few sentences: a) your major contribution to the knowledge of *P.rotundata* dominated peatbog and b) originality of your thesis.

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Discussion topic 5:
What is your opinion about function of ET of *P.rotundata* for the overall water regime and short water cycle of P.rotundata dominated peatbogs?

Discussion topic 6:
What is your opinion about recommendations for managerail measures to be taken to preserve a natural character of *P.rotundata* dominated peatbogs? What are in your opinions the major aspects, which will determine/affect the long-term development of *P.rotundata* dominated peatbogs in future? Could you relate those to ongoing climate change?

Generally, I found the thesis based on a great volume of research. I value combination of geobotanical approach with experimental ecophysiological one, what I regard as a very precious and exceptional aspect of the present thesis. Andrea showed capability to work in a team and to collaborate with researchers from other field and to evaluate and synthesize critically her findings. I also greatly admire her determination and capability to come to this finishing point of her Ph.D. study since I know that she managed to work on her thesis and simultaneously to take care about her children and family.

In summary, in my opinion the thesis entitled "Water régime of *Pinus rotundata* dominated peatbogs in the Třeboň Basin and water relations of their dominant species" and presented by Mgr. Andrea Kučerová fulfils the official requirements. The thesis can be considered as a prove that its author acquired sufficient knowledge to an independent and creative research. When Mgr. Andrea Kučerová successfully defends her thesis, I recommend conferring on her the university degree "Doctor", Ph. D.

Sincerely,

Jana Albrechtová

Head of the Board for Ph.D. Studies of Plant Physiology and Anatomy at Faculty of Science, Charles University in Prague

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