

Dissertation Review Form
-for members of the Dissertation Commission-

Please write a review of the dissertation taking the following criteria into account, where appropriate:

- General remarks
 - The significance and status of the dissertation in the field
 - The sufficiency and quality of the material
 - The adequacy of the methods used
 - The validity of results
 - The logic of the dissertation's structure
 - The knowledge and use of literature in the field
 - The project's contribution to the research area
 - The author's input into the achievement of the dissertation results
 - Language
 - The shortcomings of the manuscript
-

Name of the PhD Candidate : Ms OLESYA KOLMAKOVA

Planned Date of Graduation : 23 September, year: 2015

Title of the Dissertation: MOLECULAR GENETIC IDENTIFICATION OF
PLANKTONIC BACTERIA IN THE YENISEI RIVER BASIN AND EXPERIMENTAL STUDY OF
THEIR BIOGEOCHEMICAL FUNCTIONS

Would you please elaborate upon your review with reference to the above mentioned criteria in the box below. Please add extra pages if needed

- General remarks

The present PhD thesis focussed on 2 aims: (i) to determine the species composition of planktonic bacteria in the Yenisei River basin by molecular genetic techniques including next-generation sequencing, and (ii) to estimate their biogeochemical functions applying experiments on bacterial consumption of various types of bacterial substrates. Thereby it addressed 3 major topics: 1) to explore the bacterial biodiversity in the Yenisei River by using next-generation sequencing; 2) to evaluate planktonic bacteria consuming certain of amino acids by using the Bugach reservoir as a case study site; 3) to determine the seasonal dynamics of bacteria responding to certain amino acid additions.

The study is very well written and fulfils all requirements of a PhD thesis. The PhD candidate demonstrates that she is able to plan, perform field surveys and experimental work and to analyse all data in a thorough manner. Introduction and Discussion parts of the thesis demonstrate that the PhD candidate knows well her research topic and is able to set it into context with earlier and ongoing research (good knowledge of the literature).

- The significance and status of the dissertation in the field

The present PhD thesis, for the first time, explores the bacterial biodiversity in the Yenisei River over a length of about 1800 km. Thereby, 3022 operational taxonomic units (OTUs) of planktonic bacteria were found, whereby the alpha-diversity of bacterial communities and the relative proportion of cyanobacteria reached maximum values in the middle section of the Yenisei. Three distinct bacterial assemblages differing significantly in their species composition were found to inhabit different parts of the Yenisei River: the mountain taiga (the upper part of the river), the lowland taiga (middle portion), and the tundra (lower portion). It is assumed that these assemblages were formed as a result of biogeochemical influence of the surrounding landscape. The dominant taxa of each assemblage are specialized in the consumption of distinct organic substances. Thus the obtained results can be used for integrated environmental monitoring of the Yenisei River. The study can be used to determine the contribution of the largest Arctic river as a global sink of carbon on earth.

In experimental mesocosms, bacteria consuming lysine and glycine in the Bugach reservoir were identified. Thereby, different species of planktonic bacteria - specialized in the consumption of individual amino acids - were found. Responses of the summer bacterial community to added lysine were stable and similar in different years. In contrast to summer experiments, addition of lysine in spring and fall did not lead to significant changes in their consumption and transformation by pelagic bacteria. These results have important implications for assessing the ability of ecosystem to self-purify from organic pollution.

- The sufficiency and quality of the material

Both sequencing study and experimental study use state of the art methods and lead to new discoveries. The PhD candidate seems to be able to well work with these methods and to independently perform

excellent scientific research. All graphs and tables in the PhD thesis are of good quality both in format and in science.

- The adequacy of the methods used

As mentioned above the PhD candidate has used state of the art scientific methods. High throughput sequencing allowed for a detailed analysis of the bacterial diversity in the Yenisei River. Globally, only very little river basins of a similar extent have been studied using similar high resolution methods. The results, thus, can be regarded as unique and serve as a good basis for further follow-up studies.

- The validity of results

For me, all results seem to be very reliable and justified. I cannot detect any method flaws and hence think that the study has been performed with great care. I also believe that the PhD supervisors have carefully checked the work.

- The logic of the dissertation's structure

The dissertation has a logic structure: first exploring the biodiversity of heterotrophic bacteria in the Yenisei River basin and secondly focussing on selected groups of bacteria which are active in utilization of certain amino acids and then to follow the seasonal dynamics of specific amino acid utilizing bacteria.

- The knowledge and use of literature in the field

The PhD candidate demonstrates a good knowledge in the current literature. This can be best seen in the Introduction and Discussion sections. All cited work is relevant and I do not see a gap in important literature.

- The project's contribution to the research area

The project significantly contributes to our knowledge of bacterial biodiversity in the large Arctic river basins and allows for better global biogeography studies comparing riverine bacterial communities worldwide. The work of glycine and lysine utilizing bacteria is important to better understand DOM cycling in limnic systems, in particular to determine the seasonal role of such bacteria in the carbon and nitrogen cycling of such systems. Amino acids are a highly dynamic DOC/DON pool which has important implications for growth and biomass production by heterotrophic bacteria.

- The author's input into the achievement of the dissertation results

The first author of the published manuscript is the PhD candidate herself and hence her contribution represents a crucial input into the achievement of the dissertation results. For myself, the results of the study are well presented and prepared for future publication in international journals.

- Language

The language is of good quality, precise and well understandable.

- The shortcomings of the manuscript

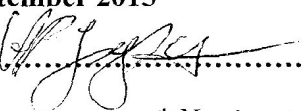
There are only minor shortcomings of the PhD thesis. Whereas the first (already-published) manuscript is of excellent scientific and language quality, the second part of the PhD thesis (mainly the experimental study and the seasonal dynamics) may not be in the final form. At least there is a slight difference in quality when comparing the 2 different sections. However, both studies are state of the art and the results have far reaching implications for our understanding of heterotrophic bacteria in riverine systems.

Name of the Dissertation Commission Member : Hans-Peter Grossart

Chair / Function : Oponent, foreign examiner

Date : 11th September 2015

Signature

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** No signature required when submitted per email.*

Please send the completed form to the Head of the office of the Doctoral and Post-doctoral, Faculty Performance Evaluation Office Grigorieva O.A. e-mail: grigorieva_00@mail.ru, tel. +7 (391) 206-22-62, address: 79/10 Svobodny pr., Room P6-16, 660041 Krasnoyarsk, Russia

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