

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
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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

Bacteria and other microorganisms mineralize organic substances and have other important functions in the cycles of carbon, nitrogen, phosphorus and other elements. Together with single-cell algae, they constitute the basis of trophic nets in aquatic ecosystems. Heterotrophic bacteria play the most important role in ecosystems with considerable inflow of allochthonous organic matter, such as rivers and reservoirs.

Since the introduction of molecular genetic methods in the last three decades, an enormous taxonomic and metabolic biodiversity of aquatic microorganisms was revealed but still the most part of it has not yet been studied. Many methods for nucleic acid extraction and analysis are used for investigations of aquatic microbial communities, including their structure and functions.

The thesis is devoted to research of biodiversity and functional activities of planktonic bacteria of the Yenisei River and the Bugach Reservoir. The urgency of this study is determined by its importance for understanding the patterns of structural and functional organization and for biodiversity assessment of freshwater ecosystems.

The dissertation consists of introduction, three chapters, conclusions and references. It has 86 pages and includes 14 figures and 9 tables. 140 published works are referenced.

In the introduction the candidate substantiates the rationale of the study, defines the aims and objectives, and demonstrates the scientific novelty and practical implications of the obtained results, as well as their validity and reasonableness.

The first chapter is a literature review of contemporary molecular genetic methods for identification of functions of individual bacterial species. Advantages and disadvantages, capabilities and limitations of each method are discussed. The second chapter is devoted to the bacterial biodiversity of the Yenisei River. In the third chapter the microcosm experiments are described, which aimed to study the influence of amino acid additions on the structure and function of planktonic bacteria of a eutrophic reservoir.

The most important results of the dissertation are:

1. For the first time the biodiversity of the Yenisei River bacteria was studied with the application of molecular genetic methods, such as next-generation sequencing.

2. 3022 operational taxonomic units of bacteria were identified in the Yenisei River planktonic communities. They belonged to 17 known taxonomic groups and 4 genera incertae sedis. The most OTUs belonged to Proteobacteria, Actinobacteria, Bacteroidetes and Verrucomicrobia.

3. The applicant marked out three bacterial assemblages at the studied section of the Yenisei River, significantly different in species composition and inhabiting river sections, located in different geographical zones: mountain taiga, plain taiga, and tundra/forest-tundra in the region of permafrost. It is supposed that the main factor which influences the taxonomic composition of the Yenisei River bacteria is the tributaries which bring along microbial inhabitants and a lot of dissolved and particulate organic matter. At each section the dominant taxa are allocated.

4. Not only the diversity of planktonic bacteria, but also the functional activity of individual species was studied. These studies are important for understanding the functioning of heterotrophic bacteria inhabiting the water column.

5. Narrow specialization in individual amino acids consumption was found in some species of planktonic bacteria.

6. Seasonal features of amino acid consumption by planktonic bacteria were determined, which might be important for ecosystem self-purification process.

The main results of the dissertation are summarized in the conclusion. They are reasonable, correspond to the objectives and follow from the content of the dissertation.

The dissertation is an example of high quality research, however, a few criticisms and questions arise:

1. A brief physical, chemical and microbiological description of the river is given, along with the map of sampling stations. A table with data on physical and chemical characteristics of the sampling stations should be added. This would be interesting, since the applicant states: "It is worth noting that at many transects there were conspicuous differences in ecological parameters between its left and right banks..."

2. Along with the bacterial counts the cell size is also worth estimating. This will allow calculating bacterial biomass, which is a very important characteristic of water ecosystems.

3. It is stated, that the reaction of planktonic bacteria depended on the concentration of the added amino acids. What is the basis for the chosen amino acid concentration? Why were the concentrations different in some experiments?

The main results of the dissertation are published in 5 articles. The dissertation is neatly formatted, the language is clear and academic. The scientific ideas are based on extensive research conducted in 2004-2013 with the application of contemporary microbiological and molecular methods. The methods which were used (DNA extraction, 16S rRNA amplification, NGS, DGGE) are described in details. The results on distribution, taxonomic biodiversity and functional activity of planktonic bacteria are new. In summary, the dissertation is a completed research study, conducted by the candidate independently at a high scientific level.

Name of the Dissertation Commission Member :

Chair / Function

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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