R E V I E W

of the PhD Thesis presented for the awarding of the scientific and educational degree DOCTOR in the field of higher education 4. Natural Sciences, Mathematics and Informatics; Professional Direction 4.3. Biological Sciences; Scientific Speciality **Hydrobiology**

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Theme: COMPOSITION, STRUCTURE AND DISTRIBUTION OF MACROZOOBENTHOS COMMUNITIES IN THE RIPAL ZONE OF THE BULGARIAN DANUBE RIVER SECTION, UNDER THE IMPACT OF THE EXISTING ANTHROPOGENIC PRESSURE

Reviewer: Prof. Dr. Zdravko Hubenov – National Museum of Natural History, Bulgarian Academy of Sciences

By order № 16 from 14.02.2025 of the Director of the Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences I was appointed a member of the scientific jury in a competition for the academic position of Doctor in the field of higher education 4. Natural Sciences, Mathematics and Informatics; professional direction 4.3. Biological sciences (scientific speciality – Hydrobiology), research group Bioindicators, Monitoring and Ecological Classification of Freshwater Ecosystems, Section Biodiversity and Functioning of Freshwater Ecosystems, Department Aquatic Ecosystems at the Institute of Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences, with scientific supervisor Assoc. Prof. Dr. Lachezar Pehlivanov.

MSc **Mila Kirilova Alexandrova-Ihtimanska**, PhD student at the Department of Biological diversity and functioning in fresh water ecosystems at the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, participates in the announced competition as a candidate.

Mila Alexandrova-Ihtimanska graduated from the Faculty of Biology (Master's Program Applied Hydrobiology and Aquaculture) at the Sofia University St. Kliment Ohridski, Faculty of Biology in 2011. She started working at the Institute of Biodiversity and Aquaculture - Bulgarian Academy of Sciences, Department of Aquatic Ecosystems in 2011. She worked as a Master of Biology and Assistant. She was a PhD student from 2012 to 2018 (with a 3-year break) when she was discharged with the right to defend and worked as a Master of Biology in the section Biodiversity and Functioning of Freshwater Ecosystems at the Institute of Biodiversity and Aquaculture, Bulgarian Academy of Sciences. She has led 2 national projects (under the program for young scientists) and has participated in 23 international and national projects of a scientific and applied science character. She has presented 19 publications, in 4 of which she is in the first place. She has 30

participations in international and national scientific forums. On the theme of the dissertation, 2 publications in specialized scientific academic journals and 3 participations in international scientific forums have been presented.

The presented data show the qualification, research experience and scientific activity, required for participation in the competition for a Doctor.

The PhD Thesis is written on 213 pages, of which 11 – Table of Contents, 2 – Introduction, 26 – Literature Review, 1 – Aim and Tasks, 19 – Material and Methods, 78 – Results and Discussion (divided into 5 sections), 7 – Summary Results, 3 – Conclusions, 2 – Contributions, 26 – References of 215 titles (27 in Cyrillic and 188 in Latin), 2 – Acknowledgements and 41 – Appendices. The dissertation contains 32 tables and 55 figures.

The introduction of the dissertation discusses the need of monitoring the ecological condition of the Danube River. Attention is paid to the lack of modern studies in the ripal zone compared to the main riverbed. The studies presented in the dissertation are current and necessary.

The precise and detailed literature review provides an idea of the knowledge of MSc Ihtimanska, her penetration into the problems and her ability to critically evaluate and use the available information. This is also seen in the following chapters of the dissertation, where the literature is used in the interpretation of her own data and conclusions. The literature analysis and the appendices provide detailed, useful, comprehensive and up-to-date information that can be used by various specialists.

The physicogeoraphical characteristic of the Danube River (included in the literature review) concern the features of the relief, waters, islands and the hydrological condition. It allows an opinion to be formed about the studied territory and the degree of its knowledge by the author. The attached figures completed this impression. Attention is paid to the macrozoobenthos, anthropogenic impact, reference conditions, water quality, water levels and the ecological condition of the Bulgarian sector of the river.

The aim and tasks of the dissertation include a study of the species composition of the zoobenthical complex of the ripal of the Bulgarian Danube river sector, its structure, distribution, comparative analysis of the separate parts and assessment of their ecological status using specific indicators for ecological classification of the habitats. The determination of the anthropogenic impact (on the influenced and most preserved habitats) on the taxonomic structure of the macrozoobenthic communities in the model ripal areas using parameters for hydrobiological impact.

The data presented in the dissertation corresponds to the set goal and the listed tasks. Classical and modern methods, adapted to the specifics of the

research, were used in collecting and processing the material. The duration of the study, joint work with the best specialists, the improvement of research methods and the use of modern methods allowed MSc Mila Ihtimanska to accumulate material suitable for comparative studies. A number of hydrobiological indices for the diversity of the composition, structure and distribution of the benthic communities were used, as well as a series of analyses that demonstrate well and convincingly present the results of the study. Software products necessary for modern analytical interpretation of the results were also used.

The current state of the macrozoobenthic communities in the ripal zone of the Bulgarian sector of the Danube River has been clarified. The influence of the anthropogenic impact and water levels on the composition and structure of the communities has been analyzed. Taxonomic differences indices have been applied and their effectiveness have been tested. The ecological potential along the entire river basin of the Bulgarian sector of the river has been determined. The least anthropogenically influenced territories have been localized. An achievement is the proposal for a modification in the methodology for calculating mRBA, standardized in the national legislation for determining the ecological potential of the rivers type R6 – Middle and Lower Danube.

The dissertation includes contributions of a faunistic, ecological, hydrobiological and methodological character, which are new for the science and enrich the existing knowledge, correct known ideas or supplement gaps in the knowledge about abiotic, biotic and anthropogenic adverse factors. These contributions have a fundamental scientific and scientific-applied character. The attached figures and tables support and illustrate the presented material.

The abstract and the reference for the scientific contributions correctly and accurately reflect the achievements of the PhD student.

The presented dissertation is according to the requirements proposed for the design of similar works. Some recommendations can be made regarding the design of the chapters and the upcoming research.

1. It should be kept in mind that the standard European and national hydrobiological methodologies, which are most often used, do not take into account the actual presence, abundance and biomass of the species from the Unionidae family.

2. When clarifying the content of the “U. crasus” complex, it is necessary to use the publication of Lopes-Lima et al. (2024).

3. It is better the Appendices 5, 6 and 7 – List of species identified in the ripal zone of the Bulgarian section of the Danube River during the studies to remain in Chapter 5.1 of the dissertation instead of being included as appendices.

From the literature at the end of the dissertation work and the abstract, it is seen the participation of Mila Ihtimanska, MSc in 2 publications (in specialized academic editions) on the topic of the dissertation and the participation in 3 scientific forums. In both publications, she is the first author. The publications are precisely presented, in English. They reflect the research of M. Ihtimanska, MSc on the hydrobiological condition of the macrozoobenthos in the Danube River – the species composition, anthropogenic impact and influence of the water levels on the communities.

The publications and original research outline the personal contribution of M. Ihtimanska, MSc as an established specialist in the presented field. The assessment according to the credit system of the Central Academic Council at the Bulgarian Academy of Sciences regarding the educational program (a mandatory minimum of 250 credits) has been significantly exceeded and the PhD student has achieved a total of 326 credits. The participation of Mila Ihtimanska, MSc is evident in a number of publications and scientific forums close to the topic of the dissertation, in some of which she is the first author.

Conclusion. Mila Ihtimanska, MSc is a well-established specialist in the field of the hydrobiology, familiar with the problems of the ecological classification of the freshwater ecosystems, their functioning and protection. The scientific results and conclusions are supported by convincing factological material and publications in specialized journals. The presented work is in accordance with the Act for the Development of the Academic Staff, the Rules of its Application and the corresponding Rules of the Bulgarian Academy of Sciences for the scientific and educational PhD degree. I give a **positive** assessment and **recommend** the Scientific Jury to vote **positively** and award the scientific and educational **PhD degree** to Mila Kirilova Alexandrova-Ihtimanska, MSc in the scientific specialty Hydrobiology.

Sofia

10.05.2025 Reviewer:

/Prof. Dr. Zdravko Hubenov/