

REVIEW

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**

Author: MSc **Monika Atanasova Subeva**, Institute of biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences

Theme: ZOOPLANKTON AS A BIOINDICATOR OF ECOLOGICAL STATUS OF STANDING WATER BODIES

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

By order № 31 from 11.04.2025 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. Vesela Evtimova, PhD and consultant Assoc. Prof. Dr. Lachezar Pehlivanov.

MSc **Monika Atanasova Subeva**, 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.

Monika Subeva graduated from the bachelor's program in biology at the Sofia University St. Kliment Ohridski (Faculty of Biology) in 2013. In 2015, she graduated from 2 master's programs at the Faculty of Biology of the Sofia University: 1) "Pedagogy, Methodology of Biology Education" and "Man and Nature" with a postgraduate qualification "Biology Teacher"; 2) "Applied Hydrobiology and Aquaculture" with a theme on the macroinvertebrate fauna of the Atanasovsko Lake. She had been a PhD student since 2016 at the Department of Aquatic Ecosystems of the Institute of Biodiversity and Ecosystem Research (IBER) at the Bulgarian Academy of Sciences, discharged with the right to defend. She is now a MSc in biology in the section Biodiversity and Functioning of Freshwater Ecosystems of IBER. She has participated in 16 international and national projects of a scientific and scientific-applied character. She has 5 publications in which she is in the first place (2 with IF) and 8 participations in international and national scientific forums.

On the theme of the dissertation, 4 publications in specialized scientific journals and 4 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 121 pages, of which 3 – Table of Contents, 2 – Introduction, 11 – Literature Review, 1 – Aim and Tasks and working hypothesis, 19 – Material and Methods, 61 – Results and Discussion (divided into 6 sections), 3 – Summary Results and Conclusions, 3 – Contributions, 14 – References of 152 titles (39 in Cyrillic and 113 in Latin), 1 – Acknowledgements and 6 – Appendices. The dissertation contains 3 tables and 18 figures.

The introduction of the dissertation discusses the need of monitoring the ecological condition of the stagnant waters via studies on the plankton communities. Attention is paid that research on the plankton run behind that on the benthic coenoses. With regard to the water directives, there are not enough planktological studies despite their importance in assessing the processes, occurring in the water bodies. That's why new studies on the plankton in stagnant waters are needed. The studies presented in the dissertation are current and necessary.

The precise and detailed literature review provides an idea of the knowledge of MSc Subeva, 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 selection of the studied stagnant water bodies, made according to the basin directorates and the river basin management plans (of different lake types and ecological potential, man-made, highly modified, included in the national monitoring program) and the environmental factors taken into account (according to the national legislation) from the respective parts of the studied lake bodies, allow an opinion to be made about the studied water bodies and the degree of their knowledge by the author. The necessary ecological indices for assessing the communities were used. The attached figures add this impression. Attention is paid to the macrozoobenthos as a comparative element in the study.

The aim and tasks of the dissertation include studying of the indicator potential of the plankton communities in representative water bodies - species composition, trophic condition, saprobic valences, biological elements of the hydrobiological impact, ecological potential and comparison with benthic communities in model locations of the separate water bodies.

The data presented in the dissertation corresponds to the set goal and the listed tasks. 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 Monika Subeva 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 condition of the plankton communities in the studied dams (stagnant water bodies of different types) has been clarified. The taxonomic composition of the Rotifera, Cladocera and Copepoda groups has been established. Their abundance and biomass, seasonal changes and dominance have been determined. The macrozoobenthic communities in the studied dams have been scrutinized. The coenotic, trophic and saprobiont indices have been determined and plankton indicator taxa have been established. The possibility of using zooplankton species as bioindicators for the ecological potential of the dams has been proven. The anthropogenic impact on the composition and structure of the communities has been analyzed and the indices for determining the ecological potential have been applied in the investigations of 8 dams.

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 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 but some recommendations can be made.

1. The abstracts of the publications for the corresponding chapters must be presented with citations of the authors (and not the titles and works that are already given in the dissertation).

2. Too many abbreviations have been used, which makes the text incomprehensible and obscure in places. Although many of them are widely used in the hydrobiological literature, it is better their use to be limited.

3. It is better the Table "Seasonal distribution of the zooplankton community" to be in the Chapter 5.1 of the dissertation. It is not necessary this table to be given as an appendix.

From the literature at the end of the dissertation work and the abstract, it is seen the participation of MSc Monika Subeva in 4 publications (in specialized academic journals) on the topic of the dissertation and the participation in 4 scientific forums. In all publications (of which 2 have IF) and reports at the scientific forums, she is the first author. The publications are accurately presented, in English and reflect the investigations of MSc M. Subeva on the hydrobiological condition of 8 dams - species composition, structure and ecological potential of the plankton communities, anthropogenic impact and possibilities for using the zooplankton taxa as indicators.

The publications and original investigations outline the personal contribution of MSc Monika Subeva as an established specialist in the presented field. The assessment according to the credit system of the Bulgarian Academy of Sciences regarding the educational program (required minimum of 250 credits) has been significantly exceeded and the PhD student has achieved a total of 402 credits. The participation of MSc Monika Subeva is evident in a number of publications and scientific forums close to the theme of the dissertation, in most of which she is the first author.

CONCLUSION. MSc Monika Atanasova Subeva 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 the specialized scientific 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 degree **Doctor**. I give a **positive assessment** and **recommend** the Scientific Jury to vote **positively** and award the scientific and educational degree **Doctor** to MSc Monika Atanasova Subeva, in the scientific specialty Hydrobiology.

Sofia

27.06.2025

Reviewer:

/Prof. Dr. Zdravko Hubenov/