

STATEMENT

From: Assoc. Prof. Teodora Ivanova Todorova, PhD, Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, appointed as a member of the scientific jury, according to Order No. 29/04.04.2025 of the Director of IBER – BAS,

Regarding: doctoral dissertation for the award of the educational and scientific degree "Doctor" in scientific specialty 02.22.01 "Ecology and Ecosystem Conservation", on the topic: "Hibernation peculiarities of cave-dwelling bats from Bulgaria in the context of Global Climate Change", Doctoral student: Nia Lyubenova Toshkova, Scientific supervisor: Prof. Vasil Popov, PhD.

The PhD thesis was developed within the framework of a full-time doctoral program in the section "Community Ecology and Conservation Biology", Department "Ecosystem Research, Ecological Risk Assessment and Conservation Biology" of the Institute of Biodiversity and Ecosystem Research - Bulgarian Academy of Sciences and represents a study of the features of hibernation in cave-dwelling bat species in Bulgaria, in connection with the climate change impact. The dissertation is presented in the form of bound publications and meets the Requirements for dissertations for the acquisition of the educational and scientific degree "Doctor", applied at the Institute of Biodiversity and Biodiversity - Bulgarian Academy of Sciences. The total volume is 147 pages. The following 6 sections are distinguished: Introduction (2 pages); Aim and objectives (4 pages); Literature review, materials and methods, results and discussion (118 pages), presented in the form of five scientific publications - three published, one unpublished manuscript, one methodology, published as a preprint on the protocols.io platform; Conclusion (15 pages); Acknowledgements and References.

The aim of the PhD thesis is clearly formulated and 4 tasks are set for it:

- Research and establishment of the patterns of winter activity of bats
- Research of the feeding activity and the food spectrum of bats in winter
- Assessment of the health status of bats in the studied sites before and after hibernation, as well as the influence of activity on key physiological parameters
- Optimization of the methods for monitoring bats to more effectively and comprehensively collect data on the impact of climate change on them.

Each task is supported by working hypotheses as well as properly selected and well-described methodologies. The obtained results emphasize the role of local ecological factors and the specific characteristics of winter shelters in determining the activity of bats. The multidisciplinary approach applied in developing the tasks clearly outlines the acquired important modern knowledge and practical skills of the PhD student. The convincing and reliable results are an undoubted scientific contribution to the field of ecological research.

The formulation of limitations and guidelines for future studies makes a good impression, as it shows that Nia Toshkova has critical thinking and possesses the qualities of a well-established and

forward-looking researcher. The significance of the present work is expressed in the provision of a scientific basis for the winter activity of bats, one of the poorly studied groups of mammals worldwide. The formulated conclusions and contributions fully reflect the results obtained by the doctoral student.

With particular scientific weight can be indicated the data obtained for the first time for Bulgaria on the preferences and dynamics of the behavior of the species, the registered flight activity of bats at temperatures of -8°C , the impact of skin parasitic mites on bats, together with the potential pathological consequences. The complex of methods metabarcoding, morphological analysis of guano, and monitoring of the winter activity of model groups of potential prey, has been applied for the first time in such a type of research and significantly contributes to expanding analytical capabilities and limiting the risk of errors in interpreting the results. Nia Toshkova has considered almost all the critical notes made during the approbation. There are still some minor grammatical or technical errors in places, which do not detract from the work in any way.

The dissertation work identifies four scientific and applied contributions, two of which can also be classified as methodological. Within the framework of the dissertation, a new methodology for determining the wing damage index in bats has been developed and published. This is a significant contribution in the context of monitoring individual and population health status, as well as morphological studies related to the structure and condition of skin membranes. Additionally, the methodology for monitoring and assessing the status of cave-dwelling bat species to the National Biodiversity Monitoring System has been updated.

Thanks to the provision of the obtained data in open-access databases, transparency of the research is ensured and the possibility of their inclusion in long-term analyses for the benefit of global and local initiatives for studying the winter activity of bats, behavioral specifics, and ecophysiology.

The abstract is formatted according to the requirements and reflects the results and conclusions presented in the dissertation.

During the development of the PhD thesis, the doctoral student took part in 5 scientific forums. The presented scientific publications in the dissertation are of high scientific quality, which is also supported by the presence of citation of one of the articles.

Conclusion: The PhD thesis of Nia Toshkova fully complies with the Law on the Development of Academic Staff in the Republic of Bulgaria and the Regulations on the terms and conditions for acquiring scientific degrees and for occupying academic positions at the Institute of Biodiversity and Ecosystem Research - BAS. All this gives me reason to vote positively and to recommend to the Scientific Jury to support the award of the educational and scientific degree "Doctor" in the professional field 4.3. Biological Sciences, in the scientific specialty 02.22.01 "Ecology and ecosystem conservation".

19.06.2025

Sofia

/assoc. prof. Teodora Todorova/