

REVIEW

by

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Studies of the Bulgarian Academy of Sciences, Sofia**

on

dissertation work for the award of the educational and scientific degree “Doctor”

by: Field of higher education 4. Natural sciences, mathematics, and informatics,

Professional direction 4.3. Biological Sciences

Doctoral Program Zoology

Author: Polina Dimitrova Hristova

**Topic: NEST FAUNA OF THE FRAGMENTS OF PLAIN FORESTS IN THE WESTERN
UPPER THRACIAN LOWLAND**

Scientific supervisors: Assoc. Prof. Dr. Hristo Dimitrov, PU, Plovdiv and Assoc. Prof. Dr. Georgi Popgeorgiev, NPM, Sofia

1. Presentation of the procedure and general description of the materials received for review

By order № 21-494 of 27.02.2024, I have been appointed as a member of the Scientific Jury to ensure a procedure for the defence of dissertation work on the topic: “NESTING BIRD FAUNA OF THE FRAGMENTS OF PLAIN FORESTS IN THE WESTERN UPPER THRACIAN LOWLAND” for the acquisition of the educational and scientific degree “Doctor” in field of Higher education 4. Natural sciences, mathematics, and informatics, Professional field, 4.3. Biological Sciences; Doctoral program “Zoology”.

The author of the dissertation is Polina Dimitrova Hristova – a Ph.D. student in full-time studies at the Department of Zoology of the Faculty of Arts of the PU with scientific supervisors Assoc. Prof. Dr. Hristo Dimitrov, PU, Plovdiv and Assoc. Prof. Dr. Georgi Popgeorgiev, NPM, Sofia.

The materials presented by Polina Dimitrova Hristova are following Article 36 (1) of the Rules for the Development of the Academic Staff of Plovdiv University. It includes all the required documents, as a specific feature of the submitted set of documents is that 2 out of 3 deposited articles are “in press” and official notes certify their acceptance by the Editorial Boards. No list of citations noticed is presented.

2. Brief biographical data of the PhD student

Hristova studied at PU Plovdiv, where she developed a diploma thesis "Research of the avifauna in the central part of the city of Plovdiv" and received a "Bachelor" qualification in the field of ecology. Subsequently, she acquired the title of "Master" after defending her diploma thesis "Distribution of nesting species of nocturnal birds of prey (Aves: Strigiformes) in the Municipality of Plovdiv". The knowledge accumulated in this stage of training allowed Hristova to successfully join the work of non-governmental organizations: initially in Green Balkans, and subsequently, after 2019, in the Bulgarian Society for the Protection of Birds, where she is still engaged in research on biodiversity and its protection in birds, mainly on the territory of Bulgaria.

3. Actuality of the topic and appropriateness of the set goals and tasks

Nowadays, in most European countries, including Bulgaria, the natural appearance of forest ecosystems has been significantly altered by economic exploitation. A particularly important role in this change is played by increasing urbanization and the expansion of agricultural areas, in which large forest areas are used. As a result of the degradation and fragmentation of natural forest ecosystems, they have been taken over mainly by agricultural land and have become island habitats for associated animal species.

The reduction of natural forests has a particularly strong impact on birds attached to forest ecosystems. Their communities are being changed by anthropogenic impacts. This change necessitates the study of environmental factors leading to changes in the structures and numbers of bird populations in response to anthropogenic pressure. In such a case, the most frequently studied parameters aimed at establishing how changes in the habitat conditions of birds in fragmented forests are affected are: the determination of their density, diversity, and number in the studied forest habitats. This is especially true for forests in the Thracian Lowland, which are fragmented forests and can be seen as island habitats and refuges for a wide variety of birds in a vast area of agricultural land.

4. Knowing the problem that will be solved in the dissertation assignment

Hristova's good knowledge of the issues related to the dissertation task planned for development, supported by her creative evaluation, allowed the Ph.D. student to build an optimal algorithm, and what actions she should take to successfully solve the goal of his dissertation task. The choice of the adopted algorithm was based on the appropriately selected information acquired through the analysis of the literature data **in the performed literature review**. They are used correctly and informatively. The doctoral student has cited main literary sources, which are an integral part of modern scientific literature related to the topic of the dissertation work. The process of selecting and interpreting literary data shows the good literary awareness of the doctoral student.

In the introductory part of the dissertation, knowledge reflecting the species composition and distribution of birds in lowland forests, as well as knowledge about them, is well presented. The

influence of certain characteristics is the characteristics presented, in this case, they are divided between analysis of: the influence of the structure and composition of the forests, in a fusion of economic practices, and in casting the fragments of lowland forests on the birds.

All of this has allowed Hristova to direct her research to a current topic for research on forests in the Thracian lowland, where the main goal is to study nesting avifauna of fragments of plain forests in the Western Upper Thracian lowland. These studies are current, important, and of interest, both from a fundamental and from a scientific-applied point of view.

The full-fledged and well-made literature review, as well as the skillful guidance and successful consultations with the academic supervisors, helped Hristova to formulate correctly the goal of her dissertation assignment, while at the same time predicting the appropriate tasks, the implementation of which would lead to its successful completion. Thus, **the formulation of the main objective of the study** was reached, which required: determining the composition of the nesting avifauna in the fragments of plain forests in the Western Upper Thracian lowland and evaluating the influence of the structure and characteristics of the fragments on their populations and ornithocenoses. The achievement of this goal is based on **the main tasks envisaged for implementation in the dissertation work**, which can generally be considered as 1. Determination of the species composition of the avifauna and the distribution of the species in the studied fragments; and 2. Determination of numbers and density of populations.

To achieve these very ambitious tasks, Hristova planned to conduct research using appropriate methodology, allowing the achievement of the set general goal and obtaining an adequate answer to the tasks solved in the dissertation work,

5. Research methodology

The applied **research methodology** allows for obtaining an adequate answer to the tasks solved in the dissertation and, on this basis, to the set general goal.

The selected methodology is being built on the basic concepts adopted in ornithology that: 1) individual species and their populations have a different role in the functioning of forest ecosystems and are accepted as an indicator of their condition, 2) the diversity of ornithocenoses is most often used to assess the condition of forests, 3) the abundance of certain groups of birds is a criterion when comparing the quality and origin of the habitat.

Material and Methods section correctly describes the methods used to obtain data characterizing the parameters allowing us to reach an analysis of these three fundamental directions for the study of birds in lowland forests.

The study area was selected appropriately. Its physical geographic characteristics and forest management nature create a good basis for demonstrating the knowledge of the dissertation student when conducting ornithological research in the Thracian lowland. The same goes for the selection of

15 fragments of lowland forests in the Western Upper Thracian lowland in which the present study was conducted. The reporting of habitat characteristics properly extends to both the reporting of habitat characteristics at the plot level and the analysis of habitat characteristics at the fragment level. Counting the birds is also correctly described showing the methodical features in the study of day-active bird species and night-active bird species. Grouping of species according to ecological requirements was also carried out.

The last dose of information included in the description of the used methods section is the presentation of the **statistical data processing algorithm**, which examined the methods used in: the analysis of the species composition of nesting birds; determining the number and density of nesting birds; determining the influence of lowland forest fragments and habitat characteristics on bird species richness and abundance. The proposed algorithm makes it possible to assess the reliability of the conclusions made subsequently.

6. Characterization and evaluation of the dissertation work

The dissertation is structured according to the standard requirements, with the necessary sections to include the information enabling its realistic evaluation and assessment of the scientific popular and scientific knowledge contained in it. Thus, its construction is built on a book body that contains 132 pages and includes: 20 tables, 20 photos, 16 figures, 19 appendices, and 201 literary sources, of which 23 are in Cyrillic and 178 in Latin.

In order to support the conducted research and substantiate its significance for science and practice, Hristova has presented in her dissertation research information that includes: 1) the basic knowledge of the subject of the research, which proves the necessity of conducting the planned research, 2) a detailed description of the objects of research and the methods of their research, 3) the algorithms used to process the received data specific to each research method and 4) the results of the research themselves and 5) their interpretation in the context of the research.

The professional approach to their presentation in the dissertation gives reason to assume that the obtained results are a solid foundation, predetermining the credibility of the material on which the conclusions and contributions obtained in this research are based.

The section **“Results and discussion”** concentrates on the main knowledge obtained during the development of the dissertation work, in which the determination of species composition, numbers, and density of breeding birds was reached, and knowledge on the determination of species composition is presented in detail of the avifauna; distribution of nocturnal breeding bird species and density, abundance, and frequency of occurrence of breeding bird species. The influence of the habitat characteristics on the species composition and abundance of ornithocenoses, as well as the influence of the fragments of plain forests on the species richness, is also evaluated.

After the conducted research, it is rightly noted that the greater species richness and diversity of birds are found in forests with a large preserved area, preserved natural and semi-natural vegetation, or a high degree of heterogeneity with preserved old trees. The decrease in the area of forest fragments and the increase in the degree of isolation between them has a significant impact on some species, but structural and vegetation characteristics are more important for a large number of species. This conclusion can serve as a basis for the preparation of proposals for the preservation of larger fragments of natural forests, during the development of forestry projects in flat areas.

7. Contributions and significance of the development of science and practice

The contributions and significance of the development of science and practice are highlighted in the **“Conclusions” section** combined with the information presented in the **“Contributions” section**.

In the **“Conclusions” section**, all important results are presented as conclusions, which are of significant importance for achieving the main goal of the assignment, and they are: 1) It has been proven that the lowland forests of the Western Upper Thracian lowland have a high species richness, which is documented by the established 95 species of birds, of which 81 have been confirmed as nesting in the investigated forest fragments. 2) At the same time, the species richness and diversity in these forests are greatest in forest fragments with a heterogeneous structure and forests with preserved natural vegetation such as fragmented forest habitats that support a small number of species with specific requirements to the habitat structure, such as the presence of dead wood, old hollow trees, and dense undergrowth. 3) It was unequivocally established that widespread forest bird species are the most abundant. 4) The specific studies for the entire territory reveal that species with the highest density are widespread forest species. 5) In the study of the size of the fragment, it was shown that it has a positive influence on the formation of species richness in fragmented forests, and also that the abundance of species is greatly influenced by the structure of the vegetation in the forests.

The inclusion of detailed information in this section, which naturally follows from the **“Results and Discussion” section**, leads to a certain degree of repetition of the information contained therein. If had the findings been presented in a more synthesized form, the dissertation would have improved its design.

The dissertation has grouped the knowledge he assumes to be contributing into three main categories. 1) Original contributions. 2) Affirmative contributions. 3) Contributions of a scientific and applied nature. I accept the contributive nature of the ornithological information shared in the three categories because it is a derivative of correctly selected methodological bases of the research and analysis of the obtained results. As the most significant contribution, I appreciate the disclosure of 1) The composition and species diversity of birds in fragmented lowland forests in Bulgaria, as well as the established knowledge about. 2) The influence of the structure of forest fragments on the

abundance and species richness of birds in lowland forests. Those presented in Confirmatory Contributions. 6 statements resulting from the development of the dissertation assignment, which by their nature coincide with the previous one the known information in the areas in which they were formulated and in other developments in the field of ornithology are proof that in the present study it was done correctly, respecting the canons for this type of research.

8. Assessment of dissertation publications

3 publications reflect the results of the dissertation articles. All three are the result of an author's collective, whose composition varies from 4 to 7 people. One of the articles has been peer-reviewed and printed. The other two are under seal, authenticated by a document from the Editorial Colleagues. The subject in which the doctoral candidate has chosen to work is very interesting, and it is possible to cooperate with other scientists from the country and abroad, which will help her acquire the scientific authority she deserves about the results obtained. For now, its results remain recognizable only in Bulgarian publications.

9. Personal participation of the doctoral student

Hristova's leading personal involvement in the development of these 3 articles is adequately represented by her involvement as first author and is supported by the fact that all publications are closely related to the content of the dissertation assignment.

10. Abstract

The content of the abstract reflects the main sections of the thesis. It presents in a synthesized form the overall information obtained during the development of the dissertation assignment. The lack of content in the abstract makes it difficult to compare the information contained in the abstract with that in the dissertation.

11. Critical remarks and recommendations

I have no significant comments regarding the conducted research and the set of materials. This is because I am convinced that the development of the dissertation has been done in compliance with all the basic principles of scientific research in the field of ornithology.

12. Personal impressions

I do not have personal impressions of Hristova's scientific activity, but a clear idea of her organizational qualities and love for scientific research is gained when reviewing the completed version of her dissertation assignment. Without a doubt, this is a person devoted to scientific research in the field of nature protection.

13. Recommendations for future use of dissertation contributions and results

For now, this is a pilot study in Bulgarian lowland forests, during which a significant amount of knowledge was obtained allowing the derivation of an algorithm for comparative analyses and evaluation of changes in ornithocenoses about economic practices and climate changes.

Turning this algorithm into a permanent monitor would help protect wild birds in the flat forests of Bulgaria.

CONCLUSION

My general impression of the qualities of Hristova's dissertation work gives me a reason to conclude that the doctoral student demonstrates the ability to carry out independent scientific and scientific-applied activity, to report and interpret in an appropriate manner the received scientific-applied and scientific data, and to draw relevant conclusions.

Based on the review of Hristova's mastery and application of research methods, the logical justification of the conclusions offered in the dissertation development, and their significance, I accept that she has developed a dissertation meeting the conditions for obtaining the educational and scientific degree “Doctor”.

I confidently give my positive assessment of the conducted research, reflected in the peer-reviewed dissertation work and abstract, achieved results and contributions, and I propose to the honourable Scientific Jury to award the educational and scientific degree “Doctor” (PhD) in the scientific specialty “Zoology” (code 10602) to Polina Hristova in field of higher education: Natural sciences, mathematics, and informatics, Professional direction 4.3. Biological Sciences, Ph.D. program “Zoology”.

Sofia, March 2024

Reviewer:

/Prof. Georgi Markov, DSc, PhD/