

**REVIEW**  
**by Dr. Tsenka Georgieva Chassovnikarova**

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"P. Hilendarski" and Institute of Biodiversity and Ecosystem Research, BAS

of a thesis for awarding the educational and scientific degree "**Doctor**" by field of higher education  
**4. Natural sciences, mathematics, and informatics**, professional field **4.3. Biological Sciences**,  
PhD program **Zoology**

**Author: Polina Dimitrova Hristova**

**Scientific supervisors:** Assoc. Prof. Dr. **Hristo Angelov Dimitrov**, PU "P. Hilendarski"  
Assoc. Prof. Dr. **Georgi Sashev Popgeorgiev**, NMNH, BAN

**1. General description of the presented materials**

By order No. PD-21-494 of February 27, 2024, of the Rector of Plovdiv University (PU) "Paisiy Hilendarski" I have been appointed as a member of the scientific jury to ensure a procedure for the defense of dissertation work on the topic "**Nesting avifauna of the lowland forest fragments in the Western Upper Thracian Plain**" for acquiring the educational and scientific degree "doctor" in the field of higher education **4. Natural sciences, mathematics, informatics**, professional direction **4.3. Biological Sciences**, doctoral program "**Zoology**". The author of the dissertation is **Polina Dimitrova Hristova** full-time PhD student at the Department of Zoology of the PU with scientific supervisors Assoc. Prof. Dr. **Hristo Angelov Dimitrov** from PU "P. Hilendarski" and Assoc. Prof. Dr. **Georgi Sashev Popgeorgiev** from the National Museum of Natural History, BAS.

The set of materials presented by Polina Hristova is in accordance with Article 36 (1) of the Regulations for the Development of the Academic Staff of the PU "P. Hilendarski" and includes the following documents:

- ✓ request to the Rector of the PU to disclose the procedure for the defense of a dissertation work;
- ✓ CV in European format;

- ✓ protocol from the departmental council related to reporting the readiness to open the procedure and preliminary discussion of the dissertation work;
- ✓ dissertation work;
- ✓ abstract in Bulgarian and English;
- ✓ declaration of originality and credibility of the results and contributions of the dissertation work and submitted documents;
- ✓ list of scientific publications on the topic of the dissertation;
- ✓ certificate of compliance with the national requirements according to the law on the development of the academic staff in the Republic of Bulgaria (ZRASRB).

The applicant has attached a list containing 3 scientific publications in print as follows: one in a journal with quartile Q4 and impact factor 0.5 -*Acta zoologica bulgaria* and two in a Q4 quartile journal with no impact factor -*Ecoologia balkanica*. Based on the presented publications, the candidate fulfills the national requirements according to the ZRASRB and the Regulations for the Development of the Academic Staff of the University of Plovdiv "P. Hilendarski" (PRASPU).

## **2. Brief biographical data of the PhD student**

Polina Hristova graduated from PU "P. Hilendarski" in 2017, as her studies are focused on the field of ecology and environmental protection - she has a bachelor's degree in ecology and graduated with a master's degree in "Biodiversity, ecology, and conservation" magister program by developing a diploma thesis on the topic "Distribution of breeding species of nocturnal raptors ( Aves: Strigiformes) in the Municipality of Plovdiv". Her entire activity was then connected with active work in the field of nature protection and conservation biology as an active participant in the activities of the "Green Balkans" association. In March 2019, she was enrolled as a full-time doctoral student in the "Zoology" department of the BF at the PU "P. Hilendarski". Her professional development is related to the development of several environmental protection projects such as the monitoring of the *Eurotestudo hermanni* and *Greek tortoise* land turtles and common loggerhead (*Himantoglossum caprine*) within the framework of the "Sustainable Biodiversity" project of the Bulgarian Society for the Protection of Birds and the study of the density of cetaceans in the Bulgarian water area of the Black Sea. Her entire professional activity reflects her formation as a well-established specialist in the field of conservation biology and environmental protection. P. Hristova is the author of a total of 6 scientific publications, three of which are on the topic of the dissertation work. She participated in two conferences - one international conference (Portugal) and one national (Hisaria, Bulgaria).

### **3. Topic relevance and appropriateness of goals and tasks**

P. Hristova's dissertation is a modern study of the nesting avifauna in fragmented lowland forests of the Western Upper Thracian lowland with an ecological and conservation-biological orientation. Priority goals for conservation biology and ecology are the protection of biological diversity and the preservation of the gene pool of natural populations. The increased anthropogenic pressure on the environment over the last century has led to an increase in the ecological risk for many natural populations and biocenoses, which is most often reflected in a decrease in their numbers. Forests, which are the largest terrestrial ecosystem, are also subjected to increased anthropogenic pressure, leading to the loss of forest territories and their degradation and fragmentation. That is why biomonitoring studies on the distribution and species composition of biocenoses in forest ecosystems are extremely important for the study and protection of biodiversity in these habitats with varying degrees of anthropogenic influence. The direct and indirect impact on forest ecosystems leads to changes in the species composition and diversity of ornithocenoses. To assess the ecological risk for their populations and species, it is first necessary to collect adequate scientific information about their distribution and to assess the environmental factors that influence their formation. Comprehensive systematic studies of ornithocenoses in old, fragmented forests, the result of natural processes, which study the influence of the structural characteristics of the habitat on bird communities are rare. In this context, the focus of the dissertation is very relevant, as it addresses a large gap in the faunal and ecological studies of the Bulgarian avifauna.

### **4. Knowledge of the problem**

In the "Literature review" chapter, the doctoral student demonstrates an enviable knowledge of the scientific literature on the studied problem. The literary list includes 206 literary sources (23 in Cyrillic and 183 in Latin). The previously known results have been examined systematically and in a logical relationship, an analytical analysis of the considered literary sources has been carried out, which is a good basis for the interpretation of the results obtained in the dissertation. The comprehensiveness and analytical nature of the literature review demonstrate the good theoretical preparation of the doctoral student on the researched scientific problems and are a prerequisite for the competent interpretation of the obtained results.

### **5. Research methodology**

The thesis employed an integrated approach, using various research methods to assess the relative density and population abundance of ornithocenoses in fragmented lowland forests of the Western Upper Thracian lowland. A remote method was used through a point transect to report the

relative density of songbirds. SmartBirds Pro mobile application was used for standardized collection and analysis of ornithological information, and QGIS software was used for spatial analysis of information. Vocal provocation was conducted at randomly selected sites other than the nocturnal bird species survey point transects. Species in the ornithocenoses are grouped according to their ecological requirements into guilds concerning the food base during the nesting period and nesting sites. The habitat characteristics at the trial site were reported based on the percentage cover of six plant floors, their composition, and dendrological parameters. Assessment of habitat characteristics at the fragment level was conducted by accounting for forest type, percentage of dominant tree species in each fragment, and forest age using spatial pattern analysis. Standard indices of diversity and evenness were used to assess species diversity. Modern multivariate statistical programs (Multiple covariate distance sampling, Multiple regression analysis, Generalized Linear Mixed Models) were used to assess the population abundance and density, the influence of fragments, and habitat characteristics on species richness.

The use of modern methods adequate to the set goals and objectives contributes to the objective analysis of the study and sets the standards for similar studies in Bulgarian ornithological studies. I appreciate very highly the methodological basis and research approaches used.

## **6. Characterization and evaluation of the thesis**

The thesis is structured in 10 sections, respecting the traditional requirements for the type and organization of the chapters - Introduction (2 pages), Literature review (9 pages), Goals and tasks (1 page), Characteristics of the researched area (6 pages), Material and Methods (11 pages), Results and Discussion (51 pages), Conclusion (2 pages), Conclusions (2 pages), Contributions (1 page), References (19 pages) and Appendix (16 pages). The chapter ratio is proportionate to the study's nature, aims, and objectives, conforming to generally accepted practices. The thesis comprises 132 pages and features 16 figures and 20 tables. Additionally, the Appendix chapter contains 3 tables, 9 figures, and 6 photos. The credibility of the conclusions and contributions of the thesis is guaranteed by the listed metric characteristics, the extent of research, the amount of data obtained, and the adequate methods used to evaluate and analyze the data.

## **7. Contributions and significance of the thesis for science and practice**

This thesis presents one of the first studies of ornithocenoses in old, fragmented forests resulting from natural processes. It investigates the influence of habitat structural characteristics on bird communities in the Bulgarian avifauna. The study makes significant fundamental and scientific-applied contributions and is based on a sufficient amount of research work, ensuring the credibility, comprehensiveness, and significance of the results obtained.

## **Basic scientific contributions**

### *Original*

- ✓ For the first time in Bulgaria an up-to-date assessment of the composition and species diversity of ornithocenoses in lowland fragmented forests is made by analyzing the population indices of the relative abundance, density, and distribution of songbirds and nocturnally active bird species.
- ✓ For the first time in Bulgaria, the positive correlation between the structure of forest fragments and the abundance and species richness of ornithocenoses in fragmented lowland forests has been proven.

### *Affirmative*

- ✓ The structural characteristics of forests influence the species diversity and abundance of birds, as the size of the fragment is extremely important.
- ✓ Fragmented forest habitats support a small number of species with specific habitat structure requirements.
- ✓ Species preferring the forest interior have a lower frequency of occurrence and relative abundance in the fragments.
- ✓ Forests with conservation status and preserved elements of natural vegetation maintain greater species diversity with more specialist species.

## **Scientific-applied contributions**

- ✓ An inventory of the species richness in the lowland fragmented forests of the Western Upper Thracian Lowland was carried out.
- ✓ The factors affecting the species diversity in the lowland fragmented forests of the Western Upper Thracian lowland were determined.
- ✓ A scientific base has been created for subsequent monitoring studies to assess the changes in the ornithocenoses of the lowland fragmented forests of the Western Upper Thracian lowland, the result of various processes - anthropogenic pressure, climate changes, etc.

In conclusion, I can summarize that this is a study that sets the methodological standards for the study of ornithocenoses in fragmented forest ecosystems, performed at a modern methodological level. I hope it finds its sequel in the future.

## **8. Assessment of dissertation publications**

When submitting the materials for the competition, I reviewed the research papers submitted by the PhD student. All of the attached 3 scientific articles are in print - one in *Acta zoologica bulgaria* and two in *Ecologia balkanica*. All are with quartile Q4, with only one having an impact factor of 0.5 (*Acta zoologica bulgaria*). This is an eloquent testimony to the qualities of the scientific developments that reflect the results presented in the dissertation. In all publications, the doctoral student is the first author, which testifies to his leading role in the research's conception, planning, and conduct. The number of co-authors varies between 5 and 7, which reflects the collective nature of the developments and the ability of the PhD student to work in a team and draw knowledge and experience from collaboration. The presented results will likely find a broad response among the scientific community due to their importance.

### **9. Personal participation of the doctoral student**

The dissertation is the personal work of the Ph.D. student. She successfully performs a complex analysis of the developed problem, which she analytically interprets and discusses. With confidence, I can state that today, Polina Hristova is a fully formed and prepared researcher at a modern level in conservation biology and ecology. During the years of developing the dissertation work, P. Hristova showed diligence, discipline, consistency, and innovation.

### **10. Abstract**

The abstract reflects the methodological, scientific-theoretical, and scientific-applied achievements of the developed dissertation work. It was prepared following the requirements of the Regulations for the Development of the Academic Staff of the PU "P. Hilendarski" and ZRASRB.

### **11. Critical remarks and recommendations**

- ✓ The relevance of the developed topic is not well presented in the Introduction of the work. The Ph.D. student could better emphasize the innovative nature of the study's part in assessing environmental factors in fragmented forest ecosystems in the formation of ornithocenoses.
- ✓ In my opinion, some vagueness has been allowed in the formulation of the main objective of the study. The wording "to evaluate the influence of the structure and characteristics of the fragments" is too vague - which characteristics of the fragments will be evaluated. This is also not specified in the subsequent tasks.
- ✓ The characteristics of the studied area should appear in the Material and Methods chapter. I see no reason for it to be singled out as a separate chapter.
- ✓ The presentation of a summary figure representing all the fragments examined would help the

reader better understand the scale of the investigation and the location and distance of the fragments relative to each other.

- ✓ The contributions should not repeat the conclusions, but in striving for this, the PhD student has deprived the contributions of any concreteness, and often sound too general and vague.
- ✓ The presentation style is often terminologically ambiguous or unclear and needs refinement.

I have the following clarifying questions for the doctoral student:

- ✓ What meaning does he attach to the concepts used in "homogeneous species diversity"? (p.92) and 'habitat quality'?
- ✓ What is leading in structuring an ornithocenoses in fragmented lowland forests - the species' specific requirements to environmental factors (biotope attachment), the size of the fragment, the vertical and horizontal structure of the phytocenoses in the fragment?
- ✓ Would the fragmentation of the particular landscape studied impact the possibility of individual displacement between fragments, and would the width of the ecological niche be affected?

## CONCLUSION

The current thesis is a study carried out at an excellent scientific level, with theoretical and applied achievements in landscape ornithology, community ecology, and conservation biology of species from the Bulgarian avifauna. It has an original scientific contribution and meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the Implementation of ZRASRB, and the relevant Regulations of the PU "P. Hilendarski". The dissertation work shows that the doctoral student Polina Hristova possesses theoretical knowledge and professional skills in the scientific specialty "Zoology" by demonstrating qualities and skills for conducting independent scientific research. Due to the above, I give my positive assessment of the conducted research, presented by the above-reviewed dissertation work, abstract, achieved results and contributions, and offer to the honorable scientific jury to **award the educational and scientific degree "doctor"** on Polina **Dimitrova Hristova** in the field of higher education: **4. Natural sciences, mathematics, informatics**, professional direction **4.3. Biological Sciences**, PhD program **Zoology**.

29.03. 2024

Reviewer: .....

(Signature)

Assoc. Prof. Dr. Ts. Chassovnikarova