

## STATEMENT

**From: Dr. Stoyan Ivanov Stoyanov – Assoc. Professor in Wildlife Management Department,  
Forestry Faculty at the University of Forestry, Sofia**

Concerning PhD thesis for awarding educational and scientific degree „doctor“

in the field of higher education 4. Natural sciences, mathematics and informatics

Professional field 4.3. Biological Sciences

in a doctoral program „Ecology and ecosystem conservation“

**Author:** *Alexander Emilov Petrov*

**Topic:** A comparative study on some aspects of the ecology of the fox (*Vulpes vulpes* L., 1758) and the stone marten (*Martes foina* Erxl., 1777) in habitats of different types

### **Supervisors:**

1. Assoc. Prof. Dr. Ivelin Aldinov Mollov - PU „Paisij Hilendarski“, Faculty of Biology, Department “Ecology and Environmental Protection”
2. Prof. Dr. Evgeniy Georgiev Raichev - Trakia University, Faculty of Agriculture

### **1. General presentation of the procedure and the doctoral student**

According to Order № ПД-21-2268 / 12.12.2024 of the Rector of Paisii Hilendarski University of Plovdiv (PU) I have been appointed as a member of the scientific jury to ensure a procedure for the defence of a dissertation on the topic „A comparative study on some aspects of the ecology of the fox (*Vulpes vulpes* L., 1758) and the stone marten (*Martes foina* Erxl., 1777) in habitats of different types“ for acquiring the educational and scientific degree „doctor“ in the field of higher education 4. Natural sciences, mathematics and informatics, Professional field 4.3. Biological Sciences in a doctoral program „Ecology and ecosystem conservation“. The author of the dissertation is Alexander Emilov Petrov – a full-time doctoral student at the Department of Ecology and Environmental Protection, with supervisors Assoc. Prof. Dr. Ivelin Aldinov Mollov from Paisii Hilendarski University of Plovdiv, Faculty of Biology, and Prof. Dr. Evgeniy Georgiev Raichev - Trakia University, Faculty of Agriculture.

The set of materials presented by Alexander Emilov Petrov on paper is in accordance with Art. 36 (1) from the Regulations for the Development of the Academic Staff of University of Plovdiv and includes the following documents:

- CV in European format
- PhD dissertation
- Abstract

- list of scientific publications on the topic of the dissertation
- copies of scientific publications.

The doctoral student has attached five publications on the topic of the dissertation.

Alexander Emilov Petrov was born on 7.11.1990. In 2020 he graduated from the University of Plovdiv with a master's degree in the specialty “Biodiversity, ecology and conservation”. He worked as a curator at the Regional Museum of Natural History in Plovdiv (10.09.2017 – 20.03.2021), field expert at Paisii Hilendarski University of Plovdiv (01. 03. 2021 – 28.02.2023), expert at „Envimon“ (01. 03. 2020 – 30.11.2020), as well as an ecologist at "Green Balkans" (01. 04. 2021 – 01.08.2021) and Rewilding Rhodopes Foundation (20.03.2023 until the moment). Since March 1, 2021, he has been enrolled as a full-time doctoral student in "Ecology and ecosystem conservation" at the Paisii Hilendarski University of Plovdiv. He has very good computer and language skills.

## **2. Relevance of the topic**

The topic of the dissertation is relevant and well-motivated in the introduction by the doctoral student. The feeding behaviour, diurnal activity, and competition between foxes and martens have not been thoroughly studied in recent years in Bulgaria. In recent years, camera trap surveys have become a powerful tool widely used in ecological research methodology. Camera traps have been used for population density estimation, to describe activity patterns, foraging, home range, social behaviour, denning, and antipredator behaviours. The aim of the dissertation is to reveal the adaptive responses of the fox and marten in terms of food and diurnal activity in agricultural areas with varying degrees of anthropogenic influence. The doctoral student has formulated four main tasks in connection with the set goal.

## **3. State of knowledge on the problem**

The excellent literary awareness of the doctoral student is evident both from the comprehensive and exhaustive review and from the 275 sources included in the bibliography, Bulgarian and foreign, of which 240 titles are in Latin and 35 in Cyrillic. He has used almost all publications on the subject, both contemporary and from the past, which were available. The citations in the text are correct. His competence in the researched problem is also evident from the analyses and discussions of the presented results, in which his research is skilfully compared with those of other authors.

## **4. Research methodology**

The doctoral student has selected appropriate field methods in relation to the goal and tasks set. Scat analysis is widely used to estimate the amounts of different foods ingested by carnivores based on identifying the indigestible parts of animals and plants found in scats. Scat analysis is simple, cheap, non-invasive, allows relatively large sample sizes, but presents both technical and interpretation difficulties. Because scat analysis is an indirect method, results could be biased by various factors. Several researchers have addressed the influence of scat collection and laboratory proce-

dures and misidentification of food remains on results. Bias and sampling error can arise as early as during scat collection due to the inclusion of scats from nontarget species, or due to inadequate study design.

The chosen method for studying daily activity is among the most appropriate and widely used in modern ecological research. Camera traps also allow the application of different approaches to estimate density and population parameters, as well as the day range and the home range. These studies were not the aim of the dissertation, but some of them could be implemented judging by the amount of data collected.

Some statistical methods were used to analyse the data, but other approaches to processing the collected information could also be applied, which are in the process of active development and would allow a more complete use of all the data obtained. When comparing the food spectrum of the two predator species, it is more appropriate to use canonical correspondence analysis, which is not sensitive to the presence of many null groups in each individual sample, instead of  $\chi^2$ -test.

## **5. Evaluation of the dissertation and scientific contributions**

The doctoral thesis is presented on 98 pages, which include 3 tables and 33 figures. It is structured consistently and logically in several chapters - introduction, literature review, purpose and tasks, material and methods, results and discussion, conclusions, recommendations, contributions, and references. Additionally, in two appendices, authentic photographic material is presented. A list of publications on the topic of PhD thesis is also presented. The dissertation is excellently designed and illustrated with figures, maps, and photographs.

The focus of the dissertation is on establishing the diet, the trophic niche width and the food competition between red fox and stone marten in anthropogenically influenced agricultural areas. The studies on the diurnal activity of both species are of practical and scientific interest, despite the small sample size and limited data. I accept the original and confirmatory contributions presented by the author.

I have a few critical remarks and recommendations that are not ranked in order of importance. Despite the extensive literature review, the dissertation did not use some methodological approaches that are applied in similar types of research. For example, much of the data could have been processed with some modern methods for quantifying levels of animal activity (Rowcliffe et al. 2014) and for measuring animal day range (Rowcliffe et al. 2016) using camera trap data. Some packages in R (R Core Team 2024) are used for the study of daily activity and for statistical data processing and analysis, like the package “*activity*” (Rowcliffe 2023), which provides functions to express clock time data relative to anchor points (typically solar), fit kernel density functions to animal activity time data, plot activity distributions, quantify overall levels of activity, statistically compare activity metrics through bootstrapping, evaluate variation in linear variables with time etc.

Camera trapping photographic rate should be used as an index of density in wild animals with caution (see Rovero & Marshall 2009), because the density also depends on day range and travel speed which were not estimated in the present study.

Scat analysis remains the primary tool used to assess carnivore diets, especially when focusing on individual prey items, but it has weaknesses. A possible source of bias and error lies in the misclassification of food remains. The interpretation of raw data also might bias results. Sometimes, items that occur only in trace amounts are discarded from further analysis. The main advantage of scat analysis is that it is non-invasive and allows the collection of abundant material, but in the present study the sample size is small (only 360 scats per species), which does not allow thorough examination of red fox and stone marten diet in the study area. At least the author should have elaborated on these issues in discussion section.

## **6. Publications on the dissertation and assessment of personal contribution**

I believe that the presented dissertation is entirely the personal work of the doctoral student. He submitted a list of five scientific publications on the topic of the dissertation, two as a single author and three co-authored, of which he is the first author. All five articles are published in peer-reviewed and indexed journals – *Ecologia Balkanica* and *ZooNotes*, the former falling in Q4 in the year of publication, and the latter has an SJR. Most of the results in the dissertation are presented in these articles and have passed a successful scientific review. Since the two articles were published in 2022, and the last three in 2024, they have not yet been cited. I highly appreciate the articles on the dissertation and believe that they will find a wide response in the scientific community.

## **7. Abstract**

The presented abstract reflects objectively and fully the structure and content of the dissertation.

## **8. Recommendations for future use of the dissertation contributions and results**

I believe that the contributions made will be reflected in future scientific research, and some are of high scientific and applied value. I recommend that the doctoral student in his future work deepen his training in research methods and statistical data processing, which will allow him to use a richer toolkit of statistical methods and models.

## **CONCLUSION**

The dissertation contains scientific and applied results that represent an original contribution to science and meets all the requirements of the Academic Staff Development Act in Bulgaria, The Implementing Regulations of the Academic Staff Development Act, and the relevant regulations at Paisii Hilendarski University of Plovdiv.

The dissertation shows that the doctoral student Alexander Petrov possesses in-depth theoretical knowledge and professional skills in the scientific specialty "Ecology and ecosystem conservation" by demonstrating qualities and skills for independently conducting scientific research.

Considering this, I confidently give my positive assessment of the conducted research, presented by the above-reviewed dissertation, abstract, achieved results and contributions, and to suggest to the esteemed Scientific Jury to also vote positively and to assign to Alexander Emilov Petrov the educational and scientific degree “**Doctor**” in the field of higher education: 4. Natural sciences, mathematics and informatics, Professional field 4.3. Biological Sciences in a doctoral program „Ecology and ecosystem conservation“.

27.01.2025 г.

**Signature:** .....

Dr. Stoyan Stoyanov