

## OPINION

of Prof. Nikolai Borissov SPASSOV

from the National Museum of Natural History - BAS

(member of the Scientific jury)

about the Ph. D. thesis for the acquisition of the educational and scientific degree "doctor" in a professional field 4.3. Biological Sciences (Ecology and Ecosystem Conservation – Behavioral Ecology)

**Author of the Ph. D. thesis:** Katerina TONEVA ZAREVA-SIMEONOVA

**Topic of the thesis:** Influence of man and environment on the behavior of selected mammal species in closed conditions - application in zoology and conservation

**Brief introduction of the PhD student.** Katerina Zareva-Simeonova is graduated from New Bulgarian University in 2006, with speciality “ecology”, with a master's thesis in ornithology. She has gained experience by participating in a number of projects related to the study and conservation of carnivores and small mammals, as well as conservation projects related to the impact of invasive species and the Natura 2000 network. The nature of most of these projects shows that the subject of her dissertation was not chosen by chance, and that she has been interested and working on animal behavior and conservation for years, with an emphasis on captive breeding for the conservation of endangered species (including the brown bear). Since 2019, Katerina Zareva has been enrolled as a doctoral student at the University of St. Kl. Ohridski" with the subject of the current dissertation work. The number of participations in international conferences is also impressive, showing the lasting interest in the mentioned topics.

**General characteristics of the dissertation - volume, structure, literary awareness.** The dissertation covers 176 pages, together with the appendices, a volume sufficient for a dissertation to obtain the degree of "Doctor of Philosophy" in the indicated field. The content shows an impressive amount of work done. At the same time, it is arranged in a rather non-standard way: the text is divided into several topics (directions) of work, each of which has its own sub-headings - material and methodology, results and discussion, instead of these sub-points of all topics being collected in one place (about this style of arrangement - see below). Essential parts - results, generally dominate in volume over such as introduction, literature review, material and

methods. The bibliography used in the dissertation is impressive: almost 300 references, the vast majority of which are in Latin, including both theoretical studies and applied ones specifically related to the research topics. There is no doubt that the author has a very good literary awareness of the issues that are the subject of the dissertation work.

**Timeliness of the problem.** The demands of the times present today's zoos with challenges that they must solve in order to survive. This leads to a serious need for zoo reforms. From "menageries" they should be transformed not only into exhibitions of live wild animals, but also into habitats with suitable conditions for the life of zoo inhabitants and even into centers for breeding and preservation of rare and endangered species. That is why I think that the topic of the dissertation work is timely and relevant.

**Methodical approach.** The different lines of work that characterize this research are the reason for using a diverse methodology: application of specific experiments, implementation of comparative observations, use of prepared questionnaires, application of ethological tests known from the literature and their statistical verification. An impressive work has been done on the application of this versatile methodology, characterized mostly by the use of ethological methods of work, a direction in which research in our country is scarce. The obtained results show, despite the risks of sometimes subjective evaluations, that the doctoral student was able to learn and apply the different work methods successfully enough.

**Meeting the minimum requirements for the educational and scientific degree "Doctor" in the relevant field and assessment of the quality of the scientific publications.** The additional evaluation documents attached to the dissertation work, incl. the certificate of compliance with the minimum national requirements for the degree "Doctor" in the relevant field, show that the doctoral student meets all the necessary requirements in this regard. She has submitted two publications on the PhD topic (in which she is the first author) and a third that is largely related to it. All three papers are in journals with quartile (one on the PhD topic is even in Q1), and all have an impact factor. All this indicates that the doctoral student has reached a high professional level in her research.

**Critical notes.** No research paper is without weaknesses. The obtained results (which I have discussed above) make it possible, it seems to me, for a more detailed presentation of the conclusions made than was done in the dissertation: I think that the results of the work give grounds, for example, to make some more detailed conclusions about the differences in the behavior of male, female and juvenile bears in relation to sound and smell, and these differences can be taken into account when creating better conditions in zoos, in the future. The discussions also concluded that human disturbance is a significant factor affecting successful hibernation, a conclusion that can be considered in captive breeding as well as in assessing the quality of the bear's natural habitats. This conclusion is unfortunately not drawn in the Conclusions paragraph. In presenting the results, some interesting analysis was also made regarding what combinations of individuals are not desirable when viewing bears together in a common room, but this is unfortunately not included in the conclusions.

I would also like to mention the unusual way of structuring the content, where chapters such as material and methods as well as results are separated and scattered in several different passages. The assessment of this particular style of work is difficult to be unequivocal. This specific structuring of the text I cannot necessarily point out as a weakness, because it follows a certain logic. I would say that this is both a strength and a weakness of this work: such an unusual division is probably justified because of the very different lines of work. With this division of the results, however, they are to some extent "dispersed", and the assessment of what has been done becomes difficult.

It is also not entirely clear, despite the stated argumentation, why research on the bear has been combined precisely with research on the Ground squirrel, without any visible connection between these animals.

The severed critical remarks do not diminish the importance of the research work carried out and the contributions of the thesis.

### **Significance of the obtained results and conclusions. Dissertation Contributions.**

The results of this research are in different directions. Some findings are confirmatory, such as that of nutritional sucking in captive bears. At the same time, the analyzes and results related to the influence of sound and olfactory stimuli and the behavioral response of *Ursus arctos* to them are impressive. These results are not only of practical importance related to the improvement of

the brown bear's conditions of confinement, but also have a contributing, scientific character. Some of the established behavioral responses complement the knowledge of the behavior of the species in indirect contact with conspecifics and can be interpreted in explaining various intraspecific forms of behavior, incl. of the burrowing behavior of the bear and some of its sexual and age characteristics.

Also of interest are some aspects of the study of the behavior of the Ground squirrel, which can be used not only when rearing them in zoo conditions, but also to complement the knowledge of the biology of the species in natural conditions (such as anti-predator and exploratory behavior, the consumption of water and the influence of daily temperature, etc.). These studies today, with the reduction in numbers and range of this endangered species, can be important for its conservation.

The main conclusions and contributions of the dissertation are in the field of the applied science, i.e. in harmony with the established topic of the research and the lines of work laid down in it. The scientific-applied contributions and recommendations made on the basis of the obtained results and conclusions are the strongest side of this work, including the recommendation to amend the regulation on the requirements for keeping animals in zoo conditions. In this regard, the conclusions and contributions regarding the influence of certain incentives for the manifestation of behavioral diversity in solving problems of captive breeding of species and also the assessment of the welfare of the bear in our zoos are also worth mentioning.

As I indicated above, modern zoos are increasingly becoming institutions with scientific programs supporting the survival and conservation of wild animals, including rare and endangered species. In this aspect is the strength of this dissertation work, and in this respect, Katerina Zareva-Simeonova's dissertation represents a serious contribution that can be used in the modernization of Bulgarian zoos.

**Conclusion.** Based on the various research methods learned and applied by the doctoral student and the conclusions drawn, I believe that the presented dissertation fully meets the requirements of the Law on the Development of the Academic Staff. This, as well as the various contributions of this work, gives me reason to evaluate it positively.

That is why I allow myself to propose to the honorable Scientific Jury to vote positively and award Katerina TONEVA ZAREVA-SIMEONOVA the educational and scientific degree

"Doctor" in professional direction 4.3. Biological Sciences (Ecology and Ecosystem Conservation – Behavioral Ecology).

15.05.2024

REVIEWER:

Prof. N. Spassov