

EVALUATION REPORT

On a thesis presented by Pavlina Ivanova Hristova for the purposes of conferral of the educational and academic degree of Doctor of Philosophy in the scientific specialty “Human and Animal Physiology” on the topic of *Canine vocal interactions recorded on sound graphs during various behavioral reactions*.

By **Prof. Boycho Lazarov Bivolarsky, DVM, PhD**, retired

Background of the candidate

Assistant Professor Pavlina Ivanova Hristova was born on 13.05.1994 in the town of Dobrich. She obtained her Masters degree in Veterinary Medicine from the University of Forestry and Technology in May 2019.

On 24.02.2020 she took the position of Assistant Professor at the Department of Anatomy, Physiology and Animal Breeding with the University of Forestry and Technology in Sofia, where she is currently based. She has a very good command of oral and written English and has published four research works, related to the topic of her thesis. She also participated in three scientific conferences, receiving two awards and recognitions.

Relevance of the topic

Dogs are considered better at reading human signals, compared to apes. Therefore, in recent years the number of research works dedicated to bioacoustic analysis of animal communication signals has increased, which is indicative of the growing interest in this topic. In this sense, this thesis intends to examine the matter in detail and shed more light on this scientific field, which follows the current trend in contemporary animal

ethology and physiology. That is why the knowledge and correct analysis of dog bark can improve the diagnostic approach of veterinary specialists in their work with this animal species. On the other hand, physicians may be better oriented when diagnosing and treating animals that manifest undesired behavioral reactions. The latter can facilitate a more wholesome contact between humans and canines as socially close species. This contact supports dog training and can contribute to the more successful adaptation of these animals, as well as their inclusion in various social activities that respond to different human needs. In this sense, I believe that the project submitted for review is topical not only at a national, but also a global scale.

Structure of the thesis

The thesis of the candidate spans on 154 standard pages and contains 72 figures and 9 tables. The structural requirements have been respected, and the content is arranged subsequently into: introduction, literature review, aims and tasks, materials and methods, results and discussion, conclusions, contributions, recommendations to practitioners, and bibliographic sources.

The **literature review** of the thesis addresses and analyzes a sufficient number of sources. The candidate has presented in subsequent order the anatomical structure of the larynx in dogs, canines and felines; the mechanism of sound production in the abovementioned animal species; acoustic phonetics; specifics of the sound signals in dogs; sound signals in canines and methods of decoding communication signals.

On the basis of the issues raised in the literature review, a specific **objective** has been formulated – to present and analyze data from canine vocalizations according to various methodologies and subdivide the animals on the principle of their physiological characteristics and behavioral reactions manifested individually and in a group.

To meet this objective, the candidate has set five main **tasks**, related to presenting recordings of dogs' bark through using different methods for decoding animal language: reading, presenting and analysis of the sound graphs in dogs divided into gender, breed and age, as well as on the basis of their behavioral reactions (play, agonistic, alimentary and anxious behaviors); analysis of the sound graphs during behavioral reactions shown in groups or individually, and a comprehensive review, presentation and statistical analysis of the results from the sound graph recordings. The set tasks have been formulated precisely and ensue logically from the set objective.

The authors's own research has been planned and conducted purposefully, by seeking an answer to the questions posed within the aim of the study. In her experimental work, the candidate observed 24 domestic socialized dogs of various breeds divided into three groups (large, medium sized and small). Moreover, a sufficient number of current methodology units have been applied to realize the author's objectives. The methods used are very well described and allow reproducibility. The candidate has obtained 1200 sound graphs from three groups of experimental animals. The decoding of the vocalizations is effectuated through three methods – wave form, spectrogram and sound graph.

The **statistical analysis** has been performed with the data processing application package in graphic environment IBM SPSS Statistics 26.

The **results and discussion**, as mentioned above, contain enough figures and tables and form the most essential, voluminous and impressive part of the thesis. There the author has presented and analyzed rigorously the obtained results. The strict consequence of the structured data is impressive, which attests unarguably to the actual empirical research work, as well as the comprehensive interpretation of the obtained results with specific statistically proven differences. It is difficult to comment on everything,

because the information is diverse and highly substantial, however, here I will summarize several key features.

The presented recordings of dogs in various situations have been thoroughly illustrated and described. The comprehensive comparative analysis of the results and those reported by other authors is notable. In the presentation of the sound signals on sound graphs the candidate has found that they offer good opportunities for a detailed study of dogs' vocalizations during behavioral reactions both in a group, and individually. It has been remarked that the wave and spectral analysis are suitable for the visualization and registering of continuous barking.

Furthermore, the frequency and amplitude of the sound signal in large and medium sized dog breeds show close values during play, aggressive and alimentary behavioral reactions. On the other hand, the highest values for the amplitude have been obtained during anxious states for the large breeds, and for the small breeds – of the frequency for all behavioral groups. It has been proven that the frequency in inter-gender comparison reaches highest levels in medium sized breeds during play and anxious states. The representatives of the three breeds show a higher frequency of the sound signal during play in a group, as well as during aggression manifested individually.

I evaluate this section as multidimensional, filled with abundant experimental data, possessing a high degree of analysis and deduction, and of fundamental and practical value, purposefully informative and revealing the great potential of her research.

The **conclusion** contains a recapitulation of the main results of the thesis and their meaning. The outlined general characteristics constitute a serious foundation for various and multiple contributions, and could lead to promising future research in this field.

The eight **inferences** are correctly and precisely formulated, reflecting the obtained results, and generally meet the set objectives.

The **contributions** amount to five in total, including three original and two confirmative. Moreover, six useful **recommendations** to practitioners have been added.

The **bibliography** lists 214 sources, of which eight in Cyrillic and 206 in Latin script.

Recommendations and remarks

Recognizing the strength of the arguments, related to the topicality of the studied problems, some negligible gaps in literature, and the correct foundations and performance of the research work, I could nonetheless make some remarks, which Pavlina Hristova may use as positive suggestions for improving her future work.

1. I believe that in the literature review, the information about felines should be excluded, because this species is outside of the range of the study.
2. The work will benefit from records reflecting the three methodologies for some wild species, which could serve as a hint for future research.

The **thesis abstract** complies with the set requirements and even in this brief form, reflects precisely the obtained results by giving a clear idea about the dissertation.

Conclusion

In conclusion, I may add that the conducted experimental work is sufficient in volume and meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria. In her study of the current problems of physiology and ethology, Pavlina Hristova has shown high competence, appropriate methodological approach, correctness and analytical ability to present and discuss the obtained results. As a result, she has drawn specific inferences, and made contributions and recommendations of pertinent scientific and practical value. The abovementioned allows me to evaluate positively the achievements of this thesis and I strongly urge the

honorable members of the Academic Jury to vote **in favor** of conferring the educational and academic degree of Doctor of Philosophy to Assistant Professor Pavlina Hristova in the professional field 6.4. Veterinary medicine, scientific specialty “Animal and Human Physiology”.

01.12.2023

Stara Zagora

Reviewer:

/prof. Boycho Bivolarsky/