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STATEMENT

by

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On the dissertation of Kostadin Ivanov Andonov, PhD student in the doctoral program "Ecology and Ecosystem Conservation", professional field: "4.3. Biological Sciences", field of higher education: "4. Natural Sciences, Mathematics and Informatics", at the section "Community Ecology and Conservation Biology", department "Ecosystem Research, Ecological Risk and Conservation Biology" of IBEI-BAS and theme "Pheromone communication, functional morphology of genitalia, and mating behavior in snakes of the family Viperidae in Bulgaria"

The dissertation work is structured in the not so popular and common model for this type of scientific work in our country, which I absolutely recommend and welcome for a field like ours.

The topic of the dissertation is interesting and clearly formulated, as well as its aim - establishing the chemical composition of skin secretions, the detailed structure of the genital organs and the nature of the mating behavior in *Vipera ammodytes* and *Vipera berus* in Bulgaria. The tasks are developed and presented in a logical sequence. A complex of scientific methods was used to achieve the goal. The results are processed precisely and are presented in tables and figures that are technically and aesthetically very well formed. The obtained results are of fundamental and applied importance. The collected data have been thoroughly analyzed and based on them, conclusions have been drawn, reflecting correctly and comprehensively all aspects of the conducted research.

The statement is scientific and specialized scientific terminology is used freely and correctly. The excellent literary competence of the PhD student is evident both from the comprehensive overview of the topic and the large number of literary sources used.

The results of the research have led to important contributions that are not described in the dissertation but are presented in a separate document. The largest part of them are related to the composition of skin secretions: 1) 88 chemical compounds involved in the skin secretions of 13 species of snakes have been identified, and for 12 of these species, the skin secretions have been studied and described for the first time. 2) Long-chain methyl ketones (C25–C33), squalene and other key compounds have been identified for the first time in the skin secretions of *Vipera ammodytes*, which, according to literature data, are involved in the chemical communication of some snake species. The presence of such substances has also been confirmed in *V. berus*. Analogous substances have also been identified in the skin secretions of *N. natrix, D. caspius, P. najadum, Z. situla, Z. longissimus, E. quatuorlineata, C. austriaca, M. insignitus, M. bornmuelleri,* and *D. mauritanica*. 3) The participation of the above-mentioned methyl ketones in chemical communication and in the female sex pheromone of *Vipera ammodytes* has been established. 4) Similarities in the concentrations of some ketones have been found between male and female individuals of *Vipera ammodytes* and *V. berus*, suggesting complex behavioral adaptations and/or the presence of other substances that participate in the female sex pheromone. 5) The key role of hibernation in Vipera ammodytes on the formation of ketones and other key substances has been proven.

Several contributions have also been made related to the mating behavior of *Vipera ammodytes* and *V. berus*: 1) It has been established that males of *Vipera ammodytes* exhibit more active exploratory behavior than females. 2) It has been established that males of *Vipera ammodytes* are more attracted to long-chain methyl ketones than females. 3) It has been shown that, like other snake species, in *Vipera ammodytes* and *V. berus* females secrete a sex pheromone that causes males to actively direct themselves towards the source of the chemical signal without any other (e.g. visual) stimulus.

A contribution related to the morphology of the genital organs has been made – for the first time the morphological features of female genitalia in seven species of snakes from three families have been described based on three-dimensional silicone casts. A comparative analysis between the female and male genitalia of the same 7 species has also been performed, with an emphasis on the genitalia of *Vipera ammodytes* and *V. berus*.

I accept all contributions and find that they correctly interpret the results obtained. The amount of work done is impressive. I believe that the present dissertation contains results that represent an original contribution to science.

The results are presented in 4 scientific publications: one is in an indexed journal, Q1 (Scopus), IF = 4.390 (2020); SJR = 0.782 (2020); two are in an indexed journal, Q2 (Scopus), respectively with IF = 1.382 (2024), SJR = 0.443 (2024) and IF = 1.189 (2024), SJR = 0.372 (2024); and the fourth is in an indexed journal, Q3 (Scopus), IF = 1.626 (2023), SJR = 0.311 (2023). It should be noted that two of the publications have already been cited – a total of seven times. The PhD student has presented his results in two scientific forums – in Bulgaria and in Serbia. With this, the PhD student fully covers and even exceeds the scientometric criteria and requirements.

Based on the above, I confirm that the presented dissertation of Kostadin Ivanov Andonov meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, which gives me the reason to evaluate it as successful and to vote with conviction for awarding the educational and scientific degree "doctor" in the professional field 4.3. Biological Sciences of Kostadin Ivanov Andonov.

Shumen
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Prepared by:
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