

REVIEW

by Prof. Dr. Dragan Petrov Chobanov, Institute of Biodiversity and Ecosystem Studies at the
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Regarding: competition for the position of associate professor in professional direction 4.3
Biological Sciences, specialty "Entomology", for the needs of the research group "Fauna,
Taxonomy and Ecology of Invertebrates", of the section "Biodiversity and Ecology of
Invertebrates" , department "Animal diversity and resources" of IBER-BAS, announced in
SG No. 71 of August 18, 2023.

Only one candidate applied at the announced competition – Dr. **Boyan Petrov Zlatkov**,
chief assistant at IBER-BAS. The certificate of compliance of the candidate with the legal
requirements, including the National minimum requirements, according to the Law on the
Development of the Academic Staff of the Republic of Bulgaria and the Regulations for its
implementation, as well as the Regulations on the terms and conditions for acquiring
scientific degrees and for employment of academic positions at BAS and IBER-BAS shows
that the candidate covers and exceeds those.

General data on the candidate's career and thematic development

Dr. Boyan Zlatkov graduated with a bachelor's degree in Biology (2003) and
subsequently a master's degree in Entomology at the Faculty of Biology (BF) of the Sofia
University "St. K. Ohridski" (2005). In the period 2006-2011, he was a doctoral student at
SU, where in 2011 he obtained the educational and scientific degree "Doctor" in direction 4.3
Biological sciences, scientific specialty "Entomology". In the period 2008-2015, he worked
as a "biologist" in the BF of SU, and subsequently (2015-2017) he was appointed as the
curator of the Zoological Collection of SU. From 2017 to the present, he is chief assistant in
"Entomology" at IBER-BAS.

Main directions in the candidate's research work and most important scientific
contributions

In the competition for associate professor, the candidate participated with 28 scientific
publications, referenced and indexed in the Web of Science and Scopus databases.

The candidate's contributions are divided into contributions on the habilitation work and those outside the habilitation work.

Dr. Zlatkov's **Habilitation thesis includes** publications of which the candidate is the lead author and which define the main focus of his research, falling in the areas of taxonomy, anatomy and functional morphology of the order of butterflies (Lepidoptera), with the family Tortricidae mainly concerned. Despite the division of the articles into "taxonomic" and "anatomic and functional-morphological" research, most publications use a similar methodology, which groups them well by topic.

1. In two articles, respectively in the journals *Nota lepidopterologica* (Q4 Scopus) and *European Journal of Taxonomy* (Q3 WoS) the taxonomy of two problem groups from the genus *Phtheochroa* is considered. The methodology used includes an original inflation method vesicles on the male ones genitalia as well as comparisons of the "barcode region" of the mitochondrial COI gene. In addition to the traditional ones diagnostic marks from the outer one morphology are structures were also analyzed on the bloated ones them blisters and barcodes. As a result, a male of an existing species was described and the following nomenclatural changes were made: *Phtheochroa schawerdae* (Rebel, 1908) comb. nov. = *P. drenowskyi* (Rebel, 1916) syn. nov.; *P. alpinana* sp. nov.; *P. apenninana* sp. nov. ; *P. frigidana* (Guenée , 1845) stat. rev. = *P. flavidana* (Guenée , 1845) syn. = *P. sulphurana* (Guenée , 1845) syn. = *P. andorrana* (Millière , 1865) syn.; *P. cantabrianana* sp. nov . A neotype of *Eupoecilia frigidana* is designated. The contribution is original.

2. In a publication in *Nota lepidopterologica* (Q4 Scopus) two taxa from genus *Dichrorampha* are examined. The collection on material from mountainous areas revealed new finding of *Dichrorampha pentheriana* (Rebel, 1917) reported for first time for Bulgaria. The new species *Dichrorampha sakartvelana* Zlatkov, 2016 is described from the Caucasus area. The contribution is original.

3. A publication in *ZooKeys* (Q 2 Scopus) revised *Clepsis consimilana* sensu auctt. and *C. neglectana* sensu auctt., based on a combination of external and internal morphological features with data from the barcode region. As a result, *Clepsis striolana* (Ragonot, 1879), stat. rev., *C. acclivana* (Zerny, 1933), stat. rev., *C. trivialis* (Meyrick, 1913), stat. rev., and *C. xylozona* (Meyrick, 1891), stat. rev. were removed from synonymy with *C. neglectana* (Herrich-Schäffer, 1851). *C. semiana* (Chrétien, 1915), stat. nov. was restored as a valid species, *C. eatoniana* (Ragonot, 1881), stat. rev. is removed from synonymy with *C.*

consimilana (Hübner, 1817), and *C. razowskii* Gastón, Vives & Revilla, 2017 is synonymized with *C. is atoniana*. The contribution is original.

4. A publication in the prestigious journal *Zoomorphology* (Q2 Scopus) proposes new approaches to study the little known function of the skeletal structures of the butterfly genitals. For understanding the function on these structures it is necessary that all are considered in together, which is why a new technique is developed for turning and inflating on the phallus, which keeps all tissues intact. The contribution is original with fundamental and applied importance.

5. A study published in *Zoomorphology* (Q2 Scopus) presents the first attempt to clarify the detailed function of the inner phallic musculature in *Lepidoptera*. The model object is the species *Eugnosta magnificana* (Rebel, 1914) (family *Tortricidae*), with a large and complex vesica (endophallus). A hypothetical position of male and female genitalia by time of copulation is proposed, as well as indirect evidence for the stimulating function of the two large infallible cornuti. The contribution is original with fundamental and applied importance.

6. The process of copulation in *Lepidoptera* from functional perspective is explored in a publication in the prestigious journal *Frontiers in Zoology* (Q1 WoS). The authors tracked the interactions between the male and female genitalia in *Tortrix viridana* Linnaeus, 1758 (family *Tortricidae*) via three-dimensional models on pairs, fixed during copulation. This is the first study on the butterfly copulation through three-dimensional reconstructions on a real copulating couple and, therefore, the research has a great original contribution.

7. In a publication in *Arthropod-Plant Interactions* (Q1 Scopus), the anatomy of the proboscis of *Macroglossum stellatarum* (Linnaeus, 1758) (*Sphingidae*) was studied microscopically, revealing why this species of moth sometimes remains attached to the flowers of the introduced ornamental *Oenothera speciosa* Nutt (*Onagraceae*). The contribution is original with fundamental and applied conservation significance.

Contributions outside the habilitation work involve 20 publications, in which the candidate is lead or equal author in 8 publications.

Contributions of a fundamental nature to the taxonomy and morpho-anatomy of several groups of butterflies, as well as to the anatomy and morphology of the genitalia of other groups of animals, are outlined here.

Taxonomic contributions

1. *Dichrorampha typhlodes* (Meyrick, 1931) was found to be a junior synonym of *D. acuminatana* ([Lienig] & Zeller, 1846). The contribution is original with sole author Dr. Zlatkov.

2. A new species, *Epinotia nigrisiana* Budashkin & Zlatkov, 2011, is described based on material collected from Bulgaria, Struma Valley. The contribution is original with equal authorship.

3. Genus *Cydia* is studied and two new species are established, *Cydia transcaucasica* Budashkin & Zlatkov, 2012 and *Cydia suffusana* Zlatkov & Budashkin, 2012, as well as one new subspecies *Cydia centralasiae elegantana* ssp. n. Budashkin & Zlatkov, 2012. Two synonymies and two new combinations are proposed. The contribution is original with equal authorship.

4. Comparison of specimens from *Dichrorampha rilana* Drenowsky, 1909 with specimens from the Dinarides in North Macedonia and Bosnia and Herzegovina show existence on undescribed species which is named *D. dinarica* Huemer, Zlatkov & Baixeras, 2012. Original contribution.

5. Females of *Cnephasia heringi* Razowski, 1958 and *Gypsonoma obratsovi* Amsel, 1959 are illustrated and described. The females of *C. daedalea* Razowski, 1983 are referred to the males of *C. hellenica* Obratsov, 1956, which leads to a new synonymy: *C. daedalea* syn. n. The hitherto unknown females of *Dichrorampha rilana* Drenowsky, 1909 are described and illustrated. The contribution is original with sole author Dr. Zlatkov.

6. A new species *Phtheochroa carpatiana* Kovács, Kovács, Zlatkov & Huemer, 2020 is described from the Southern Carpathians (Romania). The contribution is original.

7. The subspecies *Eutelia adoratrix platinea* Zlatkov, Beshkov & Huemer, 2021, *Lacanobia praedita canescens* Zlatkov, Beshkov & Huemer, 2021, *Hadena adriana petergyulaii* Zlatkov, Beshkov & Huemer, 2021 are described. The contribution is original with lead author Dr. Zlatkov.

8. *Klimeschia transversella* (Zeller, 1839) (Douglasiidae) and *Chrysoesthia sexguttella* (Thunberg, 1794) (Gelechiidae) are reported for the first time for Bulgaria. The butterflies and their genitalia are illustrated. The contribution is original with equal authorship, published in two articles.

Morphological and anatomical contributions

9. A study on the morphology on the vesica on two high specialized and close relative tribes of the family Tortricidae is performed. The contribution is original with sole author Dr. Zlatkov.

10. The hemipenis of two closely related species of lizards of the genus *Ablepharus* (*A. kitaibelii* and *A. budaki*) are described for the first time. The contribution is original.

11. The bone histology of lizards of the genus *Ablepharus* is studied. The contribution is original.

12. A study of gametogenesis and the incubation period of *Ablepharus kitaibelii* eggs is performed based on histological techniques. The contribution is original.

13. The hemipenises of *Talpa martinorum* Kryštufek et al., 2018 and *T. europaea* Linnaeus, 1758 are described and compared. Original contribution.

14. The male genitalia of three species of beetles is studied. The species are new records for the fauna on Bulgaria: *Asida* (*Asida*) *cocquempoti* F. Soldati & L. Soldati, 2001, *Pedinus* (*Pedinus*) *olympicus* Kiesenwetter, 1880, and *Platydema europaea* Laporte & Brullé, 1831. The gastric spicule of the male genitalia (spiculum gastrale) is described and illustrated is described for the first time. New diagnostic features in the females are established, allowing the distinction on three the species from genus *Pedinus*. The contribution is original.

15. Histological examination of altered sections of the wing membrane of two species of bats in Bulgaria shows the presence of skin mites. The parasites cause skin lesions in *Myotis myotis* (Borkhausen, 1797) and *Myotis blythii* (Tomes, 1857), which have been described histopathologically. Whole mites were separated from the lesions, which allowed their identification as *Psorergatoides kerivoulae* (Fain, 1959). This is the first record of this genus of mites from the Balkans. The contribution is original.

Biological contributions involving the applicant

16. A pollen analysis of the contents of the goiter of beetles from the Oedemeridae family was made. The contribution is original.

17. The composition of insects in the food of the bat *Miniopterus schreibersii* (Kuhl, 1817) during winter was studied. The contribution is original.

18. The flight period of two economically significant species – *Enarmonia formosana* and *Retinia resinella* (Tortricidae) – was established. The contribution is original.

19. The inquilines on galls of *Andricus quercustozae* (Bosc, 1792) (Cynipidae) were studied. The contribution is original.

The value of the obtained results, proven by citations, publications in prestigious journals, awards, membership in international and national scientific bodies, etc.

The candidate, Boyan Zlatkov, is the author of 47 scientific publications, 29 of which are referenced in the Web of Science and/or Scopus platforms. Zlatkov is the first author of

25 publications. In the competition, the candidate participated with 28 publications, of which he was the first author in 13, and in another 3 he was an equal author. The total number of citations, excluding self-citations, in publications with an impact factor or SJR-rank, presented in the competition, are 40. In addition, in the scientific database of BAS – SONIX (<https://sonix.bas.bg/bg>), 69 citations are found, of which 42 are in publications from Web of Science and/or Scopus. The candidate is involved in 23 projects and is a member of Societas Europaea Lepidopterologica. According to SONIX, Dr. Zlatkov participated in 9 scientific events with 13 reports.

The most significant scientific and applied achievements

The variety of scientific achievements does not give grounds for classifying them as more or less significant. However, when grouping the achievements thematically, the candidate's taxonomic and methodological contributions stand out as follows:

1. Taxonomic contributions. Dr. Zlatkov is the author and co-author of 13 newly described taxa of Lepidoptera belonging to different genera and published in reputable publications, as well as 12 taxonomic changes (synonymizations, new combinations and status revisions). This demonstrates his broad taxonomic expertise, his focus as an established taxonomist within the group, and his peer recognition.

2. Research on the functional morphology and anatomy of various groups of animals and especially on copulatory structures in butterflies impresses with the published new method for turning and inflating the phallus, which preserves all tissues, as well as with the studies of the copulation process (contributions 5 and 6 of the habilitation work), studied with various techniques, including through three-dimensional models. The candidate is the first or sole author of the mentioned studies that have been published in the prestigious journals *Zoomorphology* and *Frontiers in Zoology*.

All these contributions add to the knowledge of biodiversity and the function of some structures, which is a step towards knowledge of evolutionary processes in nature.

Demonstrated skills or aptitude for conducting research

The candidate participates in a significant number of scientific and applied projects, especially those with a conservation focus, financed through ministries and departments, which shows that he is an acknowledged expert in our country. He leads a scientific project from the Scientific Research Fund. In addition, Dr. Zlatkov performs independently or as a team leader a large number of scientific tasks, which he successfully published.

A motivated answer to the question to what extent the candidate has a clearly defined profile of research work

All the listed scientific and scientific-applied contributions of the candidate, the management of scientific projects of importance to the scientific community and the science, his participation in projects with a conservation and fundamental orientation, give me reason to confidently assert that the candidate has a clearly defined scientific research profile and is an established scholar in his field of research.

Role of the candidate for the training of young scientific personnel

In the period 2008-2015, Boyan Zlatkov worked at SU, preparing materials for the practical classes on invertebrate zoology in the bachelor's and master's degrees at the Department of "Zoology and Anthropology" and preparing materials for summer training practices, having also led some practical classes for students. Within the framework of the BAS, he leads a course at the Doctoral Training Center "Light microscopy and photomicrography". I know from personal experience that Dr. Zlatkov is a valuable staff member of IBER-BAS who has always shared with his colleagues his expertise on microscoping techniques, the taxonomy of the animal kingdom, his knowledge of the Code of Zoological Nomenclature. I believe that as a habilitated scientist, the candidate will be even more useful for the training of young personnel.

Conclusion

Dr. Boyan Zlatkov is the author of a high-quality scientific production that meets and exceeds the requirements for holding the academic position of associate professor. Doctor Zlatkov's contributions are at a high scientific level and are visible and recognizable by the international scientific community. I highly appreciate the candidate's scientific, scientific-applied and administrative results and recommend the Scientific Jury and the Scientific Council of IBER-BAS to approve the selection of chief assistant Boyan Petrov Zlatkov for the academic position of associate professor in the specialty "Entomology".

Sofia

16.12.2023

Prof. Dr. Dragan Chobanov