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REVIEW

by Corresponding Member DSc Georgi Tsvetkov Georgiev, Forest Research Institute – Bulgarian Academy of Sciences, on the materials provided for participation in a competition for the academic position of "Associate Professor" at the Institute of Biodiversity and Ecosystem Research by professional direction 4.3. Biological Sciences, Science Specialization "Zoology", for the needs of the Research Group "Fauna, Taxonomy and Ecology of Invertebrates", Section "Biodiversity and Ecology of Invertebrates", Department "Animal Diversity and Resources"

In the competition for associate professor, announced in the State Gazette no. 71 of 18.08.2023 and on the website of the Institute of Biodiversity and Ecosystem Research (IBER), for the needs of the Research Group "Fauna, Taxonomy and Ecology of Invertebrate Animals", section "Biodiversity and Ecology of Invertebrate Animals", "Animal Diversity and Resources" department, as the only candidate participates Chief Assistant Dr. Boyan Petrov Zlatkov.

1. General data on the candidate's career and thematic development

Boyan Petrov Zlatkov was born on 17.05.1982. In 1999, he began studying at the Faculty of Biology of Sofia University "St. Kliment Ohridski", where in 2003 he graduated as a Bachelor in Biology, and in 2005 - as a Master in Entomology.

In 2006, he was enrolled as a doctoral student at the Faculty of Biology of Sofia University "St. Kliment Ohridski". In 2011, he defended a dissertation on "Butterflies of the family Tortricidae (Lepidoptera: Microlepidoptera) of the Sandansko-Petrichka Valley" to obtain the scientific degree "Doctor" in professional direction 4.3. Biological Sciences, Scientific specialty "Entomology".

From 2008 to 2015, he worked as a biologist in the Faculty of Biology of Sofia University "St. Kliment Ohridski". In 2015, he started working at IBER, where in 2017 he was elected Chief Assistant in entomology.

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

The scientific work of Chief Assistant Dr. Boyan Zlatkov, is mainly related to the study of the taxonomy, fauna, morphology and ecology of leafrollers (Lepidoptera: Tortricidae).

The candidate's dissertation contributions include descriptions of everted vesicae of 23 leafroller species, of which 21 are new to science, belonging to all European tribes except Euliini (Tortricini, Cochylini, Cnephasiini, Archipini, Sparganothini, Polyorthini, Bactrini, Olethreutini , Enarmoniini, Eucosmini and Grapholitini), illustrated with original quality drawings [Publication 0.1]. The structure of the vesicae in the individual tribes was compared and regularities in their morphology were established. A new species was established for the tortricid fauna of Europe (*Dichrorampha inconspiqua*) [0.2], 5 species new to the Balkan Peninsula [0.2] and 17 species new to Bulgaria [0.2; 0.3]. 97 species of leafrollers have been reported for the Kresna gorge and Sandansko-Petrichka valley, including four rare and locally distributed in the country [0.4].

In the competition for associate professor, the candidate's works have made extremely valuable methodical, morphological, taxonomic, faustic and ecological contributions, as follows:

METHODICAL CONTRIBUTIONS. The everted vesicae and male genitalia of the dimorphic species *Phtheochroa unionana*, where there are no other morphological differences between the two forms, have been shown to be a suitable tool for species differentiation where there are taxonomic problems [1.1]. For the first time, a combined approach of analysis of structural features of everted vesicae and DNA barcodes was used for the revision of groups with taxonomic problems - *Phtheochroa frigidana* s. lat. [1.3], *Clepsis neglectana* sensu auctt. and *C. consimilana* sensu auctt. [1.6]. When preparing genital preparations, it is suggested to inject a formaldehyde solution into the phallus of fresh samples, ensuring preservation of the anatomy of this structure [1.7].

MORPHOLOGICAL CONTRIBUTIONS. The male genitalia of the dimorphic species *Phtheochroa unionana* have been described and illustrated for the first time, the specificity of which was further confirmed by genetic analyzes (mitochondrial COI gene) [1.1]. An attempt has been made to elucidate the detailed function of the internal phallus musculature in Lepidoptera by considering the complementary female structures and interaction in *Eugnosta magnificana* [1.5], *Tortrix viridana* [1.8] and the tribes Eucosmini and Grapholitini [2.7].

TAXONOMIC CONTRIBUTIONS. In the publications presented in the current competition, 13 new to science lepidopteran taxa are described independently or in co-authorship (9 species and four subspecies): *Dichrorampha sakartvelana* [1.2], *Phtheochroa apenninana*, *Phtheochroa alpinana*, *Phtheochroa cantabriana* [1.3], *Epinotia nigristriana* [2.2], *Cydia transcaucasica*, *Cydia suffuscana*, *Cydia centralasiae elegantana* [2.4], *Dichrorampha dinarica* [2.5], *Phtheochroa carpatiana* 2.13], *Eutelia adoratrix platinea*, *Lacanobia praedita canescens*, *Hadena adriana petergyulaii* [2.14].

Revisions accounting for characters of external morphology, analysis of everted vesicae and DNA barcodes have revised status or suggested synonymizations and new combinations: neotype for *Eupoecilia frigidana* [1.3], *Clepsis semiana* has been restored as a valid species; *Clepsis striolana*, *C. acclivana*, *C. trivia* и *C. xylotoma* have been removed from synonymy with *C. neglectana*; *Clepsis eatoniana* has been removed from synonymy with *C. consimilana*; *Clepsis razowskii* was synonymized with *C. eatoniana* [1.6]; *Dichrorampha typhlodes* is recognized as a junior synonym of *D. acuminatana* [2.1]; a synonymy of *Grapholitha succedana major* with *Laspeyresia pamira* (valid taxon name *Cydia major*) is proposed; *Laspeyresia pamira centralasiae* is a separate species from the succedana group (valid name *Cydia centralasiae* = *Cydia intexta*) [2.4]; *Cnephasia daedalea* was synonymized with *C. hellenica* [2.6].

FAUSTIC CONTRIBUTIONS. Analysis of inflated vesicles and DNA barcodes revealed the existence of five rather than two species of the genus *Phtheochroa* in the southern mountains of Europe [1.1]. As new for the Bulgarian fauna were reported three tenebrionid species (*Asida cocquempoti*, *Pedinus olympicus*, *Platydema europaea*) [2.16], *Klimeschia transversella* (Lepidoptera: Douglasiidae) [2.18], *Chrysoesthia sexguttella* (Lepidoptera: Gelechiidae) [2.20]. 483 species of Macrolepidoptera have been reported from the Mesta Valley, including rare and locally distributed taxa [3.1]. Data on new genera and species for the Bulgarian lepidopteran fauna are presented: *Dichrorampha pentheriana* [1.2]; *Heterogenea asella*, *Chemerina caliginearia* [3.2]; *Odontognophos dumetata* [3.2]; *Desertobia ankeraria* [3.6]; 17 tortricid species new to the Bulgarian fauna, among which *Dichrorampha caucasica* is new to the Balkan Peninsula [3.7]; *Araeopteron ecphaea* was confirmed as a valid species [3.10]; *Pempeliella alibotuschella* [3.9]; *Argyresthia trifasciata* [3.11]; *Scythris sinensis* [3.12]; *Mesophleps oxycedrella* [3.13];

Falseuncaria degreyana and *Epibactra immundana* [3.15]. It was established that, despite reports of four species of the genus *Saturnia*, only *S. pavoniella* is found in Bulgaria [3.5].

New localities of the invasive species *Hierodula transcaucasica* (Mantodea) have been reported in Bulgaria [3.14].

MONITORING OF INSECT PESTS. It has been shown that synthetic sex pheromones can be successfully used to monitor the tortricids *Enarmonia formosana*, *Retinia resinella* and *Cnephasia pasiuana* [2.8].

ECOLOGICAL CONTRIBUTIONS. The cause of mortality of *Macroglossum stellatarum* when feeding on the introduced ornamental plant *Oenothera speciosa* was established [1.4]. By microscopic examination of the pollen content, the nutritional spectrum of 5 taxa of Oedemeridae (Coleoptera) was revealed [2.3]. New data on parasitoids and inquilines in galls of *Andricus quercustozae* (Hymenoptera: Cynipidae) are presented [2.12].

Outside the scientific issues of the current competition for associate professor, the candidate has scientific contributions in describing the hemipenes of two closely related species of the genus *Ablepharus* (Scincidae), which differ only in a few external and variable characters [2.9]. Knowledge of the lifespan and reproductive cycle of *Ablepharus kitaibelii* has been expanded [2.10; 2.11]. The penis of the recently described mole *Talpa martinorum* and its relative, the European mole *Talpa europaea*, has been described [2.15]. The skin mite *Psorergatoides kerivoulae* has been found on the bats *Myotis myotis* and *M. blythii*, the latter of which is a new host for the parasite [2.17].

3. Significance of the obtained results

PUBLICATIONS. Chief Assistant Dr. B. Zlatkov presents a list of 47 publications, of which four are related to the dissertation work.

In the current competition for "associate professor", the candidate participates with 43 publications: 18 articles in scientific journals with an impact factor (IF); 10 articles in impact-ranked journals (SJR according to Scopus), but no IF; 15 articles in international journals that are not refereed and indexed.

Journal publications with IF have been printed in the most renowned publications Acta zoologica bulgarica (4 articles); Herpetozoa (2); Zoomorphology (2); Zootaxa (2); Arthropod–Plant interactions (1); Biodiversity Data Journal (1); Biologia (1); Comptes rendus de l'Academie bulgare des Sciences (1); European Journal of Taxonomy (1); Frontiers in Zoology (1); Nota Lepidopterologica (1); ZooKeys (1).

The publications of Chief Assistant Dr. B. Zlatkov in indexed journals have a very high rating. The total IF and SJR is 20.475. Nearly 60% of them were published in journals falling into the first (Q1) and second (Q2) quartiles – respectively 7 for both categories (25.0%). Four of the candidate's publications (14.3%) were published in journals in the third (Q3) quartile and 10 publications (35.47%) – in the fourth (Q4) quartile.

All 43 publications are written in English. In 7 publications (16.3%) Chief Assistant Dr. B. Zlatkov is a single author, in 14 publications (32.6%) - first author, in 13 publications (30.2%) - second author, and in the remaining 9 publications (20.9%) - third and subsequent author.

The applicant's academic performance exceeds nearly two times the minimum state requirements for professional field 4.3. "Biological Sciences" and the internal rules of IBER: 43

publications, incl. 28 in journals referenced in world-renowned databases (Web of Science and Scopus), of which 18 articles in IF journals, at a minimum threshold of 20 articles and 10 articles in IF journals.

The publication activity of Dr. B. Zlatkov has the following value expression according to the Law on the Development of the Academic Staff of the Republic of Bulgaria: Category B – 145 points, with a minimum threshold of 100 points; Category D – 276 points, with a minimum threshold of 220 points.

The value expression of the publication activity of the candidate in "Category B" (145 points) exceeds 1.5 times the required minimum for occupying the academic position of "associate professor" (100 points), and in category D (276 points) - 1, 3 times (220 items).

PARTICIPATIONS IN SCIENTIFIC FORUMS. Chief Assistant Dr. B. Zlatkov does not present a certificate of participation in national and international scientific forums.

CITATIONS. Chief Assistant Dr. B. Zlatkov has submitted a list of 40 citations to 17 of his publications. The citations are valued at a total of 80 points, exceeding by 1.3 times the accepted minimum for occupying the academic position "associate professor" at IBEI (60 points).

The citations of Dr. B. Zlatkov are proof of the quality of his research and the importance of scientific issues.

4. Most significant scientific and applied achievements

As a result of the research activity of Chief Assistant Dr. B. Zlatkov has made scientific and applied contributions in the field of forest protection and conservation of insects with conservation significance, as follows:

For the first time in Bulgaria, damage by *Argyresthia trifasciata* (Lepidoptera: Argyresthiidae) was recorded on the young shoots of *Juniperus scopulorum* [3.11] and *Mesophleps oxycedrella* (Lepidoptera: Gelechiidae) - on the cones of *Juniperus excelsa* [3.13].

Based on a specific example (*Oenothera speciosa* - *Macroglossum stellatarum*) it has been shown that specific features in interactions between plants and insects can be a conservation problem in the absence of impact assessment on insect populations [1.4].

In winter, the feeding of the bat *Miniopterus schreibersii* was found to be outside the hibernation site. It does not use cave fauna, and although Diptera is one of the most abundant insect orders, bats prey primarily on Lepidoptera and Hymenoptera [2.19].

Data are presented on the distribution in Bulgaria of the saproxylic species *Propomacrus bimucronatus* (Coleoptera: Euchiridae) included in the EC Habitats Directive and the IUCN Red List [3.4].

5. Critical notes

I have no critical remarks about the candidate's scientific works. Their quality is at a very high scientific level and they are absolutely durable in terms of technique and style. Of particular value is the rich illustration of the works with high-quality photographs and drawings of external morphological characters and genital preparations, which will facilitate the identification and revision of lepidopteran taxa with taxonomic problems.

The candidate has not provided a reference for participation in scientific forums, although I am aware of one of his participation with a poster at an International Scientific Conference: *Shishiniova M, I. Iliev, E. Tasheva-Terzieva, G. Nacheva, R. Tzonev, I.Traikov, V. Stefanov, D.*

Gradinarov, A. Lapeva-Gjonova, A. Grozdanov, B.Zlatkov, R. Bekchiev, R. Kostova. Investigation and assessment of the biological diversity of Mantaritsa and Kupena biosphere reserves. Union of BulgarianScientists' International Science Conference. 4–5 June 2009, Stara Zagora, Bulgaria.

6. Participation in projects

During the period 2006-2023, Chief Assistant Dr. B. Zlatkov participated as an expert in two international and 21 national projects, as follows:

- BBI-Matra (with the participation of Butterfly Conservation Europe De Vlinderstichting) (1 project) – Prime Butterfly Areas in Bulgaria – a Tool for Nature Conservation;
- Biodiversa Program for Horizon 2020 (1 project) – SusTaining AgriCultural Change Through ecological engineering and Optimal use of natural resources;
- Contracts with the Ministry of Education and Science (5 projects) - National scientific program "Protection of the environment and reduction of the risk of adverse phenomena and natural disasters"; Research and evaluation of the biological diversity of the "Mantaritsa" and "Kupena" biosphere reserves; Distributed System of Scientific Collections - Bulgaria (DISSCO-BG);
- Contracts with the Ministry of the Environment and Waters, the Regional Inspectorate for the Environment and Waters and the Pirin National Park Directorate (6 projects) - Mapping and determination of the nature protection status of natural habitats and species - phase I.; Development of specific and detailed nature protection objectives at the protected area level for protected areas of the Natura 2000 network in Bulgaria; Establishment and management of the reserve "Byala Krava" and maintained reserves "Haidushki chukar" and "Savcov chair"; Development of a management plan for the "Tisata" reserve for the period 2014-2023; Development of a Guide for planning activities in forests and lands from the forest fund, falling into the NATURA 2000 network and pilot testing in the Lomovete Park and the Shumensko Plateau Park;
- Agreement with the "Scientific Research" Fund (3 projects) - Construction of a National Center for Scientific Excellence in the Field of Biodiversity and Ecosystem Research - CEBDER; Sex selection in butterflies: mechanisms of copulation and functional morphology of copulatory organs (Insecta: Lepidoptera); Assessment of the state of endangered grassy habitats in Bulgaria through a population-genetic study of model groups of insects;
- Scientific Research Fund of Sofia University "St. Kliment Ohridski" (3 projects) - Butterflies of the Tortricidae family (Insecta, Lepidoptera) of the Sandansko-Petrichka valley; Species composition and distribution of butterflies from the Tortricidae family in the region of the Kresnen Gorge and the Sandan-Petrichka Basin; Food spectrum of beetles from the family Oedemeridae from some regions of South-West Bulgaria based on pollen analysis;
- Contracts for an Enterprise for the management of environmental protection activities (2 projects) - Development of specific and detailed environmental protection objectives at the level of a protected area for fifteen areas of the ecological network Natura 2000 in Bulgaria - BG0001386 Yadenitsa, BG0000495 Rila and BG0002129 Rila buffer; Development of

specific and detailed nature protection objectives at the protected area level for fifteen areas of the ecological network Natura 2000 in Bulgaria;

- Metropolitan Municipality (1 project) - Monitoring of endangered, rare and vulnerable plant and animal species and communities in Lozenska Planina Mt.

Chief Assistant Dr. B. Zlatkov collects a total of 44 points in "Category D", of which 20 points for the head of a national scientific or educational project, and 24 points - for attracted funds for projects led by the candidate (about BGN 100 thousand).

7. Profile of the research work

Chief Assistant Dr. B. Zlatkov has a clearly defined profile of research work in the field of lepidopterology. His contributions enrich and expand not only Bulgarian but also world science with new facts about the taxonomy, anatomy and functional morphology of several groups of butterflies. The candidate is an extremely erudite and established specialist, capable of conducting in-depth entomological research, which fully corresponds to the scientific specialty for which the competition is announced.

8. Personal impressions

Chief Assistant Dr. Boyan Zlatkov, is an established scientist, extremely responsive and correct in his relationships with colleagues, for which he enjoys well-deserved respect in academic community.

9. Conclusion

The candidate for the academic position of Associate Professor, Chief Assistant Dr. Boyan Petrov Zlatkov, participated in the competition with a considerable amount of and extremely valuable scientific production. An indicator of the high quality of his scientific research is the large number of publications and citations in the most renowned scientific journals.

The scientific contributions, high professionalism and authority in the academic circles, combined with the personal qualities of the candidate, whom I know very well, give me grounds with absolute conviction to recommend to the Scientific Council of IBER to choose Chief Assistant Dr. B. Zlatkov for Associate Professor in professional direction 4.3. Biological sciences, scientific specialty "Entomology".

03.12.2023 Reviewer:
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