

Review

by Prof. Dr. Lyubomir D. Penev

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Member of the Scientific committee appointed by decree No 112/28.12.2023 for the selection of an Associate Professor of 4.3 Biological sciences in the field of Ecology and Ecosystem Conservation for the Research Group "Fauna, Taxonomy, and Ecology of Invertebrates", section "Biodiversity and Ecology of Invertebrates" at the Institute of Biodiversity and Ecosystem Research (IBER-BAS).

Dr. Teodora Marius Teophilova is the only candidate who has applied and submitted the necessary documents for the competition announced in the Bulgarian State Gazette, vol. 92/03.11.2023 for the position of Associate Professor of Ecology and Ecosystem Conservation.

Overview of the candidate's career development

Teodora Teophilova was born on 18 August 1978. She received a Master's degree in Ecology and Environmental Conservation from the University of Forestry in 2001; and a Bachelor's degree in Urban Ecology in 2004. Between 2004 and 2006, she studied Cynology at the same university and was certified as an expert cynologist. Between 2010 and 2013 she was a full-time doctoral student at the University of St. Kliment Ohridski, where she majored in Ecology and Ecosystem Conservation. Her dissertation work, titled "Composition and structure of carabid communities (Coleoptera: Carabidae) in different ecosystems in the Cape Emine region" was successfully defended in 2014. Since 2015, she has been working as a Chief Assistant Professor at the Animal Diversity and Resources department at IBER-BAS. She is fluent in English and Russian. She has good communication and teamwork skills evident from her participation in scientific projects, tutoring jobs and work as a student consultant.

Evaluation of the candidate's research activity

Scientific contributions

Dr. Teophilova's main scientific interests and achievements are in the field of fauna and ecology of ground beetles (Carabidae), mainly those that inhabit Bulgaria. Members of the family Carabidae are an important group of invertebrates because of their taxonomic richness, abundance and wide distribution across diverse habitats, including agricultural lands. They possess a significant potential as bioindicators, which makes them particularly important for ecological studies and assessments. The candidate's work also concerns other insect orders, as well as some vertebrate groups (e.g. birds, fishes, mammals).

Faunistic contributions

The applicant has recorded for the first time the presence of six species, one genus and one family of coleopterans in Bulgaria (see 5, 11, 14, 21, 24, 29); and one genus and two species of nematoceran flies (Diptera) (see 17). She has also reported two new geographical occurrences for the fauna of Romania (see 19).

The candidate has also substantially contributed to the study of carabid beetles in different regions in Bulgaria (i.e. Srebarna Nature Reserve; Tundzha-Sakar region; Eastern and Western Rhodopes; the Zlatia area in the Danube plain; Struma Valley; and the mountains Pirin, Sredna Gora and Central Stara Planina). As a result, she has added considerable data about the distribution and occurrence of carabid species across diverse habitats. For the first time have been reported: ten species in the Srebarna Nature Reserve (see 5); 46 species for the Tundzha-Sakar region (see 6); 11 genera, two subgenera and 60 species for the Eastern Rhodopes (see 18); 25 species known from both the Western and Eastern Rhodopes (see 7, 18); six species for the Danube plain; and 120 for the western part of the Danube plain (see 22); two species for the Struma valley within Bulgarian territory and 13 species for Pirin (see 20).

Concerning other insect groups, new occurrences have been reported for two species of aquatic beetles from Stara Planina (see 14); and 14 species of hoverflies (Diptera: Syrphidae) from Karlovska Valley (see 12).

In a review of some rare species of riffle beetles of the family Elmidae known from the Balkan Peninsula, the candidate has presented data on the distribution, habitat association and coexistence with other aquatic beetles for seven species. Her work uses materials collected over eleven years between 2007 and 2018 (see 28).

The presence of six rare species of carabids in Bulgaria is confirmed (see 21 and 22). Similarly, the hereby data confirms the presence of four species of carabids in Romania, of which none has previously been reported in neither the Palearctic catalogue, nor other literature source (see 19).

A zoogeographic characterisation of the carabid fauna in different regions of Bulgaria has been provided (see 6, 15, 18, 20, 22).

As a result of the research work by Dr. Teophilova, the IBEI collection has been enriched with thousands of identified coleopteran specimens and other insects, which presents a significant contribution of importance to the research work by fellow scientists in the future.

All small mammals species (with the exception of synanthropic mice and rats) found in owl pellets are new to the region of Silistra (see 25, 26).

Environmental contributions

Good knowledge of Carabidae has allowed the candidate to make significant contributions in the field of the ecology of the family, namely to reveal structural and functional parameters (i.e. life forms) of carabid communities in different types of habitats, including forests; grasslands; pseudomaquis; riversides; areas with sparse vegetation; and arable land with different crops (see 5, 6, 8, 10, 15, 18, 20, 22, 23). In the meantime, the candidate has studied the role of a number of environmental factors - such as humidity and soil condition (see 8, 18, 20, 23), temperature, substrate and vegetation type (see 7, 9) - in the formation of carabid communities and their characteristics.

Nine species of ground beetles have been confirmed from higher altitudes than previously known in Bulgaria, which could be associated with the effects of climate change. However, in order to confirm colonisation of higher-altitude localities, further systematic studies using an altitudinal gradient are necessary (see 7).

The analysis of the ecological structure of carabids from different areas (i.e. rapeseed fields and adjacent grasslands in the Upper Thracian Plain and the foothills of Sredna Gora; and various natural habitats and arable lands in the Zlatia area in the Danube plain) in relation to the development of their flight wings confirms the pattern of predominance of winged forms in conditions of agricultural intensification and other anthropogenic impacts. These faunal characteristics are associated with anthropogenically influenced habitats, where species with higher mobility and adaptability dominate, since they can react more quickly to environmental changes (see 10, 23).

Various aspects of the ecological structures (i.e. dominant and trophic structures, biodiversity indices, density) of hoverfly species complexes in different types of agroecosystems have been studied (see 12).

Methodological contributions

It has been demonstrated and confirmed that light trapping, a method not routinely used in the study of carabids, can be a useful and relatively simple method for this group of beetles, especially in wetlands. It could be used to complement standard soil trapping methods or in the study of species with specific biology and ecology (see 5).

Applied science contributions

The main applied science contributions of the candidate are related to conservation biology and nature conservation practices. A distribution model for carabid species by subtype of grass ecosystems, altitudes and regions in Bulgaria is proposed. It is used as a basis for the development of a 5-point system for evaluation of carabid species richness and the environmental status of the five subtypes of grass ecosystems (see 8).

Research has been carried out in several protected areas, which has resulted in new or additional knowledge of the invertebrate fauna (mainly ground beetles). Data about species of conservation and scientific importance has been collected, and the related negative impacts have been noted. This information has been used to propose measures to mitigate the effect of those factors. It has also been used to inform management plans in some of the studied reserves, i.e. Leshnitsa, Dolna Topchiya and Balabana (see 5, 6, 14, 15).

I highly merit research that complements and expands our knowledge of the biology, ecology, distribution, and status of species of conservation importance (i.e. protected, rare, endemic, bioindicators or those with restricted distribution). Such is the candidate's work on carabid beetles (see 6, 11, 15, 18, 21), aquatic beetles (see 14, 28), the saproxylic beetle *Cerophytum elateroides* (see 29), the barn owl (see 27), the short-eared owl (see 25, 26) and the otter (see 16).

New information about the communities of invertebrates in specific and poorly studied habitats of conservation importance has been collected and analysed, which helps to inform science-based decisions for their conservation (see 5, 8, 9, 11, 20, 23, 29).

The new data about *Carabus bessarabicus* in Bulgaria will help to include the species in the national and European nature conservation policy documents, and will prompt the procedure for declaring Chepan Mountain as a protected territory (see 11).

The mapping and identification of the ichthyofauna as a component of the otter's diet and the assessment of the importance of the predator for hydrobionts (see 16) has implications for hydrobiological monitoring.

A study of eight dams in Bulgaria (Ecoregion 7 and Ecoregion 12) has been conducted, in order to assess their ecological status, where hydrochemical and other parameters of the water have been associated with characteristics of the macrozoobenthos communities. The lack of correlations, however, warrants further research (see 17). In this study, some alien and potentially invasive macroinvertebrate species have been identified.

The effect of a fungicide on syrphid fly communities in a potato crop has been studied. The work found an effect only immediately after the treatment, whereas syrphid populations recovered within 10-15 days (see 13). The results conclude that the fungicide does not pose a risk to the communities of these beneficial insects.

I generally accept the provided contribution references, which are detailed and clear, but I think that the ones that characterise the zoogeographical structure of carabid fauna rather belong to the faunal contributions. Similarly, the development of an evaluation system for grass communities based on ground beetle communities is rather a contribution of importance to ecological monitoring.

Scientific impact

Publication activity

For the current competition, the candidate has provided 25 publications, whereas a minimum of 20 is required. Of those, thirteen are published in journals with an Impact Factor (two journals are ranked in Q1 by Web of Science; one is in Q2; nine are in Q3; and one is in Q4). The remaining 12 are all in Q4.

Given the large number of research publications, which Dr. Trendafilova has authored mainly in the last ten years - where a large part of those have not been provided for this competition - demonstrate that she is a very active researcher.

The results of the candidate's research work have been presented at many scientific forums. A cross-reference confirms that in the last 10 years Dr. Teophilova has participated in 33 national and international scientific forums, where she has presented a total of 63 reports and posters.

Citations

The citation list contains 34 references, whereas a minimum of 20 is required. Of these, 23 are in journals with an Impact Factor; and nine are in journals with a SCImago Journal Rank (SJR), which is evidence of the interest in the work by the candidate.

In the **Compliance Report**, the distribution by points is: A1 – 50 points, B4 – 105 points, D7 – 232 points, D11 – 68 points. The total number of points from the individual sections is 455, where a minimum of 430 points is required.

Project activities

Dr. Teophilova's project work is quite prominent and diverse. She has participated in a total of 18 national projects, as well as one international project. These were financed by different funders. She headed one of these projects and led a Work Package at another one. Both projects were funded by the Bulgarian National Science Fund (BNSF).

Expert work

In the last seven years, Dr. Teophilova's work included serving as a reviewer for 19 research articles at 16 specialised journals, most of them international. She has reviewed two Bachelor's (2017 and 2019) and two Master's (2020 and 2021) theses at the Forestry University (Sofia, Bulgaria). Her key role in the preparation of various scientific examinations, reports and evaluations for the use of the management of municipalities, protected areas (i.e. Central Balkan park; ten national reserves within the territorial scope of RIEW-Stara Zagora and Pazardzhik) and organisms (i.e. the Hermann's and Greek tortoises; two species of ground beetles; *Rosalia longicorn*) should also be noted. Dr. Teophilova has participated in these activities as an expert on invertebrates, terrestrial invertebrates, animal fauna, or as a consultant or team leader. She took part in preparation of the Self-Assessment Report for program accreditation of the educational and scientific degree "Doctor" in the doctoral program Entomology at IBEL - BAS in 2021.

Role of the candidate in student tutoring

For two years (2010-2012), Dr. Teofilofa has led an exercise course in Ecology and Nature Conservation for full-time students majoring in Molecular Biology, Biology and Chemistry, Geography and Biology and Biotechnology at the Biological Faculty at Sofia University St. Kliment Ohridski.

Research work profile

The research activity and studies of Teodora Teophilova characterise her as a professional entomologist with an expertise in the order Coleoptera and a focus on carabid beetles. Part of her research work also concerns other invertebrates, including aquatic invertebrates. A comparatively small amount of her work is devoted to certain groups of vertebrates. She has contributed significantly to the fields of conservation biology and biomonitoring.

Personal impressions

My impressions of Teodora Teophilova, whom I have known for many years, are quite positive. She is a very good and hard-working field researcher and possesses excellent teamwork skills. She is a highly capable and motivated professional.

Recommendations for future work

I recommend her future work to include more molecular studies and novel methods for statistical data processing and ecological analyses. I also highly recommend publishing in higher-ranked journals.

Conclusion

Dr. Teophilova matches and to an extent even exceeds the requirements for the academic position of an Associate Professor, according to the Law on Academic Staff Development in the Republic of Bulgaria and the criteria of the Scientific Council at IBEI-BAS. She has successfully defended a doctoral degree; authored 25 research publications; received 34 citations (the majority of which in journals with an Impact Factor); worked for a number of research and applied science projects; supervised doctoral graduates; demonstrated skills as an expert and organiser; and participated in the training of students at the Forestry University and Sofia University. The candidate's diverse contributions to academia and applied science are clearly presented. On the basis of the above, I give a positive assessment for Dr. Teophilova's application and strongly recommend the IBEI Scientific Council at IBEI to grant her the academic position of Associate Professor of Ecology and Ecosystem Conservation.

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