REVIEW

By Assoc. Prof., Dr. Teodora Angelova Trichkova Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences (IBER-BAS)

Member of the Scientific Committee, appointed by Order No. 50/05.08.2024 of the Director of the IBER-BAS

Concerning the competition for the academic position 'Associate Professor', as announced in the State Gazette No. 48/07.06.2024, in the area of higher education: 4. 'Natural Sciences, Mathematics and Informatics', professional field: 4.3. 'Biological Sciences', scientific specialty: 'Hydrobiology', for the needs of the Research Group of Bioindicators, Monitoring and Ecological Classification of Freshwater Ecosystems, Section of Biodiversity and Functioning of Freshwater Ecosystems at the Department of Water Ecosystems of the IBER-BAS

Assistant Professor Dr. Violeta Georgieva Tyufekchieva is the only candidate for the academic position 'Associate Professor' in the competition announced in the State Gazette No. 48/07.06.2024 in the scientific specialty 'Hydrobiology' at the Department of Water Ecosystems of the IBER-BAS.

1. Professional development

Violeta Tyufekchieva has graduated from the Faculty of Biology at 'St. Kliment Ohridski' University of Sofia and defended a diploma of 'Biology' with a major of 'Fishery and ichthyology'. In the period 1995–2010 she worked as a biology specialist at the Institute of Zoology, BAS. From 2010 till the present she has been a researcher at the Institute of Biodiversity and Ecosystem Research, BAS (IBER-BAS), occupying the academic positions of 'Research Assistant' (2010–2014) and 'Assistant Professor' (2014 – up to date). In 2014 Dr. Tyufekchieva obtained the educational and scientific degree PhD in the scientific specialty 'Hydrobiology' after defending a thesis on the subject: 'Composition, distribution and ecology of order Plecoptera (Insecta) in Bulgaria'. Doctor Tyufekchieva has continuously raised her qualification through participation in various specialist trainings and courses in Bulgaria and abroad, with themes such as: taxonomy of order Plecoptera, molecular taxonomy, phylogeny and ecology, molecular and biochemical markers and their application in ecotoxicological research of wetlands, invasive alien species, including operating with databases and mastering software in statistics, GIS and mapping. Doctor Violeta Tyufekchieva has participated in over 40 national and international projects. She has 44

scientific publications and 30 attendances at academic forums. Doctor Tyufekchieva has taken part in the organisation and programme committees of 12 national and international scientific conferences and workshops. She is a member of the Union of Scientists in Bulgaria and of the International Associations for Danube Research.

2. Basic materials for the competition

Reference for the materials submitted and their compliance with the national requirements and the requirements of the BAS and IBER-BAS

The scientific production of the applicant comprises totally 44 scientific publications, the larger part of which in international and national peer-reviewed and indexed journals. Of those, three publications relates to the thesis for obtaining the educational and scientific degree PhD, while twelve publications are not involved in the competition (not evaluated), but some of them are included in the contributions.

A total of 29 publications are presented for the present competition, as follows:

- 9 scientific publications in journals peer-reviewed and indexed in the Web of Science (WoS) and Scopus databases, as a part of the habilitation work (Indicator B4 – 141 points);
- 12 scientific publications in journals peer-reviewed and indexed in the WoS and Scopus database, outside the habilitation work (Indicator $\Gamma7 183$ points);
- 8 book chapters (Indicator $\Gamma 8 120$ points) (Table 1).

According to this reference, the scientific works of Dr. Tyufekchieva are cited in 194 publications, of which 126 in journals peer-reviewed and indexed in the WoS and Scopus, and they are also presented for this competition (Indicator \mathcal{I} – 252 points). Of those, however, four (No. from the reference/from the list of citations 80/147, 88/155, 103/171 µ 111/179) are in fact self-citations and should be excluded, thus the total number under Indicator \mathcal{I} would become 244 points (Table 1).

In spite of the correction made the assessment of the presented publication activity and citations of the applicant in the competition fully complies with and even surpasses, by some criteria (\mathcal{A}) manifold, the minimum national requirements for occupying the academic position 'Associate Professor', in accordance with the Law on the Promoting the Academic Staff in the Republic of Bulgaria and the Regulations for its implementation, as well as the requirements of BAS (Table 1).

The applicant fully covers and even exceeds the criteria of the IBER-BAS as well: she has submitted 29 publications (with 20 required) and 17 publications with impact factor according to the WoS (with 10 required) and 122 citations in journals peer-reviewed and indexed in the WoS and Scopus (30 required).

Table 1. Indicators and number of points under the respective indicator according to the minimum national requirements and the requirements of BAS for occupying the academic position 'Associate Professor', the values achieved by the applicant and values adopted by the reviewer.

	Indicator	Number of points	Number of points of the applicant	Number of points adopted by the reviewer
A	1 – Thesis work for awarding educational and scientific degree PhD	50	50	50
В	4 – Habilitation work – scientific publications in journals peer- reviewed and indexed in world- renown databases of scientific information	100	141 (2 Q1, 3 Q3, 3 Q4, 1 SJR)	141
Γ	7 – Scientific publications in journals peer-reviewed and indexed in world- renown databases of scientific information (Web of Science и Scopus), outside the habilitation work	220	183 (3 Q1, 2 Q3, 4 Q4, 3 SJR)	183
	8 – Published book chapter or multi- authored monograph		120 (8 items)	120
Д	11 – Citations in scientific journals, monograph, multi-authored volumes and patents, peer-reviewed and indexed in world-renown databases of scientific information (Web of Science and Scopus)	60	252 (126 citations)	244 (122 citations)
	Total number	430	746	738

Main areas of research of the applicant

The habilitation work is based on 9 publications, which clearly delineate the main areas of research of Dr. Tyufekchieva: taxonomy, faunistics, zoogeography, ecology and conservation of the species of order Plecoptera (stoneflies). The publications outside the habilitation work (20 items) reveal a broader range of the hydrobiological research of the applicant in the area of macrozoobenthos: species composition, distribution in standing and flowing waters, ecological traits, role as bioindicators (cenotic, biotic and trophic indices based on macrozoobenthos), invasive alien species of invertebrates, etc. Contributions of Dr. Tyufekchieva in those research areas are of both scientific and applied scientific importance.

Scientific contributions

Taxonomy

The taxonomic status in Bulgaria of 2 genera, 6 species and 3 subspecies of stoneflies are clarified. The descriptions of some species are improved. Taxonomic lists are updated and the first checklist of order Plecoptera in Bulgaria has been compiled. It contains 103 species and 6 subspecies from 23 genera and 7 families. The contributions are original, as a result of fundamental research, and of national and European significance.

Faunistics

- Three Plecoptera species are newly discovered for the Bulgarian fauna.
- New faunistic data of over 30 stonefly taxa are collected on the entire territory of Bulgaria. Some of those taxa extend their ranges in mountainous and semi-mountainous rivers in Bulgaria.
- New localities of 4 taxa of order Plecoptera are found in mountainous and semimountainous rivers in the Republic of North Macedonia.
- Four stonefly species are newly reported from the Pirin Mountains; new localities of 11 taxa of stoneflies are found in the Otovitsa and Mochura rivers in the Pirin Mountains.
- A total of 38 taxa of order Plecoptera, including eight Balkan endemics, are reported from 44 glacial water bodies of Rila Mountains. The species *Perla pallida* has been found for the first time in Lake Chernoto in the Rila Mountains.
- The species *Leuctra albida* has been found for the first time in carst springs.
- The distribution of the representatives of order Plecoptera is studied within the catchments of the rivers Iskar, Struma, Mesta, Maritsa, Tundzha, and Arda, in Vrachanski Balkan Natural Park (with two newly recorded stonefly species for the region), and in the Bulgarian part of the Danube River and adjacent river areas.
- New data about the distribution of some taxa from Ephemeroptera, Heteroptera and Trichoptera are reported from different regions of Bulgaria.
- The diversity of macrozoobenthos in Smolyan and Chair landslide lakes, in the Rhodope Mountains, has been studied, with finding of 15 new macrozoobenthic taxa, of which one species from order Plecoptera.
- Rich and diverse macrozoobenthic fauna on the regional scale (148 taxa of 20 systematic groups) is found in karst ecosystems in Bulgaria.
- Macrozoobenthic communities in 51 reservoirs and lakes are studied, which include 297 species of 22 systematics group. High diversity (120 taxa) of macrozoobenthic organisms is also found in standing waters in the mountain areas of Eastern Bulgaria.
- A total of 114 taxa and certain specific groups (Ephemeroptera, Trichoptera, Plecoptera, Coleoptera, and Diptera varia) is found in intermittent rivers in the catchment areas of the rivers Struma, Tundzha, Arda, and Maritsa.
- Faunistic diversity of the macrozoobenthic communities in some rivers in the Strandzha Mountains is evaluated.

- The presence of the invasive species zebra mussel *Dreissena polymorpha* is reported for the first time in some reservoirs in Bulgaria, such as Bebresh, Aleksander Stamboliiski and Yovkovtsi.
- The first records of the invasive alien species Asian clam *Corbicula fluminea* has been reported from the Aegean Sea Basin in Bulgaria. This species is found in 6 new localities along the Maritsa and Tundzha rivers. The possible pathways of introduction and spread of the species in the adjacent river systems are analysed.

Most of the contributions are original, some of them confirm previous studies, and are of national and regional (the Balkan Peninsula, the Danube River Basin, the Aegean Sea Basin, etc.) importance. The obtained data are a basis for further investigations, as well as for developing and applying conservation measures, preventive measures against invasive alien species of aquatic invertebrates, and measures for the river basin management.

Zoogeography

- A total of 31 endemic taxa of order Plecoptera are found in Bulgaria, and they are classified as Balkan (19 species and 2 subspecies), Bulgarian (10), regional, and local endemics.
- The zoogeographic characteristics of order Plecoptera from mountainous and semimountainous rivers in Bulgaria and the Republic of North Macedonia are analysed, and the species are attributed to 5 complexes and 7 categories, among which the stoneflies from the European and Palearctic complexes prevail. It is found that species *Brachyptera beali beali* observed in the Republic of North Macedonia is a Balkan endemic.
- The representatives of Ephemeroptera, Plecoptera and Trichoptera in the mountainous tributary system of the Struma River are classified under 6 zoogeographic categories, with prevalence of the taxa from the European and Mediterranean complexes.
- The endemism in the macrozoobenthic species in some rivers in the Strandzha Mountains is evaluated.

All the contributions are original, and of national and regional (Balkan Peninsula) importance. The data would be of significant importance in developing and applying certain conservation measures.

Ecology

A large part of the research by Dr. Tyufekchieva contributes to revealing ecological traits and requirements of the stoneflies to the environmental factors: altitude, type of substrates, basic physical and chemical parameters of water (temperature, oxygen content, pH, and nutrients), hydromorphological characteristics of riverbeds, etc. The processes of the formation and dynamics of the plecopteric complex in the river cenoses are clarified. Data about distribution of the species under the present conditions and possible future climatic changes are collected. On that ground, the threats to the species of order Plecoptera, being an extremely vulnerable group, are studied. The contributions are original, some of them confirm the previous investigations, as a result of fundamental research.

Applied scientific contributions

1) Within a framework of a large-scale European research, the temporal trends in taxonomic and functional diversity of the freshwater macroinvertebrate communities over the past 50 years are analysed. It is found that after 2010 the biodiversity indicators have plateaued and as of date more than 60% of the sites being monitored at the European level have not achieved the targeted good ecological status. Some contradictory results are obtained on using different indices in assessing the ecological status at various levels. Those contributions are of great public importance and show the necessity of applying certain additional measures for recovery and conservation of biodiversity in the European inland waters. This also includes the need of sufficient and reliable data for a continuous period and careful selection of indicators for assessment of pressures.

2) The conservation status of the Bulgarian plecopteric fauna (more than 50%) is determined, being nearly comparable to that of the European fauna (63%). Fifty-seven taxa are classified according to the IUCN criteria and assessed as having high conservation status (1 extinct, 2 regionally extinct, 2 probably extinct, 22 critically endangered, 9 endangered, and 21 vulnerable species). This contribution is of great significance for conservation of the Plecoptera species both in Bulgaria and in Europe.

3) Of essence are also the contributions of Dr. Tyufekchieva's studies in characterising water quality and assessing the ecological status of water bodies in Bulgaria based on Macrozoobenthos biological quality element (BQE), especially considering that order Plecoptera is an important indicator because of their high sensitivity to various threats. The biotic responses of macrozoobenthic communities to natural and different types of anthropogenic pressures are studied, and the ecological status of 83 river sites from the whole catchment area of Bulgaria for a 5-year period is assessed. Specific response of the macrozoobenthos in model river systems is analysed, for example, in sub-Mediterranean intermittent rivers in the Aegean Sea Basin, and in uninfluenced mountainous standing water bodies. The results are extremely significant and directly contribute to developing and applying appropriate management measures and strategies for improving the water quality and environment. The applicant's contributions are also of importance for completing obligations of Bulgaria in complying with the requirements of the EU Water Framework Directive and achieving a good ecological status/potential of water bodies.

4) Protocols (type-specific scales) are developed for assessing the ecological status, using Macrozoobenthos BQE, in specific types of rivers, e.g. intermittent rivers in Southern Bulgaria. The methods for assessing the ecological status of the Danube River tributaries, using Macrozoobenthos BQE, are calibrated. The outcomes contribute to improving the protocols for ecological classification of the surface water bodies in Bulgaria and raising the effectiveness of the measures for river basin management.

I approve the reference for the applicant's contributions, which is accurate and clear. This reference reflects the contributions of her research work in a right manner. Doctor Tyufekchieva has also some essential scientific and applied scientific contributions to studying the aquatic invasive alien species of mollusks (*D. polymorpha, C. fluminea*, and *Potamopyrgus antipodarum*), including their distribution and impact on the trophic structure of water bodies, along with assessing the invasive potential of standing water bodies. Despite the applicant's leading part in some of these investigations, those contributions are not evaluated by me because of our joint work on this topic.

Significance of the results obtained

The results of Dr. Tyufekchieva research have essential importance for: study and conservation of order Plecoptera in Bulgaria and Europe; assessment and conservation of other endangered species of aquatic invertebrates; protection of biodiversity and resources in the inland waters of Bulgaria; successful application of conservation measures; assessment and improvement of the ecological status of the Bulgarian surface waterbodies; development and implementation of effective plans and strategies for river basin management; prevention of introduction, spread and establishment of aquatic invasive alien species, along with the successful management of biological invasions and restoration of the damaged ecosystems. Evidence for the significance of the results are the journals where they are published – prestigious international journals, such as: *Nature, Nature Ecology & Evolution, Scientific Data*, and *Diversity*, with 5 articles being of the highest category Q1 (Table 1), as well as the national periodicals *Acta Zoologica Bulgarica* and *Ecologia Balkanica*. The scientific works are cited in 194 publications, of which 122 (60%) in journals peer-reviewed and indexed in the WoS and Scopus.

3. Additional materials and activities

Doctor Violeta Tyufekchieva has submitted information about her participation in more than 40 national and international scientific projects. Those are funded by the Bulgarian National Science Fund, Ministry of Education and Science, Ministry of Environment and Waters of Bulgaria, Executive Environment Agency, River Basin Directorates, National Electricity Company, European Commission, Financial Mechanism of the European Economic Area 2009–2014, Austrian Federal Ministry of Science and Research, Japan International Cooperation Agency, etc. Doctor Tyufekchieva's participation consists in: studying the biodiversity, functioning and benefits of the wetlands; mapping and assessment of the conservation status of habitats and invertebrate species; macroozoobenthos monitoring in rivers and lakes as a component of the National Programme for Monitoring Surface Waters; study of BQE and supported physicochemical quality elements in potentially selected reference points in river and lake types on the territory of the river basin directorates; intercalibration and validation of methods for analysing the BQE of the surface waters;

assessment and management of *Dreissena* mussel invasions in Bulgaria; and improving the knowledge about the aliens species using citizen science. The applicant has taken an active part in projects and tasks within the framework of several scientific networks: the International Association for Danube Research (IAD), East and South European Network for Invasive Alien Species (ESENIAS), Danube Region Invasive Alien Species Network (DIAS), Distributed System of Scientific Collections (DiSSCo–BG), and distributed scientific infrastructure the Bulgarian Long-Term Ecosystem Research Network (LTER-BG). Doctor Tyufekchieva has participated in the international programme Joint Danube Survey (JDS4), as well as in preparing the management plans for Rila National Park, Bulgarian Black Sea Coast National Park, and the River Basin Management Plan for the East Aegean Sea Basin Directorate, etc.

Doctor Tyufekchieva has 30 participations in scientific forums, among which are: the regular conferences of the IAD, ESENIAS and DIAS, International Symposium of Ecologists of Montenegro (ISEM), Aquatic Biodiversity International Conference, Sibiu, Romania (ABIC), Symposium for European Freshwater Sciences (SEFS), International Scientific Conference at the Faculty of Mathematics and Natural Sciences of South-West University in Blagoevgrad, International Ecology Workshop of IBER-BAS, several conferences of the Universities of Sofia and Plovdiv, etc. She has taken part in the organisation and programme committees of 12 national and international scientific conferences and workshops.

Although these materials are not subject to be evaluated (with points) in this competition for 'Associate Professor', they show the applicant's intense project and scientific-organisational activities, and supplement her professional profile.

4. Assessment of the personal contribution and profile of the applicant

All the publications of Dr. Tyufekchieva are in co-authorship, with her being a first author of 4 publications, a second – of 5 and a following – of 20 publications under this competition. This is fully explicable owing to the complex nature of the investigations and specifics of the macrozoobenthos research, where a large number of taxonomic groups are involved. As regards order Plecoptera, she has a leading role in all publications. Concerning the remaining groups, her role consists in different extents of: collection and processing of the materials, identification of taxa, data processing and analysis, application of statistical methods, calculations of indices, summary of results and preparation of texts. The applicant has clearly indicated and discriminated in her reference for the contributions her own contribution to the publications against that of the other authors. She has also attached letters from the first authors of two publications with a larger number of authors, which prove her scientific contribution without dispute.

Doctor Tyufekchieva is one of the scientists who are notable for their exclusively clear profile of scientific and research activity. Her main investigations and scientific contributions are on order Plecoptera: its taxonomy, faunistics, ecology and conservation, as well as in the area of macrozoobenthos: its species composition, distribution, ecology, bioindicators, invasive alien species, etc. She has started work at the Institute of Zoology at the BAS, Section of Hydrobiology, in the group of Prof. Boris Rusev – one of our famous hydrobiologists working on benthic invertebrates, and under the guidance of the proven specialist Assoc. Prof. Ivanka Yaneva. With their support, along with that by Assoc. Prof. Krasimir Kumanski from the National Museum of Natural History, BAS, Dr. Tyufekchieva has proceeded with the investigations in the relevant area. In the course of her professional career, she has made significant efforts and established as the only specialist on order Plecoptera in Bulgaria. At present, she is an internationally recognised scientist in this area.

We have worked jointly with Dr. Tyufekchieva on a number of projects and tasks. She has shown great commitment and professionalism in performing her duties. Doctor Tyufekchieva is extremely responsive and has helped a number of undergraduates engaged on diploma thesis and PhD candidates in their work. The same is valid for her assistance to all colleagues in the Department of Water Ecosystems at the IBER-BAS. Doctor Tyufekchieva's efforts in organising and conducting different scientific forums are also highly praised. Exceedingly accurate and correct in her relations with the colleagues, she possesses excellent skills in keeping teamwork. She is a dedicated friend.

5. Conclusion

The materials submitted by Dr. Tyufekchieva under this competition fully complies with the requirements for occupying the academic position 'Associate Professor' according to the Law on the Promoting the Academic Staff in the Republic of Bulgaria and the Regulations for its implementation, as well as the requirements of the BAS and IBER-BAS. Her scientific works manifest in-depth investigations and original, internationally recognised, scientific contributions in the area of Hydrobiology: taxonomy, faunistics and ecology of order Plecoptera (stoneflies), macrozoobenthos in standing and running waters, bioindicators, and invasive alien species. Doctor Tuyfekchieva contributions are of both scientific and applied scientific importance and are highly useful for: evaluation and conservation of order Plecoptera in Bulgaria and Europe; conservation of endangered aquatic invertebrate species and protection of biodiversity and resources in the Bulgarian inland water bodies; successful application of conservation measures; assessment and improvement of the ecological status of surface water bodies in Bulgaria; development and implementation of effective plans and restoration of the damaged ecosystems.

All the foregoing gives me grounds to recommend with full confidence to the Esteemed Members of the Scientific Committee to vote for awarding the academic position 'Associate Professor' in the scientific specialty 'Hydrobiology' to Dr. Violeta Georgieva Tyufekchieva, for the needs of the Research Group of Bioindicators, Monitoring and Ecological Classification of Freshwater Ecosystems, Section of Biodiversity and Functioning of Freshwater Ecosystems at the Department of Water Ecosystems of the IBER-BAS.

Sofia, 02.10.2024 г.

Assoc. Prof. Dr. Teodora Trichkova IBER-BAS