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REVIEW

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Subject: a competition for an academic position "Associate Professor", submitted to the Scientific Jury, appointed by an Order of the Director of IBER-BAS № 45/20.06.2024, in connection with the election of Associate Professor in the scientific specialty "Hydrobiology", professional field 4.3. "Biological Sciences", for the needs of the research group "Invasive Alien Species", section "Biodiversity and Functioning of Freshwater Ecosystems" at the Department "Aquatic Ecosystems" of IBER-BAS, announced in State Gazette № 36/23.04.2024.

Only one candidate - Dr. Hristina Vassileva Kalcheva, Ph. D., from IBER-BAS has applied for the competition. All documents for the competition were prepared in full format and were presented according to the requirements set out in the Regulations on the Conditions and Procedure for the Acquisition of Scientific Degrees and for the Occupation of Academic Positions at IBER-BAS.

General data on the applicant's career and thematic development

Dr. Hristina Kalcheva graduated from Sofia University "St. Kliment Ohridski" - Faculty of Biology in 1990 with a qualification of Biologist and specialization in "Hydrobiology and Water Conservation". In the period 2005 - 2009 she was a full-time PhD sudent at the Institute of Zoology and Training Center at the Bulgarian Academy of Sciences, and in 2011 she successfully defended her PhD thesis on "Trophic importance of bacterioplankton in stagnant freshwater ecosystems - interactions with abiotic and biotic factors in the pelagic zone". In the period 1980 - 2006, with short interruptions, she worked as a dental nurse and a nurse at the IV City United Hospital and Medical University. She started her scientific career in 2009 as a specialist biologist at the Institute of Zoology, BAS. There she continued as an assistant professor, and from 2012 to the present she has held the position of senior assistant professor.

Dr. Kalcheva has submitted 20 scientific publications and four book chapters in the competition for "Associate Professor". The total impact factor of the articles is 6.562. There were submitted 4 more articles without impact factor but with SJR, and ten articles without impact factor and SJR. There are 23 scientific papers with a total of 60 citations in world-renowned databases of scientific information (Web of Science and Scopus). The candidate's scientific works confirm her activity and prospect for future development. In summary, the presented scientific metrics according to the minimum national requirements and the requirements of the BAS for the academic position "Associate Professor", in the field 4.3 "Biological Sciences", in sub-categories, are as follows:

1. Group of indicators "A" - Successfully defended dissertation for the award of PhD - (50 points out of the required 50 points)
2. Group of indicators "B.4" - 7 publications with a total impact factor of 3.223 have been submitted, of which with a rank of Q3 - 6 and Q4 - 1 (a total of 102 points out of the required 100 points).
3. Group of indicators "Г" - 13 publications have been submitted, of which with rank Q2 - 2; Q3 - 6; Q4 - 1. Four book chapters have been added to the asset for the competition (total 242 points out of the required 220 points).
4. Group of indicators "Д" - A total of 60 citations in world-renowned databases of scientific information have been submitted (a total of 120 points out of the required 50 points).

I accept the fulfilment of the minimum national requirements under Article 2b of the Development of Academic Staff in Bulgaria Act and the requirements of BAS for the scientific and the professional field 4.3. Biological sciences, in which Dr. Hristina Kalcheva exceeds the points for indicators В, Г and Д.

Main areas of the candidate's research work and most important scientific contributions in each of them

The research activity of the candidate is focused on the study of spatial and temporal dynamics in quantitative indicators of bacterioplankton from freshwater ecosystems and, tracing the relationships of bacterioplankton with environmental factors and with other communities of the microbial and grazing trophic network under the influence of climate change and invasive alien species.

According to the Regulations on the Conditions and Procedure for the Acquisition of Scientific Degrees and Academic Positions at the Institute of Biodiversity and Ecosystem Research at BAS, the contributions of the scientific papers submitted to the competition must be classified as original or confirmatory. As this has not been done for some of the contributions and others have been classified only as being of an application significance, I have made some clarifications based on the information provided by the candidate, by classifying the unclassified contributions. I have additionally indicated those contributions which have applicable importance in order to highlight their practical relevance.

Contributions of the candidate's work by reserch fields:

1. Freshwater microbial ecology and complex ecosystem studies

Original contributions:

- For the first time, bacterioplankton was studied seasonally over a three-year period (2009-2012) in wetlands of different types, marshes on Belene Island and Kalimok-Brashlen canals and in the Danube at Belene. Phototrophic anaerobic purple sulphur bacteria of the genera *Chromatium* and *Thiopedia* in the canals and filamentous phototrophic green non-sulphur bacteria of the genus *Chloroflexus* in both marsh and canal wetland types were detected for the first time **(B4.2.)**. (also career contribution).
- Bacterioplankton was studied, for the first time, in two wetlands of the Danube flood terrace, Hungary (Middle Danube) **(B4.7.)**.
- Two alien crustacean species have been recorded, the cladoceran *Pleuroxus denticulatus* with low abundance only in Lake Riha and the calanoid *Eurytemora velox* in both wetlands **(B4.7.)**.
- Primary factors determining the hydrochemistry and functioning of wetlands as a source or sink of biogenic elements in the Hungarian and Bulgarian sections of the river. Danube are the degree of wetland connectivity to the river and the presence and percentage of macrophyte cover **(B4.1.)**.
- It was found that bacterioplankton in Lake Srebarna has moderately high abundance, biomass and reproduction rates, with a difference as the values indicate a mesotrophic state by microbiology, although morphologically Srebarna is a eutrophic lake **(Г8.1.).**
- For the first time, bacterioplankton has been studied seasonally over a three-year period. n three Bulgarian dams, two affected, Ogosta and Zhrebchevo, and one unaffected, Koprinka, by the invasive mussel *Dreissena* spp. **(B4.6., B4.3, B4.4., Г7.2., Г7.4)**.

Original and applied contributions:

- It is pointed out that the condition of Lake Srebarna would be brought closer to the natural one by digging a second inlet channel in the area of the demolished dyke or by providing an outflow when high Danube waters enter through the existing channel **(Г8.2.).**
- For the first time, a very strong multiple regression equation was derived between phytoplankton biovolume as the dependent variable, and water level, chlorophyll-a and dissolved inorganic nitrogen as the independent variables (R=0.93), allowing phytoplankton biovolume to be predicted by more easily measurable variables with good accuracy **(Г8.3.).**
- The trophic state of three dams (affected and unaffected by *Dreissena* spp.) was determined to be mesotrophic using the Carlson trophic indices **(Г7.4.)**.
- Detection of statistically significant differences in water column transparency by Secchi and concentrations of oxygen and NO_3-N (nitrate-nitrogen) in the hypolimnion in favour of the period after the invasion of the zebra mussel (*Dreissena polymorpha*) in the Zhrebchevo dam, indicating a serious discrepancy in the concept of trophicity by characteristics in the pelagic zone, due to the fact that the zebra mussel shifts the production-destruction processes in the benthos. **(Г7.2., Г7.4.)**.
- A discrepancy was found in the trophicity estimation by inorganic phosphorus and by phytoplankton biomass in the Zhrebchevo dam **(Г7.2.)** when comparing taxonomic composition and abundance of phytoplankton and its relationship with major nutrients in the periods before (1978-1980) and after (2009-2010) *Dreissena polymorpha* invasion **(B4.4.)**.
- Based on a comparison of original and literature data, it was found that Secchi disk transparency and chlorophyll-a concentrations can be used as indicators applicable in assessing the trophic and ecological status of surface standing water bodies affected by invasive mussels **(B4.5.)**.
- Deep freezing filtered phytoplankton samples in liquid nitrogen was found to result in significantly higher Chl yields, especially when the phytoplankton was dominated by algae with thick cell walls **(Г7.3.)**.
- It is provided a complete bibliographic list of the scientific publications of Prof. Dr. Rumen Kalchev as an established scientist in the field of hydrobiology **(Г7.10.)**.

Confirmatory contributions:

- Bacterioplankton is most abundant in spring, during the May flood, which is also typical for other wetlands of the Lower Danube **(B4.2.)**. In my opinion, this contribution is better to be classified as confirmatory.
- A negative correlation was found between zooplankton and phytoplankton biomass (expressed by chlorophyll-a), indicating a strong zooplankton pressure which is typical of the grazing food chain. **(B4.7.)**.
- The relationship between phosphorus and other trophic characteristics in standing water ecosystems was found to be affected by the zebra mussel (*Dreissena polymorpha*) in 18 Bulgarian dams surveyed in summer and autumn 2016 **(Г7.1.)**.

Original and confirmatory contributions:

- Original scientific contribution on the influence of the invasive species *Dreissena polymorpha* in increasing dissolved oxygen and confirming an increase in Secchi transparency in affected reservoirs as a result of testing 52 ponds, 22 with and 30 without *Dreissena* spp. **(B4.3.)**. This contribution is better to be divided into two separate ones, one original and one confirmatory.

2. Invasive alien species

Original contributions:

- Two new regional networks have been established and developed: the Eastern and Southern European Network on Invasive Alien Species (ESENIAS) and the Danube Invasive Alien Species Network (DIAS). The results of the 7-th ESENIAS Workshop with Scientific Conference, held in 2017 in collaboration with DIAS in Sofia, are presented on 6 themes, including 127 published abstracts and 41 contributions with articles **(Г7.9.)**.
- The scientific results and contributions of the participants of the ESENIAS and DIAS Conference and the 9-th ESENIAS Workshop in 2019 in Sofia are reviewed and summarized. In this context, the 3-rd ESENIAS and DIAS Joint Scientific Conference and the 9-th ESENIAS Workshop regarding Invasive Alien Species were held in Ohrid, in 2019 **(Г7.13.)**.

Original and applied contributions:

- Based on a brief review of aquatic invasive alien species (IAS) in the Danube River Basin (DRB) and the Western Black Sea Coast (WBSC), the Danube Invasive Alien Species (DIAS) Network has been found to promote improved coordination between scientists, authorities and stakeholders in the field of IAS **(Г8.4.)**.

3. Effect of organic fertilization on primary production and other environmental factors in carp ponds

Original and applied contributions:

- In a three-year experiment conducted in seven ponds, three of which were fertilized with manure and the others designated as controls, it was found that relationships between biotic factors, their influence on primary production, and the effect of fertilization can contribute to increased carp pond production and to improving ıure existing management practices for better water quality in fish farming. **(Г7.6.)**.
- In a new analysis of the results for the abovementioned fish farms **(Г7.6)**, guidance is given to improve existing practices for better production management on fish farms **(Г7.7.)**.
- A three-year experiment (2004-2006) in carp fertilized and control ponds **(Г7.6.)**, there were found elevated levels of oxygenation, phosphate phosphorus, and pH in fertilized ponds in the final year **(Г7.8.)**.

4. Applying statistical methods to data analysis in other studies:

Original and applied contributions:

- Data on the distribution and ecology of 17 species of the family Taeniopterygidae (Insecta: Plecoptera) in Bulgaria are summarized: one is regionally extinct (RE) from the country, 9 - critically endangered (CR), 3 - endangered (EN) and one is vulnerable (VU). **(Г7.11.)**.
- One of the first studies was conducted on the relationship between radial growth index (RWI) of trees and tree characteristics. Applying knowledge on tree growth strategy can be important for selecting appropriate tree species and increasing forest income **(Г7.5.)**.
- In an investigation of the effects of the herbicides paraquat (PQ) and glyphosate (G) on the germination and early development of standard test plants, watercress (*Lepidium sativum* L.) and radish (*Raphanus sativus* var. *radiculata* L.), the applied complementary ISSR profiling technology was found to be a suitable tool to identify both G- and PQ-induced mutations. **(Г7.12.)**.

The total number of contributions submitted is 28, of which 24 are original (15 of them are also of an applied nature) and 4 are confirmatory. This proves the significance and uniqueness of the obtained scientific results. Also noteworthy is the relevance of the topics on which the candidate works, namely the impact of climate change and invasive species on the

functioning of freshwater ecosystems. I accept the statement of scientific contributions formulated by the candidate.

The following can be mentioned as the most significant scientific achievements:

- contributions related to the study of wetlands in the Danube floodplain terrace and the Danube River - mainly of an original character due to the unstudied parameters of the sites so far;
- contributions related to the study of the influence of the invasive zebra mussel on freshwater ecosystems - the practical relevance of the results obtained is of great importance for clarifying the nature of the relationships between different groups of organisms and the factors that influence them;
- contributions of an applied nature in the field of fish farming - the significance of the research is of a practical nature, which is related to the optimization of conditions in fish farms;
- contributions related to the determination of the taxonomic composition, distribution, pathways of introduction, prevention and management of invasive alien species - the summarised information from the conferences held on the subject outlines the main problems and possible strategies for dealing with invasive species worldwide;
- contributions related to the application of statistical methods in the analysis of data from other studies - the feasibility and effectiveness of using given statistical methods in the processing of results obtained is demonstrated;
- contributions related to the optimisation of methodologies in research - for example, for higher chlorophyll-a yields.

Dr. Kalcheva was a guest editor of a journal issue or as an editor of a Book of Abstracts. She has improved her qualifications and developed her competences and skills by participating in a number of courses and seminars held in the country and abroad. The acquired knowledge of working with specialized computer programs as well as additional scientific knowledge make her a desirable partner to work with researchers from other institutions and organizations, both nationally and internationally. The importance of her scientific production is confirmed by a total of 81 citations in SCOPUS and an h-index of 6 for the entire research period.

Dr. Kalcheva has participated in 14 projects, most of them international. This demonstrates her recognition as a world-class scientist and expert, as well as a preferred and respected member of working teams. My recommendation in this regard is that she should also work towards being a project manager, and based on the experience she has, she would be a

successful one. I would also recommend that the candidate should make an effort in training young staff, either as a graduate or as a lecturer in higher education institutions. In this way she will be able to implement her knowledge and skills in the training process of young professionals.

The profile of the research work of the candidate fully corresponds to the professional field of the competition 4.3. "Biological Sciences", scientific specialty "Hydrobiology". The scientific production presented by Dr Kalcheva proves her competence in the field of structure and function of freshwater ecosystems and in particular covers the area of the research group 'Invasive alien species'.

In conclusion,

The present candidature fulfils and even exceeds the mandatory conditions and scientific criteria for the academic position of Associate Professor. In view of the above opinion on the professional scientific research activity of the candidate, I will vote positively and accordingly recommend to the Honourable Members of the Scientific Jury appointed by the Order of the Director of IBER-BAS № 45/20.06.2024, to propose Dr. HRISTINA VASILEVA KALCHEVA to be elected for the academic position of Associate Professor in the scientific specialty "Hydrobiology", professional field 4.3. "Biological Sciences", for the needs of the research group "Invasive Alien Species", section "Biodiversity and Functioning of Freshwater Ecosystems" at the Department "Aquatic Ecosystems" of IBER-BAS.

19.08.2024 Assoc. Prof. Silvena Boteva