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REVIEW

by Dr. Mihaela Bogomilova Beshkova - associate professor at Institute of Biodiversity and Ecosystem Research – Bulgarian Academy of Sciences on materials submitted for participation in a competition for the occupation of the academic position "Professor" in Professional direction 4.3. Biological Sciences, Scientific specialty "Hydrobiology" for the needs of the Research Group "Bioindicators, monitoring and ecological classification of freshwater ecosystems", Division "Biodiversity and functioning of freshwater ecosystems", Department "Aquatic Ecosystems" of IBER - BAS

By Order No. 41/27.05.2024 of the Director of IBER, BAS, I have been appointed as a member of the scientific jury of a competition for the academic position "Professor" in the field of Higher Education 4. Natural Sciences, Mathematics and Computer Science; Professional direction 4.3. Biological Sciences; Scientific specialty „Hydrobiology “, announced for the needs of the Division „Biodiversity and Functioning of Freshwater Ecosystems “, Department „Aquatic Ecosystems “, IBER - BAS.

In the competition for the academic position "Professor" in the specialty "Hydrobiology", announced in issue No. 27 of the State Gazette of 29.03.2024, for the needs of the Division „Biodiversity and Functioning of Freshwater Ecosystems “ of Department „Aquatic Ecosystems “ , a single candidate participates - Assoc. Prof. Dr. Emilia Dobrinova Varadinova – researcher in the same unit.

1. Brief biographical data and career development of the candidate

Emilia Dobrinova Varadinova was born on 21.08.1967 in Blagoevgrad. In 1991 she graduated from the Faculty of Biology of Sofia University "St. Kl. Ohridski" specialty "Biochemistry and Microbiology" with a master's degree, acquiring the qualification of a biochemist-microbiologist with a specialization in virology.

From 1994 to 1996 she was an ecologist-biologist at the Department of Environmental Genetics and Conservation of Natural Ecosystems of the Institute of Ecology. From 1996 to 2000

she held the position of ecologist-biologist at the Central Laboratory of General Ecology, Bulgarian Academy of Sciences, at the sections "Biological Monitoring" and "Bioindication and Environmental Risk", "Bioindication and Environmental Assessments", where she carried out research, experimental, laboratory and technical activities. From 2000 to 2010 she held the position of Research Associate III-I degree at the Biodiversity of Parasites and Ecology of Parasitic Communities, Department of Biodiversity at the Central Laboratory of General Ecology, BAS, and in the period 2003 - 2006 she was a PhD student at the Department of Biodiversity of the Central Laboratory of General Ecology, BAS. In 2006 he successfully defended her dissertation on "Composition, dynamics and indicator potential of the functional trophic groups of zoobenthos in the Mesta valley", and in 2007 she acquired the educational and scientific degree of Doctor of Science in the scientific specialty 01.06.11. Hydrobiology. From 2010 to 2014 she was Chief Assistant at the Department of Ichthyology and Fish Resources, Department of Aquatic Ecosystems at the IBER-BAS, and from 2014 to 2015 she was an Associate Professor at the same department. Since 2015, in addition to being an associate professor at IBER, Dr. Varadinova has held the position of Associate Professor at the Faculty of Natural Sciences and Mathematics of the South-West University "Neofit Rilski", Blagoevgrad, Department of Geography, Ecology and Environmental Protection, where she is engaged in intensive teaching activities in bachelor's and master's programs in the specialties "Ecology and Environmental Protection", "Geography and Regional Development", "Chemistry and Ecology" and "Eco PR". Other than as a teacher (titular of study disciplines) at the South-West University "N. Rilski", she is a part-time lecturer at the Plovdiv University "P. Hilendarski". She was also a guest lecturer at the University of Forestry.

Assoc. Prof. Varadinova has 33 years of work experience in the specialty, and her research activity is thematically related to the announced competition.

2. Compliance of the received materials with the requirements of LDASRB and the criteria for IBER for occupying the academic position of Professor.

The presented by Assoc. Prof. Varadinova a set of paper and electronic materials includes the following documents: 1) an announcement in the State Gazette; 2) a curriculum vitae according to the European standard; 3) a copy of a master's degree diploma; 4) a copy of a diploma for the educational and scientific degree of "Doctor"; 5) a copy of a diploma for "Associate professor"; 6) certificate of experience in the specialty; 7) a reference for the applicant's compliance with the

minimum state requirements, the requirements of the Bulgarian Academy of Sciences and the criteria of the Supervisory Board of IBER-BAS (Art. 3 of these Regulations); 8) a list of publications; (9) a list of projects; 10) a list of scientific and applied developments; (11) a list of citations; 12) a reference for scientific contributions; 13) a certificate of successfully defended doctoral students; 14) a reference for teaching activity; 15) other activities; 16) copies of scientific papers; 17) evidences.

The candidate Assoc. Prof. Dr. Emilia Varadinova has applied a total of 93 scientific papers, of which 54 are related to the dissertation and habilitation for associate professor. Outside the works on the dissertation and habilitation, Assoc. Varadinova presents a total of 38 scientific papers, with 31 scientific publications published in journals referenced in Scopus, of which 20 are with an impact factor and 6 book chapters. Assoc. Prof. Varadinova is a leading author in a total of 25 of the presented scientific papers (document No. 8. LIST of PUBLICATIONS).

The documents for the competition are presented correctly and in accordance with the requirements of the LDASRB and meet the criteria of IBER for occupying the academic position of "Professor".

With regard to the number of points on the main indicators (A, B, D, E and E) according to the minimum national requirements, which is 640 p, the applicant submits 1334 p, i.e. twice the required minimum. Additional requirements of IBER-BAS have also been significantly exceeded, according to Art. 5 of the Regulations on the terms and conditions for acquiring scientific degrees and for occupying the academic position of "Professor", as the candidate has two successfully defended PhD students (one according to the requirements), 31 scientific publications in international journals referenced in SCOPUS outside the habilitation (according to the additional requirements 10), management of 2 projects with external funding for the Bulgarian Academy of Sciences, team leader of 1 project, manager of a work package of 3 projects, with a minimum of one project required (document No. 7. Reference for compliance with minimum requirements).

3. Main scientific areas in the candidate's research work and most important scientific contributions

The main scientific and scientifically applied contributions are summarized in the following directions and areas of research:

I. Biodiversity of macrozoobenthos in surface continental waters

II. Bioindication and assessment of the ecological status

III. Methodology of biological water monitoring

IV. Protection of biodiversity and the ecological status of water bodies and wetlands

Important scientific and applied scientific results:

I. Biodiversity of macrozoobenthos in surface continental waters

- The taxonomic composition and structure of macrozoobenthos in different types of lotic and lentic water bodies on the territory of Bulgaria is investigated in connection with leading factors of the aquatic environment, including under the influence of different types of water pollution (Nos. 69, 74, 78, 79, 81, 84).
- A significant personal contribution has been made to a deeper study of the Trichoptera fauna (order Trichoptera), class Turbellaria, subclass Hirudinea, the orders Coleoptera, Odonata, Hemiptera, Megaloptera and Diptera (excluding the family Chironomidae), subclass Oligochaeta and the orders Ephemeroptera and Plecoptera up to genus/family level.
- The species composition of aquatic invertebrates in representative for all types of lentic and lotic water bodies on the territory of the country was studied (139 river and 79 lake points (E16.1))
- The species-environmental factor interactions in both unaffected ecosystems (Nos. 78, 81) and those influenced to varying degrees by human activity have been studied, and the processes of redistribution in the ratio of the main taxonomic groups (No. 84) under the influence of anthropogenic pressure have been traced.
- The processes of restoration of freshwater biodiversity in Europe are traced (No. 82) by accumulating arrays of data for the Mesta River, as well as for other Bulgarian and European rivers that flow on the territory of 22 countries, for which long-term changes in the bottom invertebrate fauna have been traced.
- A comparative analysis of the functional groups of macrozoobenthos in defined type-specific water bodies in different ecoregions and catchments (Nos. 57, 76) has been made and the key role of altitude, shading and anthropogenic impact for the formation of the trophic structure of the bottom invertebrates has been established.

II. Bioindication and assessment of the ecological status

- The bioindicative potential of macrozoobenthos as a key biological quality element in lotic (Nos. 55, 61, 63, 67, 74, 84) and lentic (Nos. 58, 62, 66, 81) ecosystems was evaluated, and the transformation of the bottom communities and the trophic structure of macrozoobenthos under the influence of human activity was traced (Nos. 57, 60, 64, 76).
- The ecological status of 11 lakes and 39 dams belonging to 15 types of standing water bodies in Bulgaria (No. 64), as well as 40 reference points located on 35 rivers in the Aegean and Black Sea catchments (No. 60) has been determined.
- In connection with the presentation of measures for the restoration and long-term conservation of Atanasovsko Lake, a special development is dedicated to the six-year monitoring and the implementation of an integrated assessment of the ecological status of the coastal lagoon. When determining the ecological status, a site-specific approach was adopted, in which, depending on the salinity of the water in the studied points, relevant metrics were applied for the assessment of fresh and salty/ hypersaline waters (No. 58).
- By applying a biotic index based on macrozoobenthos, the ES has assessed of Vladayska, Boyanska, Vitoshka Bistritsa and Yanchovska Rivers, which flow on the territory of the reserves Bistrishko Branishte and Torfeno Branishte, located in the Vitosha Nature Park (No. 63).
- Assessment of the anthropogenic impact on the waters of the transboundary Strumeshnica River (the largest tributary of the Struma River) (No. 67), in whose watershed areas with special protection status (areas with water intended for drinking and domestic purposes, nitrate-vulnerable areas, Natura 2000 protected areas) are identified.
- Another Bulgarian river - Batova, whose catchment area also falls within a protected area, has been studied from a physicochemical and biological (benthological) point of view (No 60, 61).
- On the basis of model lotic ecosystems, the correctness/accuracy of the assessment of the ecological status of lotic water bodies has been analyzed and recommendations have been proposed related to the need to increase the frequency and number of points in the studied lotic water bodies (E14.15).
- For the first time, the effect of the activities of the coal-fired thermal power plants "Republika" and "Bobov Dol" in Bulgaria and the impact of wastewater discharge on the

ecological status of the Razmetanitsa River (Struma River catchment) and Sokolitsa River (Maritsa River catchment area) were assessed.

- The influence of seasonality on the assessment of the ecological status by macrozoobenthos in 12 representative standing water bodies (No. 66) and 9 river points located in the upper, middle and lower reaches of the rivers Mesta, Tundzha and Vit has been studied.
- The applicability of trophic indices (RETI/PETI, ITC) in assessing the ecological status of lentic and lotic surface waters (Nos. 57, 60, 64, 76) has been analyzed.
- For the validation of the typology and classification system in Bulgaria, the ecological status of 218 monitoring points, which belong to 175 lotic and lentic surface water bodies (E16.1), has been determined.
- A biological classification of surface water bodies of the categories "River", "Lake" and "Transitional waters" in Bulgaria has been made, as well as an assessment of the ecological status of all studied water bodies for a five-year period (E14.12). The results are summarized and included in the new RBMPs (2022-2027) of the Danube, Black Sea, East Aegean and West Aegean Basin Directorates.
- Based on data accumulated in the period 2016-2020, a comparative analysis and parallel assessment of the ecological status of 367 river points (15 river types) located on different rivers in Bulgaria, under two key biological quality elements macrophytes and macrozoobenthos (No. 84) was carried out.
- A comparison of the classification systems for assessing the ecological state of surface waters between Bulgaria and Ireland as well as between Bulgaria (Maritsa River) and South Korea (Han River) based on macrozoobenthos quality element is carried out.
- The degree of similarity of the species composition of earthworms in uranium mine-affected territories in Bulgaria has been determined, and their bioindicative potential has been evaluated (No. 73).

III. Methodology of biological water monitoring

- A new methodology/multimetric and type-specific scales for assessing the ecological status of different types of surfaces standing waters through a biological quality element "macrozoobenthos" have been proposed and approved. The assessment scales are

published in the latest amendment to Ordinance H-4/2012 on the characterization of surface waters (SG, 67/04.08.2023) (E14.12).

- Participation in the development of a methodological framework for assessment and mapping of the state of ecosystems and ecosystem services in inland wetlands (Nos. 86, 87, 88, 89) and marine ecosystems in Bulgaria (Nos. 90, 91) (E14.2).

IV. Protection of biodiversity and the ecological status of water bodies and wetlands

The accumulation of theoretical knowledge and practical skills has been realized in participation as an expert in freshwater ecosystems in project developments dedicated to:

- Analysis of habitat diversity in the Danube wetlands of Hungary and Bulgaria, in order to study biodiversity, biological invasions, services, functioning and management of aquatic ecosystems (E14.5);
- Biological and ecological study of the freshwater ecosystems ecological state in target lakes in order to develop a methodology for limiting and maintaining eutrophication levels in them, as well as conducting a monitoring (E14.11);
- Updating and supplementing the text of the draft Biodiversity Strategy in the Republic of Bulgaria, in accordance with the current regulatory and strategic objectives and documents, with reference to the conservation and restoration of biodiversity at national, EU and international level (E14.10).
- Developments of national importance such as the Management Plan for Pirin National Park and the reserves of Bistrishko Branishte, Torfeno Branishte, Bogdan and School Forest. The environmental assessments of the River Basin Management Plans of the Danube, Black Sea, East Aegean and West Aegean regions for the period 2016-2021 have been developed.

4. Evidence for the significance of research conducted

The candidate has submitted a significant number of citations (261) in document No. 11 „L ist of citations “, of which 189 are in the current competition for professor. Of these, 116 are in journals with impact factor. 147 citations are included in indicator D "Citations in scientific journals, monographs, collective volumes and patents, refereed and indexed in world-famous

databases with scientific information (WoS and Scopus) ". These data are indisputable evidence of the relevance and significance of the conducted by Dr. Varadinova Scientific Research.

5. Most significant scientifically applied achievements

Of great importance are scientific and applied developments of Assoc. Prof. Varadinova to the National Environmental Monitoring System (NEMS) at the Executive Environment Agency (EEA) and in particular hydrobiological monitoring by the biological quality element macrozoobenthos. Special attention should be paid to the significant personal contribution of Assoc. Prof. Varadinova in the development, improvement and validation of the methodology for assessment of the ecological status of surface lotic and lentic waters by a key quality element macrozoobenthos, enshrined in the National Classification System for Assessment of the Ecological Status of Waters and the Bulgarian legislation (Ordinance H-4/2012, promulgated, State Gazette, issue 22 of 5.03.2013, in force from 5.03.2013, last amended and supplemented, Pc. 67 of 4.08.2023, in force from 4.08.2023 (folder EVIDENCE, file ORDINANCE H-4).

6. Demonstrated research management skills and abilities

Associate Professor Varadinova has held a leading position in a total of 6 national scientific/applied scientific projects with external funding for the Bulgarian Academy of Sciences : a work package manager and site coordinator in 3 scientific projects, a project manager in 2 scientific and applied projects, a team leader in one applied scientific project.

The applicant participates in 5 international scientific/applied projects and in 15 national scientific, applied or educational projects funded by the Ministry of Environment and Water, OPE, Financial Mechanism of the European Economic Area, etc. where she participates as an expert by waters, an expert by macrozoobenthos, a team/group leader and a site coordinator (Reference 9. LIST PROJECTS).

7**. Research profile**

Associate Professor Varadinova has a clearly defined scientific research profile, which fully corresponds to the announced competition. She is a prominent hydrobiologist and specialist in macrozoobenthos with indisputable authority in the Bulgarian and international scientific community. This is evidenced by the significant volume of published scientific results concerning the taxonomy, ecology, biodiversity of macrozoobenthos communities and their bioindicator

potential in various type-specific aquatic habitats, both within Bulgaria and in other European countries and even other continents, as well as by her expert activity - as an expert on water quality and assessment of the ecological status of lotic water bodies to management plans (MP of Pirin National Park for period 2014-2023), head of the team for the preparation of the Environmental Assessment of the RBMPs (2016-2021) of the West Aegean, East Aegean, Black Sea region and Danube regions, expert hydrobiologist at the Management Plans of the „Bistrishko Branishte“, „Torfeno Branishte“, „Bogdan“, „School Forest“ Nature Parks, hydrobiologist expert for the preparation of an opinion on the competence of the proposed scope and content of the EIA for the investment proposal "Improvement of the route of Lot 3.2 of Struma Motorway, etc. (folder EVIDENCES).

8. Role of the candidate for the training of young scientists

Associate Professor Varadinova is the scientific supervisor of two successfully defended full-time PhD students: In 2015, a full-time PhD student at IBER Maria Kerakova with a dissertation topic: "Trophic structure of macrozoobenthos in native and influenced lotic ecosystems" and in 2024 a full-time PhD student at „Neofit Rilski“ SWU Jiyoung Park with a dissertation topic: "Ecological status of model lotic ecosystems from South Korea and Bulgaria".

Associate Professor Varadinova has developed her own electronic lecture courses and in the period 2015-2024 she is actively engaged in teaching bachelor's and master's students from the South-West University "N. Rilski" Blagoevgrad and the University of Plovdiv "P. Hilendarski" in the academic disciplines "Water Pollution and Impact on Ecosystems", "Water Resources Management", "Methods for Analysis and Assessment of the State of Water", "Environmental Monitoring", "Air Pollution and Impact on Ecosystems", "Air and Water Pollution", "Environmental Requirements and Norms", "Environmental Protection Management", "EIA", "Environmental Assessments", "Management of Environmental Projects" and "Environmental Programs" (Document No. 14.).

9. Personal impressions about the candidate

My personal impression of Assoc. Prof. Dr. Varadinova is that she is an extremely ambitious, active, hard-working and responsible person with outstanding leadership skills and significant knowledge in the field of hydrobiology, taxonomy and ecology of aquatic invertebrates.

Thanks to these qualities, as well as her correctness and ability to work in a team, Assoc. Prof. Varadinova has achieved significant results and contributions, and has established herself as one of the leading specialists in the field of aquatic ecology and macrozoobenthos communities in Bulgaria, with wide recognition abroad.

Conclusion

The candidate of the announced competition Assoc. Prof. Dr. Emilia Varadinova, in her capacity as an established scientist, hydrobiologist and benthosologist, with outstanding research and organizational qualities, exceeds the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the criteria of IBER for occupying the academic position of "Professor" in all indicators. Her scientific works have received high recognition from Bulgarian and foreign specialists and have a substantial scientific-fundamental and scientific-applied contribution. All this, as well as my personal impressions of the candidate, give me reason to vote "FOR" her candidacy and to propose with full conviction to the esteemed Scientific Jury and the members of the Scientific Council to unanimously elect Assoc. Prof. Dr. Varadinova to the academic position of "Professor" in the scientific specialty "Hydrobiology".

Date: 23.07.2024 Reviewer……

(Assoc. Prof. M. Beshkova)