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REVIEW

by Prof. Dr. Yordan Ivanov UZUNOV,

retired, former head of the "Aquatic Ecosystems" Department at IBER-BAS (2010-2018)

Regarding: The materials of **Assoc. Prof. Dr. Valentina Ruseva TODOROVA** - the only candidate in the competition for the academic position " PROFESSOR " in the professional direction 4.3. Biological Sciences; Scientific specialty "Hydrobiology"; Scientific direction "Macrozoobenthos", for the needs of the scientific department "Biology & Ecology of the Sea", announced by the Institute of Oceanology - BAS, Varna in the Official Gazette, no. 87/01.11.2022

The present review is prepared in compliance with Order No. 1/03.01.2023 of the Director of IO-BAS for the nomination of the Scientific Jury for conducting the above competition and the decisions of this NJ from its first meeting held on 11.01.2023.

The candidate has submitted a complete set of documents (copies of diplomas, lists, publications and other materials) in accordance with the national minimum requirements under Art. 2b, para. 2 and 3, respectively, to the requirements under Art. 2b, para. 5 of ZRASRB, which have been transferred to the requirements of PURPONSZAD of IO-BAS. (according to the Appendix to Art. 1a). I express the opinion that they meet and fully cover the criteria of the above requirements and the candidate Assoc. Prof. Dr. Valentina Todorova can be admitted to the evaluation procedure for the competition for the academic position of "PROFESSOR" at IO-BAN .

In accordance with the IO-BAS Rules for occupying academic positions, below these materials have been examined and evaluated as follows:

(1) General data on the candidate's career and thematic development:

In 1991, the candidate completed her higher education at the Faculty of Biology of the Sofia University, majoring in Biology with a specialization in "Hydrobiology and Water Conservation". Her graduation thesis (*Composition and distribution of the macrozoobenthos from the soft sandy*

and silty bottom of the Varna Bay) seemed to predetermine her further scientific and career development. He climbed the entire career ladder: from specialist biologist (09.1992-12.1998), through research assistant third (12.1998-05.1999), second (05.1999-03.2002) and first degree (03.2002-09.2011) to the first habilitation - associate professor (09.2011-02.2021)). All her promotions are in the scientific specialty Hydrobiology (01.06.11), later - in the scientific direction 4.3 "Biological Sciences". In 2005, she defended her doctoral thesis " *Ecological status of the zoobenthic communities from the sublittoral sediments of the shelf in the northwestern part of the Black Sea and in front of the Bulgarian coast* ". During all these years, Dr. V. Todorova worked as a research associate at IO-BAS. From 06.2012 to 02.2021, she successively held the positions of Head of the key Department "Biology and Ecology of the Sea" and Deputy Director in Science of IO-BAS. From 02.2021, she works as an associate professor in the same section on an open-ended employment contract (see reference 07). In 2006, she led a regional expert group on Black Sea biodiversity at the United Nations Office for Project Services (UNOPS) and developed the report " *Transboundary Diagnostic Analysis of the Black Sea 2007* ".

During these years, Assoc. Dr. V. Todorova developed, coordinated and led scientific teams on a number of projects with national and/or external funding; prepares scientific publications and works, presentations and posters, reporting reports on assigned projects; organizes, collects and reports the data from the monitoring of the ecological state of the sea waters, according to the IO-BAS contracts with national and European management structures and multilateral projects. She performed expert and consulting activities; participates in advisory bodies and working groups to ministries and others national and international bodies (MoES, EAES, BDCR, Black Sea Commission, etc.).

For his participation in the competition, Assoc. Dr. V. Todorova presented **68** published works, incl. **9** in referenced and indexed databases (DBs) such as Web of Science and Scopus (Indicators C.4. ZRASRB), another **18** works in referenced and indexed databases such as Web of Science and Scopus (Indicators D.7. ZRASRB) and **1** book chapter (Indicators D.8. ZRASRB), **18** publications, not referenced and indexed in the above networks, as well as **4** selected scientific and technical reports (without ISBN, ISSN). I believe that the latter, compared with reference 13 for the project activity, could have been supplemented with several more scientific and technical reports with the authorship/ participation of the candidate, which are completely within the field of her expertise and competence.

(2) Upon reviewing the documents and materials submitted in this way, the reviewer believes that **no evidence of plagiarism can be found** in the publications/papers submitted for evaluation.

(3) The main directions in the candidate's research work are:

- *The species diversity and coenological characteristics of the bottom communities (macrobenthos)* were studied, and a number of populations of local and imported bottom dwellers were studied, evaluated and mapped; with modern statistical and cartographic methods, a description and classification of the national types of benthic biotopes in front of the Bulgarian coast of the Black Sea, agreed with EUNIS, was prepared; developed and tested approach for interdisciplinary mapping of bottom habitat diversity based on a model marine protected area (Ropotamo); the population characteristics of a series of benthic species with high economic and conservation significance are derived ; along the way, groups of macro-algae communities in the lower part of the infralittoral were studied, as well as on the tapping of current synthesized data on the distribution, habitat preferences and numbers of the three species of cetaceans inhabiting the Black Sea (Publications: 8.B.1.1, 8. B.1.2, 8.B.1.4, 8.B.1.5, 8.B.1.6, 8.B.2.8, 8.B.2.13, 8.B.2.14, 8.B.2.15, 8.B. 3.1, 8.B.3.2, 8.B.3.12, 8.B.4.1, 8.B.4.2, 8.B.4.3);
- Scientific *knowledge of alien species in the Black Sea has been developed, including the introduction of new alien species* and the ecological impact of established invasive species; and the ecological impact of established invasive species; developed the scientific basis for the management of the invasive species *Rapana venosa* with potential for economic application through aquaculture; a validated list of foreign species in the Black Sea has been prepared for Bulgaria (26 foreign species) and Romania (37 species), indicating errors, omissions and uncertainties related to the inventory of foreign species from the marine waters of both countries; among them, five non-native species were established for the first time in the Black Sea or in the Bulgarian Black Sea waters; for the first time in our country, an ecosystem approach was applied in the study of alternatives for the management of the invasive species *R. venosa* with the aim of achieving good marine environmental status, good economic status and low management costs through the proposed original indicator of the impact of the alien invasive species *R. venosa* on mussel populations with a justified threshold for " good status " of the marine environment, according to the requirements of RDMS (Publications: 8.B.1.8., 8.B.2.1, 8.B.2.7, 8.B.3.16, 8.B.4.3, 8.B.4.4).
- Developments for *assessing the state of the macrozoobenthos and the ecological state of the marine environment/aquatic environment for assessing the state of the macrozoobenthos and the ecological state of the marine environment/aquatic environment* in terms of benthic habitats and the integrity of the seabed, as well as a system of indicators for the state of the macrozoobenthos as a biological quality element (BQE) of coastal marine waters under the WFD and as an element for the assessment of bottom habitats under the RDMS; the type-specific reference conditions for all benthic biotopes, characteristic of the sediments of the Bulgarian Black Sea shelf and coast, were derived, and the macrozoobenthos condition indicators were validated in relation to the derived complex index of anthropogenic pressure in the coastal waters of the Bulgarian Black Sea; the threshold values of the condition indices (species richness, Shannon diversity, AMBI species abundance and sensitivity index, and M-AMBI multiparametric index) were derived for the five classes of ecological condition according to WFD, respectively according to national standards (high, good, moderate, bad and very bad). Through spatial modeling in a GIS environment, the area/proportion of each type of bottom habitat in good/poor condition was estimated (Publications: 8.B.1.2, 8.B.1.4, 8.B.3.1, 8.B.3.2, 8.B.4.3).

- Developments of scientific *foundations for the assessment of physical disturbances from mobile bottom fishing gear* on the seabed and benthic habitats through a first-of-its-kind study in the Black Sea water area, which brings out the interrelationship between this type of anthropogenic pressure and the habitat condition of bottom habitats in the Bulgarian Black Sea shelf by means of an analysis of five-year data from the Fishing Vessel Monitoring System (VMS) using an adapted methodology of the International Council for the Exploration of the Sea (ICES). The research is a contribution to the development of methodological foundations for a science-based assessment of the physical pressure of fishing on the integrity of the seabed as a primary factor of the anthropogenic impact on benthic habitats and organisms, according to the criteria of the RDMS. (Publications: 8.B.1.3, 8.B.3.7, 8.B.4.3).
- *A systematic approach has been developed for assessing the ecosystem services of benthic habitats* in European seas in support of marine spatial planning and management. Information on 56 types of European biotopes on the seabed, classified according to EUNIS, and the related (ecosystem) goods and services, sensitivity issues and conservation status, the latter referring to management and protection tools currently applied to these biotopes at European or international level, as proposed by the adapted MEA categories (Millennium Ecosystem Assessment). The relative value of seabed biotopes is a starting point for ecosystem-based marine spatial management and redistribution of human activities to ensure optimized use and maintenance of ecosystems in high quality (Publication: 8.B.1.9).
- Contribution to *the development of a science-based strategy for the conservation of marine protected areas* in ecologically connected networks, based on complex knowledge of physical oceanographic connectivity, propagule dispersal, community/species beta-diversity and genetic connectivity of multiple species having different lives cycles. The construction of a well-connected network/system of such marine areas is protected through the applied holistic conservation approach, a group of benthic organisms has been selected as model objects for approbation of the approach. An analysis of the available legal instruments was carried out, 4 challenges were outlined and recommendations were made to overcome the fragmented approach to be replaced by a holistic, integrated and ecosystem-based cross-sectoral approach to the conservation and management of marine ecosystems and the related goods and services in the coastal marine environment (Publications: 8.B.2.4, 8.B.2.5, 8.B.2.9, 8.B.2.16, 8.B.2.20).
- *Numerous methodical contributions* have been developed, which in most cases are the result of her research activities on various scientific or applied projects, which she organizes, leads and/or participates as an expert-executor.

Special mention should be made of her leadership, authorship and editorial work for the development of the " *Black Sea Monitoring and Assessment Guide* ", which represents the first regional recommendation for the introduction of a harmonized methodological framework for monitoring and assessment of the ecological state of the Black Sea in terms of biodiversity of pelagic and benthic habitats and a range of other features of the marine environment and anthropogenic pressures and impacts. The guide has been developed in accordance with the European regulatory requirements defined in the RDMS and the latest criteria and methodological standards of Decision (EU) 2017/848 of the EC (publication: 8.B.3.4, ANEMONE project).

A general framework and guide for monitoring and evaluation of spatially managed areas has also been developed, and the available tools are described with links to them. The framework has been tested in nine sea areas of 13 European countries, including the

Bulgarian Black Sea sector. In addition to evaluating the effectiveness and adaptation of existing plans, the common framework creates a logical and coherent algorithm for developing new ecosystem-based marine spatial plans (Publication 8.B.2.6, MESMA project).

Other different methodological aspects are also contained in the scientific contributions discussed above.

Most of the scientific contributions brought out so far are without a doubt original in nature, such as e.g. first data on the discovery of new species in the marine communities, in particular the macrozoobenthos; derived and tested new criteria, data and correlations for assessing the state of the marine environment and its biodiversity; developed methodological guidelines and algorithms for management and evaluation of protected marine areas, etc. All this gives grounds to the reviewer to accept the developed reference with the candidate's scientific, methodical and applied contributions formulated in this way as correct and objective.

(4) *The significance of the obtained results* in the research activity of Assoc. Dr. V. Todorova is unequivocally proven by the considerable number of her publications in refereed and indexed scientific publications on the world wide web (19), as well as by the found citations (over 330) of publications published after the year 2000. The large number of citations (82!) of one key title (under index 8.B.1.9, CoCoNET project), as well as two other titles, with 42 and 34 found citations, is particularly impressive.

In recognition of the level of her scientific research activity, competence and expertise is the participation/ membership of the candidate in various institutional bodies and structures such as: the National Council for Biological Diversity, the Advisory and Coordination Council for Environmental Protection in the Sea Waters of the Black Sea sea, the Advisory Council on Marine Spatial Planning to the MRRD, as well as in international expert groups such as the Technical Group on Benthic Habitats and Integrity of the Seabed under RDMS (TG SEABED) to the EC, the Advisory Group on the Convention on biological diversity to the Commission for the Protection of the Black Sea from Pollution, the Geographical Intercalibration Group (GIG) "Black Sea" under the WFD. For scientific achievements in the project "*Studies of the state of the marine environment and improvement of the monitoring programs developed according to the RDMS* " (ISMEIMP) is the winner of the collective award " Varna " of the Municipality of Varna for 2018.

(5) The most significant *scientific and applied achievements*, outlining their social significance;

Due to Dr. V. Todorova's targeted focus on issues of managing biological diversity, ecological status and the quality of the marine environment, the majority of her studies and results have immediate practical applicability for the purposes of strategic planning, direct and/or remote monitoring, for the methodology of the ecological classification of the state of marine water bodies (coastal and offshore), in the implementation of the Water Framework Directive 2000/60/EEC and the Marine Strategy Framework Directive 2006/56/EEC, etc.

The applied aspects of her works are read or clearly stated in a number of publications (scientific articles and reports, scientific and technical reports on projects, other publications) and outline several directions of applicability of the achieved results. The main applied contributions of the candidate are related to the implementation of EU directives in the field of typology, classification, management, protection, monitoring of the species and habitat diversity of the Black Sea coastal zone and shelf. As a result, under the leadership of Dr. V. Todorova, the following more significant applied results were achieved:

- a fourfold expansion of the marine Natura 2000 special zones of protection was achieved (confirmed by Decision No. 660/01.03.2013 of the Council of Ministers); developed motivated proposals and documentation under Art. 8, para. 1 of the Biodiversity Law for the expansion of 6 zones and the announcement of 3 new zones of the ecological network Natura 2000 in the Black Sea in front of the Bulgarian coast;
- the intercalibration procedure according to BQEs "phytoplankton" and "macrophytobenthos" has been fully completed, and the classification systems for assessing the state of BQE "marine macrozoobenthos" have been normatively approved by Regulation H-4/2013 for the characterization of surface waters and are applied to assess the ecological status of the coastal waters, according to the requirements of the WFD;
- improved monitoring programs of the marine environment have been developed, according to the separate descriptors of the RDMS, and representative monitoring networks have been determined, enshrined in the Maritime Strategy of the Republic of Bulgaria (adopted by Decision No. 1111/ 29.12.2016 of the Council of Ministers);
- the "good condition" content of the bottom habitats was defined according to the criteria of the RDMS by determining threshold values of a set of indicators for the ecological quality of the macrozoobenthos communities and of spatial thresholds for area and proportion, and was expressed in quantitative parameters;
- the most significant types of pressure on the seabed have been assessed - physical loss from the coastal infrastructure and physical disturbances from fishing activity, as well as the state of the broad types of benthic habitats; prepared a generalized spatial assessment for six marine areas - five coastal and shelf.

(6) Demonstrated skills or aptitude for *leading scientific research (project management, attracted external funding, etc.)*;

Without a doubt, the candidate possesses excellent research and organizational skills and abilities to lead working /teams, which she acquired during her scientific and managerial career at IO-BAS. After the first habilitation (2011), she participated and managed numerous projects (references 13, 13y from SONIX), financed both by national sources (MOES/ PUDOOS/ BDCHR-Varna) and by foreign/ European funds (7th FPRD/EC, ENI CBC Joint Operational Program BLACK SEA BASIN, IUCN, etc.). For the current competition, the candidate presents only a part of the rich list of completed and/or managed projects. As can be seen from the attached references, after 2011 Dr. Todorova participated in the development of **14** national scientific projects (head of **2** of them) and had **2** personal participations in such projects. There are no fewer international projects with the participation of the candidate - **15** scientific projects (in **3 of which** she was the head of the team from IO-BAS) and one personal participation as an expert. In all of them, she was an active person, an organizer and executor of specific tasks, a motivator of the working teams.

It is noteworthy that in most cases, through these projects, the integration of the section and the institute in ERA (European Research Area) and the methodological requirements of European regulations, such as WFD 2000/60/EU, FDMS 2006/56/EU, Habitat Directive 92/43/EEC and other environmental/ marine environment management tools, in particular, are being implemented of our Black Sea biodiversity. As well as vice versa, the data, results, summaries and reports/ publications produced by Dr. Todorova and her working groups become the property of ERA and the Bulgarian maritime expertise acquires another added value.

The fact that the projects managed by her have provided the section and the institute with additional funding in the amount of almost BGN 2 million cannot be ignored! (BGN 1,933,257, reference 13x). Only through one of the projects (ISMEIMP) was purchased field and laboratory equipment and apparatus for the research needs of BEM/IO in the amount of BGN 380,000!

(7) A motivated answer to the question *to what extent the candidate has a clearly defined profile* of research work;

Thus, Assoc. Prof. Dr. V. Todorova presents herself at this competition with a clearly defined profile of her scientific-research, scientific-applied and scientific-organizational work as a prominent and recognized in our country and abroad a researcher of species and habitat diversity of benthic communities and ecosystems and the ecology of the Black Sea, as a connoisseur of native and introduced species and the routes of their invasion; as an expert in the implementation of the relevant EU directives such as RDV 2000/60/EEC, RDMS 2006/56/EEC, the Habitats Directive 92/43/EC and the development of criteria, indicators and metrics for typology, evaluation and the monitoring of the ecological state of coastal and marine water bodies, with outlined and original scientific-

research, methodological and scientific-applied contributions, which it develops and improves with additional training, assimilation and implementation of the most modern approaches and methods of work in the field of marine ecology and the management of biodiversity and the ecological state of the waters in the Black Sea.

(8) The candidate's role in *the training of young scientific personnel* is only limited to the guidance of a full-time PhD student (Media Riza Gumus) with a dissertation topic "*Biology, ecology and economic importance of the bivalve species Donax truncatula in the Black Sea in front of the Bulgarian coast*", registered with the right of protection in Oct 2022.

There is no data on training and/or management of graduates, as well as on delivered lecture courses in higher education institutions in the city and/or the country.

(9) **A conclusion** recommending unequivocally the selection or not of the respective candidate:

The materials thus presented (publications, references, copies of documents, etc.), as well as my personal impressions of the (episodic) joint work on some projects, create in the reviewer the categorical conviction that the candidate Assoc. Ph.D. V. Todorova fully meets the requirements and criteria for occupying the academic position "PROFESSOR" in Hydrobiology at the Institute of Oceanology of the BAS. Even just the fact that the points collected by her according to the modern evaluation system (2005 points) exceed THREE TIMES! the minimum national requirements (640 points) in accordance with Art. 2b, para. 2 and 3, respectively, to the requirements under Art. 2b, para. 5 of ZRASRB, to which the requirements of PURPONSZAD in IO-BAS are also applicable.

On the basis of the above, I propose that the Scientific Jury (NJ) recommend to the Scientific Council of IO-BAS to elect Assoc. Prof. Dr. Valentina Ruseva TODOROVA as a "PROFESSOR" in Hydrobiology for the needs of the Department "Marine Biology & Ecology" at IO-BAS.

Sofia, February 26, 2023

REVIEWER:

Prof. Dr. Yordan UZUNOV

