

REVIEW

From: Assoc. Prof. Dr. Ventzislav Kostadinov Karamfilov, IBER-BAS

Member of the scientific jury, determined by order No. 1 of 03.01.2023 of the director of the Institute of Oceanology-BAS for conducting a competition for the academic position of "professor" in the Higher Education Field: code 4. "Natural Sciences, Mathematics and Informatics"; Professional direction: cipher 4.3. "Biological Sciences"; Scientific specialty: "Hydrobiology"; Scientific direction: " Macrozoobenthos " at IO "Fr. Nansen" - BAS, city of Varna, announced in SG No. 87/01.11.2022

Candidate: Assoc. Prof. Dr. Valentina Ruseva Todorova

1. General data on the candidate's career and thematic development

Assoc. Prof. Dr. Valentina Todorova graduated from the Faculty of Biology of Sofia University "St. Kliment Ohridski" in 1992. with a master's degree in biology with a specialization in hydrobiology and water conservation.

Her career development took place at the Institute of Oceanology- BAS. In the period 1992-1998, he held the position of specialist biologist with main directions: participation in marine expedition activity, sampling , analysis of macrozoobenthos and data leading to publication activity. From 1999 to 2005, he worked on and defended his doctoral degree in the specialty "Hydrobiology" with a main focus in the areas of: Biological Oceanography; Diversity, biology and ecology of benthic invertebrate fauna and benthic habitats in the Black Sea, as well as Biological indicators and systems for assessing the state of the marine environment. In the period 1998-2011, he gradually held the positions of research assistant III-I degree, expanding his activities with participation in development, implementation and reporting of scientific research projects and training of students. In 2006 is the head of a regional expert group on biodiversity of the Black Sea at the United Nations Office for Project Services (UNOPS) with the main goal of developing a report "Transboundary Diagnostic Analysis of the Black Sea 2007". Since 2011 holds the academic position of "associate professor" as a result of a competition held, information about which is also provided in the materials of this procedure. In the period 2012 – 2017, he was the head of the "Biology and Ecology of the Sea" section - IO-BAS, organizing, leading and controlling the implementation of the scientific research activities of the section. From 2017 to 2021, he holds the position of Deputy Director of Research Activities of the IO with a commitment to assist the Director in carrying out the planning, management, organization and reporting of research and implementation activities, along with ongoing commitments to leadership and participation in the development and implementation of research projects .

I know the candidate from our professional contacts and am familiar with the scientific output. At the time of submission of the documents for the competition, the candidate held the position of "associate professor" at the "Biology and Ecology of the Sea" Section at IO-BAS.

2. Presented materials for the competition

The candidate has submitted a total of 90 titles, of which 39 are related to participation in a previous habilitation as "docent" (35) and as part of a procedure for acquiring a scientific and educational degree "doctor" (4).

51 papers published after a previous habilitation are submitted for participation in the current competition. Of these, visible in the Scopus and/or WoS databases are 32 titles, which, together with their citations, give the candidate an h-index of 12. For assessment in the reference for compliance with the minimum requirements of the IO-BAS, 28 titles are indicated, distributed by groups of indicators from the candidate as follows: C4- 9 nos. (148 titles); D- 19 publications (346 titles), with distribution: in edition with quartile Q1 - 10 titles, Q2 -3 titles, Q3 -3 titles, Q4 -7 titles, referenced in Scopus and/or WoS databases - 5 titles. Group A adds 50 points to the score, and from group D - 674 points achieved by 337 citations in scientific publications, referenced and indexed in the scientific information databases of Web of Science and Scopus. All citations are correctly reflected excluding self-citations by all authors. Group E adds 787 points achieved through participation in 3 national, 9 international scientific projects, leadership of 2 national and the Bulgarian team in 3 international scientific projects, as well as a significant number of points (387) from attracted funds for projects led by the candidate, or total from all groups 2005 points. Apart from the reference for compliance with the minimum national and IO-BAS requirements, 18 unreferenced titles are presented, but still visible by their ISSN, ISBN or DOI numbers, as well as 4 scientific and technical reports commissioned by national institutions. Title 8.B.2.18. from "List of Publications" is listed as refereed in a non-quartile journal (Journal of Environmental Protection and Ecology). Reference in the Scimago system Journal Rank (SJR) indicates that for the year of publication 2010 the journal has been awarded Q3, which changes Q3 to 4 titles, and adds 5 points to the applicant's G7 group score. On the other hand, titles 8.B.1.2. and 8.B.1.3. are indicated as publications in journals with Q4, but should be accepted as refereed (with SJR), which reduces a total of 4 points from group B4, reff. the candidate's self-assessment table. In practice, this does not change compliance with the minimum requirements for the IO-BAS indicators and leads to an increase in the candidate's final score by 1 point. I attribute these minimal deviations to the typical difficulties faced by colleagues in self-assessments of scientific activity across the two main databases.

From the provided reference for achieved metrics, according to the ZRSSRB and the Regulations for the academic development on IO-BAN, is seen that the minimum requirements for

holding the position of "professor", according to the higher than the national criteria of the Regulations for acquisition of scientific degrees on academic positions in IO- BAS are significantly above the minimum limits. The minimum points by categories A, B, G, D and E for the relevant position is 640 points, and the total points on candidate is 2006 (after the above corrections), which is more than 3 times above the minimum.

3. General areas in research work on candidate and most important scientific contributions

The provided titles and their content are in line with the declared mission of IO-BAS to carry out fundamental and applied scientific research in the field of oceanology in accordance with national priorities and world trends, as well as with the emphases of IO-BAS activities aimed at developing a strategy for sustainable development and management of the Black Sea ecosystem, harmonized with regional and European legislation, applying an ecosystem approach. As an institution of national value, IO researchers are also involved in the activities of carrying out regular monitoring and reporting on the state of coastal water bodies and the marine environment under the Water Framework Directive (WFD) and the EU Marine Strategy Framework Directive (MSFD), respectively.

In relation to the above, both the main work areas of the candidate have been developed – strictly scientific, encompassing also the methodological basis for their realization, and scientific-applied - developed on the established scientific basis. The scientific output and contributions of an original nature by Assoc. Prof. Todorova are systematized in the following specific areas:

3.1. Scientific

➤ ***Study of the biodiversity, structure, functional characteristics and ecology of benthic communities in the Black Sea.*** The major part of the candidate's scientific output and original contributions are in the direction of studying the marine macrozoobenthos at the species, population and habitat level of organization (titles 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). In these publications, in addition to the challenge of systematizing long series of data from the period 1998-2022, a significant amount of new empirical data has been accumulated from the collection and processing of over 1400 sediment samples to assess the biodiversity, abundance and distribution of marine macrozoobenthos from the Bulgarian Black Sea shelf, including for shellfish species of high environmental and/or economic importance. Some of the more important achievements are:

i) the remarkable recovery of the *Flexopecten glaber* population recorded in 2021 along the Bulgarian Black Sea coast after the 1960s. Up-to-date information on the age structure, distribution, habitats of the species is presented, as well as quantitative data on abundance, growth rates and other related data. Explanations related to the environmental factors that led to the possibility

of restoring the populations of the species such as reducing eutrophication and predatory pressures are also given (8.B.1.1). In addition, the research leads to the restoration of an "iconic" species in the sense of cultural ecosystem services along the Bulgarian Black Sea coast;

ii) through the use of statistical analyses, macrozoobenthos communities are characterized in terms of species diversity, biomass, abundance and distribution in relation to key environmental stressors such as depth, sediment type, temperature and dissolved oxygen, degree of eutrophication, pollution and physical impacts (8.B.1.2, 8.B.1.4, 8.B.1.5, 8.B.3.1., 8.B.3.2, 8.B.3.13, 8.B.4.1, 8.B.4.3) ;

iii) classification and description of the national benthic types have been prepared on the basis of modern data biotopes that are assigned to the corresponding habitat categories of the European Nature Information System (EUNIS) (8.B.3.13, 8.B.4.3). Biotope distribution and classification data have been successfully used for the purposes of modeling the first prognostic map for the distribution of benthic habitats from the Bulgarian continental shelf, as well as for validating threshold values of key environmental factors such as wave energy, temperature and dissolved oxygen (8.B.3.13);

iv) on the basis of modern data it is estimated the condition on population ta on *Donax trunculus*. It was found that values on the indicators for good condition are under thresholds for the populations. This is a particularly important result that accounts for the consequence of the uncontrolled industrial in the hunt for the so-called "white clam", carried out after 2012 (8.B.2.8). We hope that it will be taken into account by the regulatory authorities in the sector.

v) researched and the possibilities of using opportunistic observations are demonstrated for the goals of a large-scale screening on distribution on the three cetacean species in Black sea in coastal, shelf and offshore areas and in relation to their preferred habitats (8.B.2.13, 8.B.2.15). Based on my personal experience, I believe that the conclusions of these studies can also be used as a basis for stimulating the development and scientific integration of data obtained from "citizen science".

➤ ***Development and application of science-based indicators for the assessment of the ecological status of coastal water bodies within the meaning of the Water Framework Directive (WFD) of the EU and of the marine environment within the meaning of the EU Marine Strategy Framework Directive (MSFD) and their application in routine studies for the assessment of the ecological status of the Black Sea ecosystem.***

Assoc. Prof. Todorova has well-documented contributions in this direction regarding the use of macrozoobenthos communities as a biological element of quality (BEC) with wide application in practice. For the first time, the type-specific reference conditions for several indices (species richness, Shannon diversity, AMBI species abundance and sensitivity index, and multiparametric M-AMBI)

for the benthic biotopes from the Bulgarian Black Sea coast and shelf have been derived, statistically validated and applied in relation to the intensity of the main pressures. Modeling in a geographic information system was applied to assess the areas and the ecological condition of the habitats (8.B.1.2, 8.B.1.4, 8.B.3.1, 8.B.3.2, 8.B.4.3). The indicators are in routine use in ongoing monitoring programs.

➤ ***Development of the scientific knowledge for the non-natives species in Black sea***

The following original contributions stand out:

i) prepared and validated is list on the alien species in Black sea for Bulgaria and Romania and the information has been improved for existing omissions and uncertainties in the inventory from the marine species in both countries. The results from the survey provide basis for effectively application on the European policies related to the invasive species (8.B.2.1). Raised also is the threshold values for good condition by the criterion "number on the newly introduced non-native types " of the MSFD for the three marine areas - coastal waters, shelf and open sea (8.B.4.3). Here is also the candidate's contribution (alone or in colaboration) for the establishment for first time and the inclusion in the list of the fifth benthic types for Black sea or in Bulgarian waters (8.B.2.7, 8.B.2.1, 8.B.28, 8.B.29);

ii) in relation to the invasive foreign species *Rapana venosa*: for a first time in Black sea is developed and proposed ecosystem approach for its sustainable management and achievement on goals like "good environmental status of the marine environment", "good economic status" combined with "low management expenses". As a result of the analysis, the conflicts of interest between the stakeholders were also brought out and it was demonstrated that species should be considered/managed simultaneously like invasive and like economic resource (8.B.1.8), which is valuable advice to governing bodies. It is proposed an original indicator for impact assessment of the mussels populations with science-based threshold for good status on the ratio on the biomasses prey/predator according to the requirements of MSFD (8.B.3.1, 8.B.4.3); for the first time is established the spatial scope on the negative the impact on *R. venosa* in front of Bulgarian coast (8.B.4.4).

➤ ***Assessing the ecosystem services of benthic habitats***

It is a relatively new and rapidly developing field of knowledge that is used for the purposes of marine spatial planning and sustainable resource management on the background of increasing anthropogenic and climatic pressures.

Within the framework of a complex study of the European seas, 56 types of European bottom biotopes have been systematized and classified according to EUNIS, as well as the services provided by them adapted to the framework of the program document in this area " Millennium " Ecosystem Assessment ". Through this study, for the first time in the EUNIS list, two new for the system, specific to the Black Sea biotopes, were formulated and proposed: Pontic *Phyllophora* beds on circalittoral

bedrock and boulders (EUNIS A4.28) and Pontic anaerobic microbial biogenic reefs above methane seeps (EUNIS A6.96). The potential services that they offer, their sensitivity to anthropogenic pressure, as well as their conservation status were evaluated (8.B.1.9). The publication is from an international team, where Assoc. Prof. Todorova is the only participant from Bulgaria, which clearly defines her place in this research and the credit for the described achievement.

➤ ***Development of a science-based strategy for nature conservation through networks of marine protected areas .***

i) by studying the genetic structure of 4 benthic species with different degrees of mobility and life cycle (*Mytilus galloprovincialis*, *Tritia neritea*, *Scorpaena porcus*, *Zostera noltei*) is proposed a conservation approach based on knowledge of the physical connectivity of the zones through currents, circulation and the manner of dispersal of propagules. The results are interpreted in the light of the life cycle and duration of the larval stages (8.B.2.4, 8.B.2.5, 8.B.2.9, 8.B.2.16). As a result of these studies, a practical guide and recommendations were developed for defining "cells of ecosystem functioning" as basic units for nature management on an ecologically appropriate scale (8.B.2.20). The achievement is a result of research by an international European team working in the Mediterranean region, which also includes the Black Sea.

ii) to overcome the fragmented approach and conflicts of interest in the protection and management of the coastal marine environment it was developed a model through the introduction of integrated intersectoral approaches aimed at the protection of ecosystem services (8.B.1.7).

➤ ***Scientific basis for assessing the impact of demersal fishing gear on benthic habitats.***
Fragmentation of the bottom as a result of applied fishing effort is among the main negative impacts with a long-lasting effect. Its study is a top priority in the development of science-based approaches to mitigation and/or elimination of impacts. In a series of publications from 2021, under the direction or with the participation of the candidate in an international collective, for the first time, a first-of-its-kind study was carried out in the Black Sea, which assessed the physical disturbance on the seabed by mobile bottom fishing gear, brought out the interrelationship between this species anthropogenic pressure and the ecological condition of the bottom habitats and an assessment of the areas under this influence was made (8.B.1.3, 8.B.3.7, 8.B.4.3).

➤ ***Mapping and modeling the distribution of benthic habitats in the Black Sea under conditions of anthropogenic local and climatic global pressures;***

As a result of interdisciplinary research carried out within the boundaries of the Ropotamo Marine Protected Area, for the first time in our country, high-resolution data on the topography of the seabed, sediments and zoobenthic communities have been integrated, and a map of the national benthic types has been prepared biotopes (8.B.1.5). In the same area, another similar study mapped and quantified the distribution and abundance of macroalgal communities with an emphasis on the

hitherto unstudied *Phyllophora crispa*, developing on the unique Black Sea habitat "biogenic *Ostrea edulis* reefs", established for the first time by Assoc. Prof. Todorova in 2009 (8.B.14). Inferences about the distribution of communities are made by applying highly specialized software analysis that infers the preferences of different communities for areas with specific characteristics. Based on the analysis, it was concluded that the connectivity of *P. crispa* populations in the network of marine protected areas is insufficient and remains within this particular functional ecosystem cell (8.B.1.6). I want to emphasize that the preparation of such maps is a labor-intensive process that requires the combining of the efforts of specialists with different qualifications and serves for the purpose of decision-making by the competent authorities in their environmental protection activities.

➤ ***Research methodology***

The correct methodological basis is an important prerequisite for the quality of scientific and scientific-applied activity. In this regard, Associate Professor Todorova has well-documented original contributions by preparing manuals for monitoring and assessing the ecological state of the Black Sea:

- i) up basis on available scientific knowledge is prepared n asokas for integration on indicators and criteria to evaluation on the whole condition on level descriptors of MSFD (8.B.3.4);
- ii) was created a common frame for monitoring and evaluation on spatially managed zones. Through them, for the first time in the region, methodological frameworks harmonized with European recommendations have been put in place for an adequate assessment of the ecological state of the Black Sea in terms of the biodiversity of the different types of habitats in the conditions of anthropogenic pressure. It is important to note that these developments are the result of international projects developed for the benefit of society (8.B.2.6).

3.2.Scientific-applied field and contributions

The timely application of scientific achievements in practice is also a measure of the importance of developments for the benefit of society. In this direction, Assoc. Prof. Todorova has clearly expressed contributions with a long-lasting effect in the fields of application. The following stand out:

➤ ***Implementation of European environmental directives***

- i) Habitats Directive (92/43/EEC). In the implementation of the Project assigned by the PEEP to the Ministry of Education and Culture "Expansion of the ecological network NATURA 2000 in the Bulgarian Black Sea water area", the scientific basis for the expansion and completion of the network of marine protected areas was created. As a result of the proposals with Decision No. 660 of November 1, 2013 of the Council of Ministers, a fourfold expansion of the

marine Natura 2000 was achieved (8.B.4.1). The current state of this part of the zones is mainly the result of the implementation of the specific project;

ii) Water Framework Directive-WFD (2000/60/EC of EC). Within the framework of an international project, Assoc. Prof. Todorova led the team for intercalibration of the macrozoobenthos as an element of the quality of coastal water bodies in the general types of Bulgaria and Romania (8.B.3.2). The results are reflected in Decision (EU 2018/229) of the Commission on establishing the determined classification values of the monitoring systems of the two countries, which has also been transposed into the relevant regulations of the state bodies, e.g. "Regulation H-4 on characterization of surface waters", which are already applied to assess the ecological status of coastal waters. User: MoEW, BSBD (publication 8.B.3.2).

iii) Marine Strategy Framework Directive - MSFD (EU 2008/56/EC).

By order of the Ministry of Education, Culture and Science, BSBD, a team led by Associate Professor Todorova has developed improved monitoring programs for the marine environment, which are included in the Marine Strategy of the Republic of Bulgaria (8.B.3.1). The achievement was also appreciated by the Municipality of Varna by awarding the team with the "Varna" award, 2018. A report on "Initial assessment of the state of the marine environment" was prepared, defining the criteria for "good state of the marine environment" (8.B.4.2), as well as a follow-up report on "Update of the first part of the Marine Strategy" and determination of the environmental objectives and related indicators for the second reporting period of the RDMS. The state of the broad types of benthic habitats was assessed and a generalized spatial assessment was prepared for the marine areas (8.B.4.3). User:

➤ *development of the scientific and technical infrastructure of IO-BAS*. Field and laboratory equipment worth BGN 380,000 was delivered with funds from projects led by Assoc. Prof. Todorova, which is a significant contribution to improving the institute's capacity to carry out marine environment monitoring activities.

4. Significance of the obtained results, proven by citations, publications in prestigious journals, awards, membership in international and national scientific bodies, etc.

Assoc. Prof. Todorova has a clearly outlined profile of the research work, which corresponds to the announced competition. The original scientific results obtained are well documented through publications in journals with a high impact factor and Q1-index. For the most part, the published titles are from groups of (and international) scientists, which also reflects the team way of working characteristic of marine research. However, the candidate's role is clearly expressed - Associate Professor Todorova is either a team leader or the only representative from the country, which is a recognition of her capability as a scientist with international recognition. The citations indicated by the candidate exactly correspond to those visible in the world databases (Scopus) and support the

directions outlined above in the work of Assoc. Prof. Todorova. Analysis of the reported 337 citations shows both good visibility of the titles in the world literature and the areas of greatest interest - ecosystem services, marine spatial planning, ecosystem approach in marine environmental management, biological indices, invasive species. 13 publications falling into these areas of knowledge contributed to approximately 90% of the number of citations. Based on this, I fully accept the reference for the scientific contributions formulated by the candidate.

5. Research management skills (project management, attracted external funding, etc.).

The candidate has led and is a participant in a significant number of projects financed by national sources (MoEW, BSBD), as well as international ones, mostly under the framework programs of the EU, Horizon, Norwegian Mechanism, etc. The result is also reflected in the financial resources attracted by the projects, indicated in the provided reference.

6. Training of young scientists

Assoc. Prof. Todorova is the supervisor of 1 full-time doctoral student, dismissed with the right of defense. The doctoral student has shown the result of the training with realized publications (8.B.2.8, 8.B.2.11, 8.B.2.12). I would like to draw attention to the difficulties faced by all scientific institutions in attracting young scientists in recent years.

7. Conclusion

Prof. Todorova is an established scientist with outstanding research and organizational qualities in the field of marine science. The scientific, scientific-applied activities have already received their recognition both in international and national sources, as well as in the routine practice of the institutions concerned. Her production exceeds the requirements of the National Academy of Sciences and the criteria of IO-BAS for holding the academic position "Professor". **Based on the above, I firmly vote "YES" the selection of Assoc. Prof. Todorova in the current competition and propose to the members of the Scientific Jury of the Scientific Council of IO-BAS to select the candidate for the academic position of "Professor" in the scientific direction "Macrozoobenthos" .**

Signature:

V. Karamfilov

Date:

28.02.2023