OPINION

by Assoc. Prof. Dr. Nikola Stoyanov Todorov
Head of the Department of Ecology and Environmental Protection
Faculty of Natural Sciences
Burgas State University „Prof. Dr. Assen Zlatarov"

Appointed under Order No. UD 229/26.06.2025 of the Rector of Burgas State University "Prof. Dr. Assen Zlatarov" as a member of the Scientific Jury and according to the minutes of the first scientific jury meeting, assigned to prepare an opinion for the awarding of the educational and scientific degree Doctor in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.2. Chemical Sciences, scientific specialty Ecology and Environmental Protection.

Candidate:	**Elena Yankova Mollova**
Thesis title:	**Study and Analysis of Pollution Indicators in Marine and Coastal Ecosystems along the Southern Black Sea Coast**
Scientific supervisors:	**Assoc. Prof. Dr. Alexander Dimitrov**
	Prof. Dr. Sevdalina Turmanova

General presentation of the procedure

The set of documents submitted by the doctoral candidate Elena Mollova, in both paper and electronic form, complies with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, as well as with Art. 43(3) of the Regulations for the acquisition of scientific degrees and academic positions at Burgas State University "Prof. Dr. Assen Zlatarov". Elena Mollova was enrolled as a full-time doctoral student on 15.02.2021 by Order UD 24/08.02.2021.

Brief biographical data

Asst. Eng. Elena Yankova Mollova graduated in 1997 from Burgas State University "Prof. Dr. Assen Zlatarov" with a degree in Water Technology and obtained the professional qualification of Chemical Engineer. In 2001 she also completed a Master's degree in Finance at Burgas Free University. Her professional career includes positions in both the industrial sector and academia. She has worked as a technologist, insurance inspector, sales representative, and quality specialist. Since 2009 she has been working at Burgas State University, initially as a chemical technician, and since September 2024 as an Assistant Professor in the Department of Ecology and Environmental Protection. Between 2021 and 2024 she was a full-time PhD student in the same department. In her teaching activity she conducts seminars and lectures in the disciplines Fundamentals of Heat and Mass Transfer, Food Ecology, and Ecology of Petroleum Products. Her scientific interests lie in the field of ecological monitoring, marine and coastal ecosystems, microplastic pollution, and the application of analytical methods for environmental impact assessment.

Relevance of the topic

The subject of the dissertation – "Study and Analysis of Pollution Indicators in Marine and Coastal Ecosystems along the Southern Black Sea Coast" – is highly relevant in the context of increasing anthropogenic pressure on the Black Sea and the urgent need for integrated environmental monitoring.

Pollution of marine and coastal ecosystems poses a serious risk to biodiversity, ecological balance, and the socio-economic functions of coastal zones. Enclosed seas such as the Black Sea are particularly vulnerable due to limited water exchange with the ocean and the high concentration of anthropogenic pressures, including urbanization, port activity, industrial and domestic pollution, and tourism.

Against this background, the study of key indicators – physicochemical parameters of water, concentrations of toxic metals and metalloids, and the distribution of microplastics – provides valuable information on ecosystem status. The focus on microplastics is especially important, as these emerging contaminants represent a significant ecological risk, yet data on their occurrence in the Black Sea remain scarce.

The results have direct practical value for the implementation of national and European policies on marine environment protection and sustainable management of coastal resources. They may also support the development of regional and municipal strategies for pollution control and the inclusion of new indicators in environmental monitoring systems. Thus, the dissertation topic is in line with contemporary scientific priorities and responds to societal and ecological needs at both national and international levels.

Characteristics and evaluation of the dissertation

The dissertation of Asst. Eng. Elena Mollova comprises 163 pages, contains 12 tables and 73 figures, and cites 206 references. The structure of the work is clear and logically organized, fully consistent with the requirements for a doctoral dissertation. It includes an introduction with justification of the relevance, aims and objectives; a literature review; an experimental section with detailed description of objects, methods and analytical equipment; results and discussion; conclusions and contributions.

The research focuses on three types of ecosystems: a lagoon (Lake Vaya), a river (Karaagach River), and a marine system (Burgas Bay). A complex approach has been applied, combining field studies, sampling, and laboratory analyses. The investigated parameters include physicochemical characteristics (pH, temperature, salinity, conductivity), concentrations of heavy metals and metalloids in water and sediments, and the distribution of microplastics – an emerging pollutant of high ecological concern.

Results are presented convincingly and consistently. Modern analytical methods (GC-MS, ICP-MS, μ-FT-IR) have been applied, and data processing is statistically well-grounded. The scientific conclusions are logically linked to the defined goals and objectives.

The dissertation demonstrates both high scientific value and significant practical contribution. It expands the knowledge on pollution in the Southern Black Sea region,

providing systematic data on physicochemical conditions, contamination with metals and metalloids, and the accumulation and seasonal distribution of microplastics. The candidate shows strong methodological competence, analytical skills, and the ability to formulate practical recommendations for the management and protection of marine and coastal ecosystems.

Evaluation of publications and personal contribution

The doctoral candidate has an active publication record directly related to the dissertation topic. The submitted works exceed the minimum national requirements for the PhD degree in professional field 4.2. Chemical Sciences.

The most important publications include:

- Contamination of the coastline of Burgas Bay with microplastics (Journal of Environmental Protection and Ecology, 2023);
- Monitoring the seasonal distribution of microplastics in Burgas Bay, Bulgaria (Journal of Environmental Protection and Ecology, 2024);
- Monitoring of marine organisms for microplastics in the water area of Burgas Bay (Journal of Environmental Protection and Ecology, 2025).

All of these articles are published in a reputable international journal indexed in global scientific databases. They reflect the major stages of the dissertation research – coastal contamination, seasonal dynamics, and the spread of microplastics in marine organisms. Presented publications demonstrate the candidate's ability to work as part of a team, while also highlighting her individual contribution as a leading participant in the experimental work, data analysis and interpretation, and manuscript preparation. Alongside the international articles, Elena Mollova has participated in conferences and projects, some of which have been recognized with awards, further underlining her active engagement in the academic community.

Her publication activity fully complies with the requirements for the PhD degree and illustrates her independent scientific contribution to the study of microplastic pollution in marine and coastal ecosystems, as well as her ability to present and disseminate research results at both national and international levels.

Critical remarks and recommendations

The dissertation is overall well-developed and presents original results. Although the candidate has a sufficient number of publications in international journals, it is recommended that part of her future work be directed towards higher-impact journals (Q1–Q2), which would enhance the international visibility of her scientific contributions. This remark is not a criticism of the current achievements but rather a perspective for further advancement of her research.

Conclusion

Based on the submitted materials, the detailed analysis of the dissertation, the publications, and the overall research activity of Asst. Eng. Elena Yankova Mollova, it can be concluded that the candidate demonstrates high scientific competence, consistency, and thoroughness in her work. The dissertation is structured according to established academic standards and encompasses clearly defined goals and objectives, a comprehensive literature review, well-justified methodological approaches, and fully interpreted results. The topic is relevant and significant, addressing contemporary ecological challenges, in particular the problem of Black Sea pollution, which is of both national and international importance.

Obtained results are original and at the same time of practical value. They expand knowledge on the state of marine and coastal ecosystems along the Southern Black Sea, provide new data on the distribution of microplastics and heavy metals, and form a basis for the development of measures for environmental management and protection. The candidate's publication activity shows that the conclusions and contributions of the dissertation have already been disseminated in international scientific outlets, attesting to their quality and significance. Her active participation in research teams, conferences, and academic life further highlights her personal contribution and scientific maturity.

In view of all the above, I consider that the dissertation of Asst. Eng. Elena Yankova Mollova fully meets the criteria of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the regulations of Burgas State University "Prof. Dr. Assen Zlatarov" for the award of the educational and scientific degree Doctor. I therefore **recommend to the esteemed Scientific Jury that the degree of Doctor be awarded to Asst. Eng. Elena Yankova Mollova in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.2. Chemical Sciences, doctoral program Ecology and Environmental Protection.**

Подпис заличен
чл.2 от ЗЗЛД

22.08.2025 Member of the Scientific Jury:

/Assoc. Prof. Dr. Nikola Todorov/