

REVIEW

by Professor Mariyana Vladimirova Filipova-Marinova,

Doctor of Biological Sciences

Member of the Scientific Jury by Order No. 268 from 10th of December 2020 of the Director of the Institute of Oceanology, Bulgarian Academy of Sciences, Varna regarding a dissertation defense and awarding the educational and scientific degree “Doctor of Philosophy, **PhD**” to **Elitsa Valentinova Hineva**, PhD student at the Section “Biology and Ecology of the Sea” for Dissertation Work entitled „*Ecological factors limiting the distribution of the seagrasses of the genus Zostera in the sublittoral zone of the Burgas Bay (the Black Sea): importance of wind waves and epiphyte abundance*“ in the Higher educational area cipher 4.: Natural Sciences, Mathematics and Informatics; Professional area cipher 4.3.: Biological Sciences; research specialty “Ecology and Protection of the Ecosystems”

1. General characteristics of the dissertation – contents and structure

The dissertation of **Elitsa Hineva** has a total content of 247 pages and is structured in 10 chapters **in accordance with the Rules of IO-BAS**, as follows: Introduction (3 pages), Literary review (16 p.), Aims and objectives of the study (2 p.), Material and methods (34 p.), Results and discussion (132 p.), Summarized results and conclusions (3 pages), Contributions (1 p.), List of publications on the topic of the dissertation (1 p.), Literature (14 p.) and Appendices (33 p.). The required ratio between the size of the main sections is observed, with emphasis on the results and their discussion. The made figures (170 pieces) and tables (32 pieces) facilitate the presentation and interpretation of the results. For greater clarity, a list of abbreviations used is presented. An index of figures and tables is missed. **The aim of the dissertation is clearly stated, the tasks are specific.**

2. Literary awareness and theoretical preparation of the candidate

The State-of-Arts chapter is **well structured and linked to the subject** of the dissertation. It is divided into two sections related to the components of the dissertation. A brief description of the importance of turbulence as a factor limiting the spread of aquatic angiosperms has been made. Particular attention is paid to the various models for spatial distribution of seagrass species. The mechanisms of impact of eutrophication in marine macrophyte communities are considered. Approaches for analyzing a set of structural and functional indicators are presented. Two hundred eleven literature sources (38 in Cyrillic, 173 in Latin) and 4 websites were used. The above testifies to a **good theoretical preparation** of the PhD student.

3. Methodical approach

The research approach in the dissertation **corresponds to the standards for conducting modern research** and ensuring reliable results. Three working hypotheses with antitheses are formulated, **adequate classical and innovative methods and approaches** for solving the set tasks are selected, including an experimental. The use of mathematical modeling and statistical methods allows the obtaining of significant research results.

4. Significance and persuasiveness of the obtained results and conclusions

The obtained results **are presented correctly and are properly discussed**. They are organized in three sections, corresponding to the aims and objectives. **The data are presented with arguments and are successfully interpreted**. I believe that the dissertation of Elitsa Hineva is **a model of research** on the importance of wave effects and epiphytic loads to limit the spread of seagrass in the Bulgarian Black Sea waters. The obtained empirical models can be used to

predict the presence of marine angiosperms in unexplored areas of the Black Sea coast.

The relevance and significance of the research is determined by the need to assess the real environmental risk of eutrophication and damage to marine grasslands in the improper planning of human activity in watersheds. A significant part of the water areas in front of the Bulgarian Black Sea coast is dominated by seagrasses, which occupies shallow coastal areas near the mouths of rivers or canals, connecting them with eutrophicated lakes. Thus, seagrass meadows are constantly exposed to freshwater imports of nutrients from land. The pioneering research of the PhD student on the exposure and the wind impact as a natural factor on the development of the grass fields are essential in determining their ecological status.

I believe that the dissertation of Elitsa Hineva has a **practical focus on improving maritime monitoring programs**, in accordance with the requirements of the EU Marine Strategy Framework Directive, 2008/56/EC. The lack of studies on seagrass meadows in the Bulgarian Black Sea waters and the scarce data regarding the entire basin determine **the originality of the research**.

5. Critical notes to the dissertation

In essence, I have **no critical remarks** on the dissertation. There are some minor technical errors that do not change my general impression of the high quality of the presented dissertation.

6. Character of scientific contributions

I fully accept the reference for the scientific contributions of the dissertation and define them as basic research and applied research with original and confirmatory character. The identification of a new parasitic

species for the Black Sea is a **contribution to the study of biodiversity in the Black Sea ecosystem**. The study of the presence of aquatic angiosperm communities has **an applied research character for the improvement of the existing marine monitoring programs**.

In general, the research contributions of **Elitsa Valentinova Hineva's** dissertation can be summarized as follows:

Original research contributions:

- ✓ For the first time, the limitation of the upper boundary of marine angiosperms meadows by wind waves in the regions: the Nessebar Bay, the Sozopol Bay, the Foros Bay and the lack of limiting (destructive) effect in the Chengene Skele (estuary of the Marinka River) has been proven. For each studied area the limiting directions of the approach of the wind waves are established. The obtained statistical models of the relationship between the upper boundary of seagrasses and waves can be applied to unexplored areas.
- ✓ For the first time, the species *Plasmodiophora bicaudata* parasitizing on *Zostera noltei* was found off the Bulgarian Black Sea coast.

Original research contributions with applied character:

- ✓ For the first time, threshold values for the maximum allowable epiphytic load are derived, depending on the light reaching the epiphytic layer in the Burgas Bay waters;

Confirmatory research contributions with applied character:

- ✓ It has been confirmed that the function for exponential raise to a maximum is the most suitable to account for shading caused by the accumulated

epiphytes. The coefficients of the equation for the conditions of the Burgas Bay are determined.

- ✓ It has been confirmed that the study of the presence of marine angiosperms communities in different regions of the Bulgarian Black Sea coast optimizes the monitoring programs.

7. Evaluation of the quality of the publications, reflecting the research on the dissertation

The PhD student has presented 6 full text publications on the topic of the dissertation, which **fully covers the scientific and metric criteria** for awarding the educational and scientific degree "PhD". The doctoral student is a leading author in all publications.

8. Personal contribution of the PhD student

The participation of the PhD student in several training courses related to the topic of the dissertation and her leading role in all publications testify to her **undoubted personal contribution to the development of the dissertation** under the expert guidance of her supervisor Prof. Snejana Moncheva, PhD. My personal impressions of Elitsa Hineva are very good. She is an established researcher who has the competence to carry out significant research independently and as a member of multidisciplinary teams.

9. Conclusion

The presented dissertation and the accompanying materials **FULLY MEET THE REQUIREMENTS** of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Ordinance for the implementation of the Law, and the specific minimal research metric criteria for awarding the educational and scientific degree "PhD" at the Institute of Oceanology "Prof. Fridtjof Nansen", Bulgarian Academy of Sciences, Varna. Given the above and my general impression that the achieved scientific contributions are real and represent a reliable basis for future research with a practical focus, **I express my POSITIVE assessment of the dissertation and I PROPOSE to the members of the scientific jury to VOTE FOR THE AWARD to Elitsa Valentinova Hineva with the educational and scientific degree "PhD" in Ecology and Protection of the Ecosystems.**

15.03.2021

Reviewer:

Varna

(Prof. Mariyana Filipova-Marinova, Dr. Sci. Biol.)