

REVIEW

by Galerida N. Raykova-Petrova, Associate Professor in the Faculty of Biology at Sofia University "St. Kliment Ohridski", in execution of an order No. RD-38-576/03.10.2022 of the Rector of Sofia University, regarding the dissertation of Borislava Kostadinova Margaritova on the topic: "Study of the spawning and feeding habitats of the sturgeons in the Bulgarian section of the Danube River" for the award of the educational and scientific degree "doctor" in professional direction 4.3 Biological Sciences, speciality "Hydrobiology"

Brief information of the PhD student:

Borislava Kostadinova Margaritova completed full-time studies at the Faculty of Biology of the University of „St. Kliment Ohridski" as a bachelor in "Biology" in 2006; in 2013 she graduated with a master's degree in "Applied Hydrobiology and Aquacultures" at the Department of "General and Applied Hydrobiology", from February 2019 to February 2022 she was a doctoral student in "Hydrobiology - Ichthyology and Aquacultures /4.3 Biological Sciences".

From the attached certificate of compliance with the minimum national requirements for educational and scientific degree "PhD" for field 4. Natural sciences, mathematics and informatics, Professional direction 4.3. Biological sciences, it can be seen that the PhD student covers them. According to Indicator 1 she covers 50 points out of minimum 50; by the Sum of indicators 1-4 she covers 47 points at minimum of 30

B. Margaritova participated in 8 projects. While working on her dissertation, she worked on 3 more – 2 ("Size characteristics and condition of the sturgeon fish (family Acipenseridae) from the Bulgarian section of the Danube River and the Black Sea" and "Using the macrozoobenthos in determining fitness on some feeding sites of the mullet (*Acipenser ruthenus* L.) from the Bulgarian section of the Danube River") are funded by the Sofia University's Scientific Fund and 1 ("Crustaceans of the order Amphipoda in the water area of the South Gulf, on Livingston Island: taxonomic composition and ecological features") is with external funding .

The PhD student is a co-author in 5 scientific publications and has participated in 4 international and national conferences with 3 reports and 1 poster.

From February 2013 - until now, she has been working as an expert on "Protection of waters and species" at WWF Bulgaria (World Wide Fund for Nature).

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General characteristics, volume and structure of the dissertation work

Sturgeon fishing dates back over 20 centuries. It is believed that the human influence on the numbers of these species began to be felt after the 16th and 17th centuries. A steady and rapid decline in global stocks began in the late 19th century. Since April 1, 1998, all species belonging to the families Polyodontidae and Acipenseridae have been included in the list of species under the control of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES Appendix II /Notification to the Parties No. 1998/ 13 Conservation of Sturgeons).

In 2001-2002, the first complex studies on the biology and ecology of sturgeon fish were conducted in Bulgaria and an "Action Plan for sturgeon fish in the Bulgarian water area of the Danube River and the Black Sea" was developed. As an implementation of this plan, WWF is developing 3 projects: In 2012 - 2015 - "Implementation of activities from the National Sturgeon Action Plan in order to improve the condition and protection of sturgeons in Bulgaria" and "Joint actions to raise awareness about the overexploitation of Danube sturgeons in Romania and Bulgaria" and in 2016 – 2020 - "Sustainable conservation of sturgeons in the lower Danube, through prevention and countermeasures against poaching and illegal trade in wildlife species". Some of the results of these projects are the basis of dissertation.

In connection with the above, I believe that the current development is up-to-date and timely, as it also provides recommendations for practice.

The structure of the dissertation is the generally accepted for this type of works – introduction, literature review, aim and objectives, materials and methods, results and discussion, summaries, conclusions, recommendations and literature. The work comprises 239 pages. It is illustrated with 21 tables, 19 figures and 65 appendices. 279

literary sources are cited, of which 35 are in Cyrillic and 244 are in foreign languages. All this shows Margaritova's good knowledge of the subject under consideration.

The title of the dissertation is clearly formulated and corresponds to the content. The set goal and the resulting 3 tasks specify the essence of the work and are subsequently fulfilled.

During the approbation of the work, notes and recommendations were made, which the PhD student complied within the legal deadline.

Literary awareness and theoretical preparation

The PhD student has used the literature well. The publications are written uniformly and in the manner accepted for scientific publications.

The theoretical knowledge of B. Margaritova is at a good level. Adequate classical and modern methods are used. The obtained results are processed with software programs.

Originality of research

The present work is largely pioneering in this field and is an important attempt to link the biological requirements of the species with the abiotic and biotic factors of the Danube River environment.

Evaluation of scientific contributions

The interpretation of the obtained results and the literature data gave the doctoral student the opportunity to make 8 practical recommendations. 10 scientific and scientific-applied contributions are presented.

I accept the PhD student's self-assessment of the contributions of her work, but they could have been formulated more precisely and concretely.

Persuasiveness of the obtained results, interpretations and conclusions, notes and recommendations on them

The obtained results, interpretations and conclusions, as a personal work of the PhD student, deserve high praise.

I have the following notes and questions regarding the work.

Notes:

1. "For one of the currently most numerous sturgeon species, *A. ruthenus*, we can make the definite conclusion that it reproduces in the Lower Danube and the fragmentation of the river at Iron Gate II (863 rkm) doesn't have such a significant effect on its natural reproduction" (p. 25). For the sterlet, as a non-migratory species, this is natural.

2. In fact, allometric growth can only occur in young individuals; in general, fish have isometric growth, which is due to the growth rate (compensatory or depensatory in the different age groups). The limited material here doesn't allow such generalizations about growth type.

3. For some of the obtained interesting statistical data, there is no discussion and any conclusions, only the calculated values are given - e.g. for the "relative growth rate", the "condition".

4. In Fig. 5-5 The x-axis values are not well represented. They start from 0 at large empirical values.

5. Out of the 864 year-of-year (YoY) caught individuals, belonging to four sturgeon species – *A. ruthenus*, *A. stellatus*, *A. gueldenstaedtii* and *H. huso* – 713 were caught in the Vetren area. With increased fishing effort in this area; it is logical that 82.5% of the fish are from there.

The general impression of the text is one of "hastiness". The verb tense for scientific work is not always respected, in many places there is "stuttering" from the keyboard, etc.

Questions:

1. "Different factors of anthropogenic origin ... reveal the strong sensitivity of sturgeons to environmental change and, in particular, to climate change." What exactly are the climate changes in the Danube river?

2. Page 26 "...back-calculations of the path traveled by hatchlings and juvenile fish downstream during their first year of life". How reliable is the determined rate of descent along the river?

3. Why in Tabl. 5-1 *A. gueldenstaedtii* there are no dimensions?

4. Page 85 “The coefficient b of the length-weight relationship for *A. ruthenus* and *A. stellatus* of size class L_1 is below 3 and for them the predicted growth type is negative allometric, while for *A. gueldenstaedtii* the coefficient is not significantly different from 3 and the growth is isometric.” The coefficients are respectively 2.4331; 2.6088 and 2.8588. What is the criterion by which 2.61 differs from 3 and 2.85 doesn't? If this classification of growth is accepted, then all three species are with allometric growth.

5. What do you mean by “negative growth” – how does length decrease and how with negative allometric growth, yearlings show good growth rate and higher condition?

Assessment of the quality of the scientific work

The PhD student undoubtedly has a personal contribution in the collecting, processing and analysis of the materials, as well as in the presentation and discussion of the results in the dissertation work and the attached scientific publications.

There are 4 publications on the subject of the dissertation. She has promoted the results of her work with 3 reports and 1 poster at 4 international conferences.

I recommend that some of the growth data be further developed, compared with literature data, and published in a scientific paper.

The dissertation abstract reflects correctly the content of the dissertation.

Conclusion

A rather complex study of the distribution, migration, growth, feeding and requirements of the species for abiotic factors has been carried out. Literature data and modern scientific results are well summarized. The drawn conclusions provide a basis for future research and practical recommendations.

The dissertation fully meets the criteria for obtaining the educational and scientific degree "PhD".

All of the arguments and facts, listed above, give me the reason to recommend to the esteemed Scientific Jury to award Borislava Kostadinova Margaritova the educational and scientific degree "PhD" in professional field 4.3 Biological Sciences, speciality "Hydrobiology".

14.12.2022.
Sofia

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(Assoc. Prof. G. Raikova)