

Report on ICHM Grant for Attendance in BSHM ‘Research in Progress’ 2025

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The British Society for the History of Mathematics (BSHM) organises an annual meeting ‘Research in Progress’ for research students to present their research. This year’s meeting took place on 22nd February 2025 in the Shulman Auditorium of The Queen’s College, University of Oxford.

My research on the history of mathematical models in Soviet fishery science was initiated in the Vertically Integrated Project (VIP) ‘History, Mathematics, and the Public’ at the University of St Andrews, supervised by Charles Paxton and Matthew Ylitalo. In the project, I explored ideas on mathematics by Fedor Ilyich Baranov (1886-1965), Nikolai Mikhailovich Knipovich (1862-1939) and Alexandre Nikolayevich Derzhavin (1878-1963). Currently, my focus is on Kuzma Kirillovich Tereshchenko (1893-1930), an unsung ichthyologist.

As a further research activity, I was fortunate to attend ‘Research in Progress’ to present a research poster on Baranov. The poster was created in collaboration with Alisa Senses, a former member of the VIP.

The participation in this event was very significant to me. First of all, it allowed me to think about diversity in the history of mathematics. This was through various perspectives on the history of mathematics in the presentations and the research posters presented on the day. For example, I learned about the history of mathematics education in France, the introduction of historical elements in mathematics education, and the life of Russian mathematicians who moved to Yugoslavia. From the unique topics discussed on the day, I truly felt the size of the field and how there are numerous mathematics histories waiting to be discovered.

Secondly, I received a lot of valuable feedback from other attendees. This was both in the poster itself and the research topic, including recommendations of relevant ichthyologists that I could research. The feedback helped me reflect on the current progress and will be very useful in the future to navigate my research direction and in determining methods to share the findings with the public. Therefore, in the ‘Research in Progress’, I gained ideas for my future research activities.

Thirdly, the event allowed me to connect with researchers and those interested in the history of mathematics. By meeting them in person and having discussions, as well as exchanging contacts, I could ask questions and find further information about their research,

which I am interested in. Simultaneously, I also received some interest in the research on the poster. The event, therefore, allowed me to enter the academic community in the history of mathematics.

Overall, my attendance at the ‘Research in Progress’ of the BSHM was crucial in my development as a future researcher. This happened through the awareness of the scale of the history of mathematics, receiving inspiring ideas for my research activities, and connecting with other attendees to share each other’s knowledge. I would like to thank the BSHM for this wonderful opportunity and the ICHM for making my participation possible.

Baranov Set the Foundations of Quantitative Fishery Science But Was It the Right Catch?

Who is Fedor Ilyich Baranov?

- Using theoretical mathematics in fishery science was not an idea until then.
- Russian academic, interest in fishery science, fishing gear and engineering.
- On the question of the biological basis of fisheries (1918) he is considered as the first application of mathematical modelling in fishery science.
- Baranov was also invited in the idea of "mathematical biology" in the 1940s papers, based on the famous equation, he adapted:

But was Baranov really correct? What did other biologists at the time say?

Criticism towards Baranov (1918) and Knipovich

- Knipovich - An internationally recognized biologist from Russia.
- Specialised in zoology instead of mathematics from an early stage.
- Belief in the complexity of nature.
- Criticism in negative impacts of human activities on nature.
- Influential criticism questioned Baranov's work in the Soviet Union.
- Baranov responded by publishing another paper in 1920, but it was not successful.

Key Variables in Models

- N_t - The number of fish population on fish year.
- N_0 - Initial number of fish population.
- C_t - The catch on fish year.
- F_t - The fraction of reproduction of age group t .
- Z - Total mortality rate.
- M - Instantaneous mortality rate.
- B - Natural mortality rate.

Derzhavina (1922) - Alternative to Baranov's Model?

To Derzhavina (1922) created a foundation of the biostatistical method. Baranov was acknowledge in this paper.

Derzhavina (1922) developed a new model by reconsidering assumptions of Baranov's (1918).

Baranov (1918)	Derzhavina (1922)
Empirical model on an exponential mortality curve.	Biostatistical model.
Natural mortality is required to fit instantaneous fishing mortality.	Many years of fishery data following the same cohort of fish are required.
Constant exploitation rate for all age groups.	Different exploitation rates for each age group.
Consideration of natural mortality rate.	Ignoring natural mortality rate.
Assumption of direct proportionality between fish length and age.	Later referred by Bulow (1954, 1955), Chignone (1961), Monemetyen (1970) and Fox (1989).
Later influenced Beverton and Holt (1957), Taylor (1962) and Beverton (1962) model.	Taking into account that the rate of reproduction of fish depends on the adult population size.

Fig. 1 Research poster on Baranov

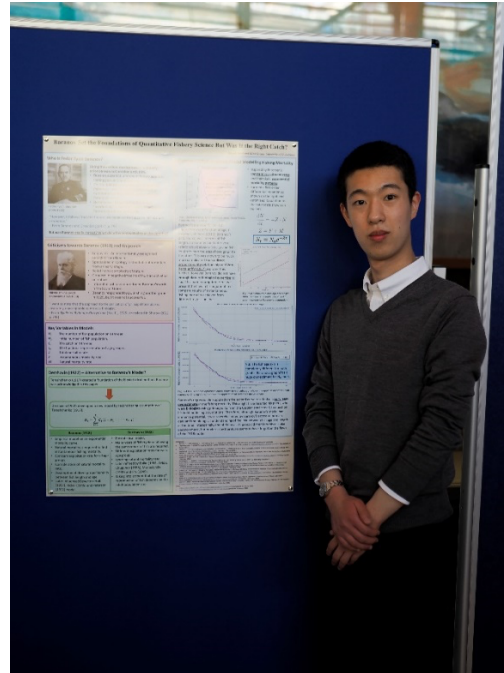


Fig. 2 Research poster display



Fig. 3 Discussing the research on Baranov

*Fig. 2 and Fig. 3 were kindly taken by Troy Astarte.