

ANNOTATION

to the dissertation submitted for the degree of Doctor of Philosophy (PhD)
under the educational program «8D05101 - Biology»

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on the theme «Parasitofauna of commercial fish of the Zhaiyk-Caspian basin»

General characteristics of the dissertation.

The dissertation summarizes the results of parasitological, ichthyological, and hydrobiological studies conducted in the Kazakhstani sector of the Zhaiyk - Caspian water basin and provides scientifically based recommendations to ensure epizootiological well-being in the studied water area.

Topicality of the study.

The Zhaiyk–Caspian basin is a region of strategic importance for the Republic of Kazakhstan, both environmentally and socio-economically. It includes one of the country's largest rivers—the Zhaiyk (Ural) River—as well as the northeastern part of the Caspian Sea, which is the largest enclosed body of water in the world. This basin covers a vast territory rich in biological and mineral resources and is characterized as an important natural complex that ensures the sustainable development of the state. In addition, the Zhaiyk–Caspian basin is distinguished by its unique biodiversity and serves as a habitat for numerous valuable species of aquatic organisms, including sturgeon fish, which have high commercial and conservation value. In this regard, the region is traditionally considered one of the key centers of fisheries in Kazakhstan, while the Caspian Sea serves as an important platform for international cooperation in the field of fisheries.

In this context, the study of fish parasitofauna becomes particularly relevant. This relevance is primarily обусловлена biological factors. Parasites have a significant impact on the growth, development, and reproductive capacity of fish: living in the host organism, they utilize its nutritional resources, damage internal organs, and weaken the immune system. Therefore, studying the species composition of parasites and their relationships with the host allows for a deeper understanding of the biological characteristics of fish.

From an ecological point of view, parasites are an integral part of aquatic ecosystems. They participate in the regulation of trophic relationships and play an important role in maintaining balance between populations. Therefore, changes in the structure of parasitofauna are widely used as bioindicators in assessing the ecological state of water bodies. For example, deterioration in water quality or anthropogenic pollution directly affects the composition and distribution of parasitic communities.

From an economic perspective, this issue is also of great importance. Parasitic diseases of fish cause significant damage to production and reduce its export potential. As a result, farms incur substantial economic losses. In this regard, the timely detection of parasites, control of their transmission pathways, and the development of preventive measures form the basis for an effective system of anti-epizootic measures in fisheries.

In general, fish of the Zhaiyk–Caspian basin play a key role in the ecosystem as an important link in trophic chains and biological cycles. Their parasitofauna, forming close and often highly specialized relationships with hosts, can significantly influence the structure of fish populations, their physiological condition, and reproductive potential. In addition, the study of parasitofauna is important from the perspective of ensuring biosafety and the sustainability of fishery systems. The ability of certain parasites (*Dactylogyrus wunderi*, *D. anchoratus*, *Ancyrocephalus paradoxus*, *Gyrodactylus cyprini*, *G. elegans*, *Khawia sinensis*, *Schyzocotyle acheilognathi*, *Ergasilus siboldi*) to cause mass diseases or reduce the commercial value of fish increases their economic significance.

Thus, the study of fish parasitofauna should be considered not only as a theoretically significant field but also as an important applied aspect, forming an integral part of comprehensive ecological monitoring of aquatic ecosystems.

The aim of the dissertation is to study the parasitofauna of commercial fish in the Zhaiyk–Caspian basin in order to develop scientifically grounded recommendations for ensuring epizootic well-being regarding parasitic fish diseases.

Research objectives:

- To study the species composition, age and sex structure of populations of commercial fish in the Zhaiyk–Caspian basin, as well as their biological characteristics.
- To investigate the composition and structure of zooplankton in the Middle Caspian as the main component of the food base and as intermediate hosts in the life cycles of parasites.
- To study the parasitofauna of commercial fish in the Zhaiyk–Caspian basin and to уточнить their taxonomic affiliation.
- To develop scientifically grounded recommendations for ensuring the epizootic well-being of fish in the Zhaiyk–Caspian basin with respect to parasitic diseases.

Objects of research:

Commercial fish species, zooplankton, and metazoan parasites of commercial fish.

Research methods.

The study employed ichthyological, hydrobiological, and parasitological methods.

Scientific novelty of the research:

- New data have been obtained on the species composition, age and sex structure, as well as biological characteristics of 21 species of commercial fish in the Zhaiyk–Caspian basin.
- New data have been obtained on the composition, structure, and spatial distribution of zooplankton in the Middle Caspian.
- For the first time, a comprehensive study has been conducted and new data have been obtained on the metazoan parasites of fish in the lower and middle reaches of the Zhaiyk River, as well as in the Kazakh sector of the Caspian Sea.

- For the first time, allochthonous foci of ocular digeneid infections in fish have been recorded in the Middle Caspian.

- For the first time, the native marine pike-perch (*Sander marinus*) and the naturalized so-iuy mullet (*Chelon auratus*) inhabiting the Middle Caspian have been studied, and their biometric characteristics and parasite species composition have been determined.

Practical significance.

The results of the conducted research make it possible, taking into account regional characteristics, to assess the condition and productivity of commercial fish populations; to identify key protected areas (feeding and wintering grounds); to monitor changes in zooplankton as the main component of the food base and parasitic life cycles; and to detect and control parasites, including zoonotic and pathogenic forms relevant to sanitary safety and the protection of fisheries. The obtained results can be used for ecological monitoring, planning of fisheries activities, as well as for the prevention of diseases in commercial fish.

Main statements submitted for defense:

- Current state of the commercial ichthyofauna of the Zhaiyk–Caspian basin.

- Composition and structure of zooplankton in the Middle Caspian.

- Parasitofauna of commercial fish in the Zhaiyk–Caspian basin.

- Scientifically grounded recommendations for ensuring epizootic well-being with regard to parasitic fish diseases in the Zhaiyk–Caspian basin.

Main research results:

1. The ichthyofauna of the Zhaiyk-Caspian basin retains signs of stability and trophic completeness. However, regional differences in the biological parameters of commercial fish, as well as the influence of hydroecological factors on the state of fish resources, indicate the need for further monitoring and assessment.

2. A decrease in the proportion of indigenous species of the Ponto-Caspian basin and a simultaneous dominance of Palearctic zooplankton representatives were observed. This may indicate a continuing transformation of the faunal complex under the influence of abiotic and biotic factors. Changes in dominant species, including the decline of the previously consistently dominant copepod *Acartia tonsa* and the emergence of the cladoceran *Evadne nordmanni* as a new dominant, suggest community restructuring and potential changes in trophic chains.

- Parasitological studies of 28 marine, semi-anadromous, and freshwater commercial fish species in the Kazakhstani sector of the Zhaiyk-Caspian water basin revealed 52 parasite species belonging to various taxonomic groups. Specifically: 1 parasite species in *Clupeonella cultriventris*, 1 in *Alosa kessleri*, 5 in *Alosa saposchnikowii*, 3 in *Atherina boyeri*, 1 in *Esox lucius*, 17 in *Cyprinus carpio*, 11 in *Carassius gibelio*, 14 in *Abramis brama orientalis*, 14 in *Leuciscus aspius*, 12 in *Rutilus caspicus*, 8 in *Ballerus ballerus*, 11 in *Blicca bjoerkna*, 8 in *Pelecus cultratus*, 2 in *Rutilus rutilus*, 1 in *Ballerus sapa*, 1 in *Chondrostoma nasus*, 6 in *Scardinius erythrophthalmus*, 1 in *Vimba vimba*, 1 in *Squalius*

cephalus, 1 in *Leuciscus idus*, 2 in *Tinca tinca*, 1 in *Esox lucius*, 9 in *Silurus glanis*, 6 in *Perca fluviatilis*, 11 in *Sander lucioperca*, 4 in *Sander marinus*, 11 in *Sander volgensis*, 4 in *Chelon auratus*. By water areas: 43 species in the middle and northern parts of the Caspian Sea, 28 species in the Zhaiyk River delta, 11 species in the Zhaiyk River floodplain, 3 species in the Kigach River.

4. To ensure the epizootiological well-being of commercial fish in the Zhaiyk-Caspian basin, it is recommended to carry out large-scale monitoring studies and strengthen control over fish stocking activities.

Author's personal contribution:

Field (expeditionary) work, including sample collection, as well as laboratory studies on the processing of biological material, parasite identification, and microscopic analysis, were carried out independently by the doctoral student. The analysis and statistical processing of the obtained data, their interpretation, the formulation of scientific conclusions, as well as participation in the preparation of publications and the drafting of the dissertation were performed by the doctoral student with methodological support from the scientific supervisors.

Connection with main scientific programs:

The results of the dissertation were obtained within the framework of the following grant, program-targeted, and regional projects:

1. “Assessment of natural foci of anisakidosis and the risk of their epizootic occurrence in the shelf areas of the northeastern part of the Caspian Sea” – a grant-funded project by the Ministry of Education and Science of the Republic of Kazakhstan, IRN AP05131687, 2018–2020.

2. “Comprehensive study of pathological changes in fish in the studied area of the Zhaiyk River to develop proposals for reducing the negative impact of anthropogenic factors on fish resources and their effects on the ichthyofauna of the Zhaiyk River” – Project (Contract No. 70 dated 18.07.2019).

3. “Comprehensive studies of fish habitats (including sturgeon) in the ichthyofauna of the Zhaiyk River within Atyrau and West Kazakhstan regions, taking seasonal factors into account, to develop proposals to mitigate the negative anthropogenic impact on fish resources and other aquatic animals” – Project (Contract No. 05-02/65 dated 25.06.2020).

4. “Comprehensive study of water bodies to assess the potential of biological resources and model population dynamics for their conservation and sustainable use (natural resources)” – Scientific and technical program of the Ministry of Agriculture of the Republic of Kazakhstan, BR 23591095, 2024–2026.

Approbation of research results.

The materials of the dissertation research were presented and discussed at scientific-practical conferences:

- Proceedings of the V International Scientific-Practical Conference of Young Scientists and Specialists “Ecological and Biological Problems of Using Natural Resources in Agriculture.” — Yekaterinburg, 2019.

- Proceedings of the XXII International Scientific-Practical Conference of Young Scientists and Students “Scientific Youth in Agrarian Science:

Achievements and Prospects” held within the framework of the Year of Youth in the Republic of Kazakhstan. — Almaty, 2019.

- Proceedings of the International Scientific-Practical Conference dedicated to the 90th anniversary of NAS RK academician Z.K. Kozhebekov. — Almaty, 2019.

- Proceedings of the VI Interregional Scientific Conference “Parasitological Research in Siberia and the Far East,” dedicated to the 70th anniversary of Professor V.D. Gulyaev. — Novosibirsk, 2019.

Publication of dissertation results.

Based on the dissertation materials, 21 scientific works were published jointly with co-authors, including: 5 articles in publications recommended by the Committee for Quality Assurance in Education and Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan; 5 articles in journals indexed in the Scopus database; 4 articles in the proceedings of international scientific-practical conferences; 1 certificate of registration in the state registry of rights to an object protected by copyright.

Volume and structure of the dissertation.

The dissertation includes an introduction, a literature review, materials and methods of research, research results, evaluation and generalization of results, conclusion, list of references, and appendices. The work is formatted in accordance with established standards, has a total volume of 158 pages, and contains 40 tables and 32 figures.