

Prospects of biodiversity research in water basins of the Karabakh region

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The article is devoted to the prospects of scientific research of biodiversity in the water basins of the Karabakh territory liberated from the 30-year Armenian occupation. Both flora and fauna barbarously looted and destroyed by the invaders are subjects to comprehensive restoration, and the elaboration of scientifically based approaches to the development of the once-prosperous region remains with the scientists of the Republic. The primary tasks facing scientists are the analysis of the state of biodiversity of the water basins located in the territories of Karabakh, in particular, the establishment of species and stocks of fish belonging to the local ichthyofauna, the study of the potential of the food base. The article gives the names of rivers and other water sources of the Karabakh zone, where natural fish farming and aquaculture can be developed. A list of multidisciplinary studies necessary for the restoration and development of aquatic biodiversity in the liberated territories of Karabakh is proposed. The article is preceded by a brief review of works on the research of the physiology and ecology of fish in the reservoirs of the Republic, focusing on sturgeon, which is of industrial importance for the country.

Keywords: *Karabakh, biodiversity, water basins, sturgeon, fisheries*

INTRODUCTION

The Karabakh land remained under occupation for nearly 30 years, and its rich biodiversity was not only left out of scientific research but also subjected to ecological terror and was brutally exploited by Armenian invaders. It should be noted that before the occupation, the scientists of the Institute of Zoology of the Azerbaijan Academy of Sciences conducted some researches in the reservoirs located in Karabakh (Державин, 1956; Əbdürrəhmanov, 1966; Насиров, Мамедова, 1975) but these researches were not long-term.

The study of sturgeon fish species occupies an important place in ecological, physiological studies of fish in the water reservoirs of the Republic. Numerous studies have been devoted to the study of the ecological and physiological features of the oldest, but at the same time of high industrial importance, sturgeon fish species, their reproduction in factory conditions and the determination of the optimal environment for proper cultivation

(Касимов, 1961; Касимов и др., 1966). The results of these studies have played an important role in the conservation and reproduction of fish stocks, the oldest representative of the aquatic biodiversity of the Republic.

In studies conducted using the classical method of forming conditioned reflexes, a biologically expedient method and the selection of conditioned stimuli, it was proved that both food and protective conditioned reflexes in sturgeons can be created very quickly, and their nervous processes do not lag behind other, more highly organized animals in their mobility and expediency (Касимов, Рустамова, 1969; Палатников, Касимов, 1980). At the same time, it was revealed that the analytical and synthetic activity of the nervous system in evolutionarily ancient sturgeon fish is below the level. The results obtained were taken as a basis for the organization of industrial breeding of sturgeon in the former USSR, which became the basis for the creation of the theory of biological progress of sturgeon.

A consistent study of genetically determined behavioral reactions at the early stages of ontogenesis and their ecological plasticity at the species and population levels allowed us to identify adaptive reactions to individual environmental factors

In a number of works, the morphofunctional organization of the taste and visual systems of sturgeon fish was also studied (Крацкин и др, 1977; Палатников, Касимов, 1980). The research was of great importance not only for fundamental science, but it also served to develop specific guidelines for creating optimal conditions for the artificial cultivation of these valuable fish species, thereby reducing the death of fry in the early stages of ontogenesis during their breeding and cultivation in factory conditions (Gasimov et al., 2017)

There has been great importance the studies on the ecological and physiological features of the development in the ontogenesis of valuable fish species of the Kura River region (sturgeons, zanders, carps) (Касимов и др, 1966). Using ethological, morphological, physiological, and ecological research methods, the most optimal conditions for obtaining and fertilizing caviar in individual fish species, temperature, salinity, light and oxygen conditions for the development of fry and fish at various stages of growth have been identified. The results of these studies have played a special role in improving existing and creating new biotechnical standards for the cultivation and breeding of various fish species in Azerbaijan and have found wide application in farms.

The results of the above-mentioned studies are summarized in a number of monographs, served as the basis for the development of recommendations for the factory cultivation of certain species of sturgeon, optimization of the timing and conditions for the release of fry into natural reservoirs (Касимов, 1980, 1987; Лукьяненко и др., 1984). These results have also been confirmed in joint studies with French scientists on the localization and staging of functions in the development of the brain of sturgeon (Веселкин и др., 1977).

As a result of many years of research, Azerbaijani scientists have obtained and grown interspecies reciprocal hybrids of sturgeon for the first time. In the first three years of life of these fishes, ecological plasticity and adaptive capabilities were revealed, the hereditary transmission of morpho-

physiological characteristics in direct and reciprocal hybrids was studied. Based on the results of joint research by scientists of the Azerbaijan branch of the Central Research Institute of Sturgeon Farming and the I.Pavlov Institute of Physiology, hybrid of sturgeon fishes (*Acipenser nudiiventris* and *Huso huso*) was proposed for breeding in aquaculture farms of the USSR, which was distinguished by high adaptive capabilities in terms of freshwater tolerance, growth, and other physiological characteristics (Касимов, 1970).

Another priority of research in the field of physiology and ecology of fish in the country was to study the effect of oil and other chemical pollutants on the physiological functions of aquatic organisms (Касимов, Рустамова, 1969; Gaisina, Kasimov, 2019). Scientists of the Laboratory of ecological physiology (Head Prof. Rafik Kasimov) in Institute of Physiology of the Academy of Sciences of Azerbaijan in cooperation with the Scientific Research Institute of Oil and Gas and the Institute of Fisheries "Azerbalig" in these applied studies, which are important for the ecology of the Caspian Sea, studied the effect of crude oil, drilling mud, sludge and other chemical reagents on sturgeon fry and determined their permissible concentrations for the Caspian environment. It has been proposed effective methods for neutralizing particularly harmful components. The results of ecotoxicological studies have been presented at numerous symposiums and conferences, repeatedly demonstrated at the All-Union Exhibition of Achievements of the National Economy (Moscow), awarded the gold medal of the Leipzig Fair.

All these achievements of the Azerbaijani school of physiology and ecology of fish will be demanded during the restoration of the aquatic biodiversity of the Karabakh territory, the development of natural fish farming, as well as the introduction of aquaculture methods for growing valuable fish species, including sturgeon (Мамедов и др., 2013; Freyhof et al., 2020).

There are 14 rivers and more than 10 other water sources in the liberated Karabakh zone.

The sources of water available in the Karabakh region start from the Lesser Caucasus mountains. The main sources of water reserves in this region are as follows: the rivers Tartarçay (*Tərtərçay*), Hakari (*Həkəri*), Khachinchay (*Xaçın-*

çay), Gargarchay (*Qarqarçay*), Bazarchay (*Bazarçay*), Okhchuchay (*Oxçuçay*) and the water reservoirs Khudaferin (*Xudafərin*), Giz Galasi (*Maiden Tower – Qız Qalası*) (located on the Araz River) and Sarsang (*Sərsəng*) reservoirs (located on Tartar river). Besides, many small rivers, lakes, and several reservoirs are planned to build. Today, in the context of the state-level restoration work on the liberated Karabakh territories, our scientists have great responsibilities.

Analysis of biodiversity, especially fish species in water basins located in Karabakh, determination of the level of their resources, the study of feed base are among the main tasks facing scientists. Extensive multidisciplinary research on the restoration, storage, and efficient use of fish resources is required.

It should be noted that the information on studying the biodiversity of the water basins of Karabakh in the pre-occupation period was of a general nature and mainly dominated by its fundamental importance. From an economic point of view, inland water basins were not given much importance due to the fact that the fishery in the Caspian Sea and other water basins (Kura river, Mingachevir reservoir) met the country's demand. The lack of relations of water basins in the liberated territories of Karabakh (except for Araz river and Okhchuchay) with the territories of the neighboring states creates good conditions for their ecologically clean water and development of Fisheries. Therefore, conducting complex research in the Karabakh water basins in the post-conflict period is of great importance both in terms of biodiversity protection and in terms of economy.

First of all, passportization of water basins should be carried out from the liberated zones of Karabakh.

At later stages, the following studies should be conducted sequentially:

- Passportization must be carried out in accordance with international rules in rivers and water reservoirs (location, sources of water, etc. must be specified);

- Monitoring of rivers and water basins (chemical composition of water and bottom sediments, water volume depending on the seasons, average temperature limit, etc. must be studied);

- The study of biodiversity should be organized. For this purpose, species composition and

stocks of aquatic organisms (algae, infusorias, fishes, etc.) should be determined.

- It is necessary to study the distribution of industrially important fish, their stocks, and ways to restore;

- Work should begin to explore the possibilities of aquaculture of industrially important fish in water reservoirs;

- Studies should be carried out on the transfer and adaptation of new species of fish in rivers and other water basins.

In order to carry out all these studies, permanent control points should be established.

The creation of several fish farms on the Terter River (from Kalbajar to Sugovushan) for the cultivation of commercial trout in the conditions of aquaculture can provide a certain share of demand for these products in our country. During the implementation of these works, the physiological state of fish living in the waters of the areas liberated from occupation should be studied and an appropriate ecotoxicological and parasitological study conducted.

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Qarabağ regionunun su hövzələrində biomüxtəlifliyin tədqiqinin perspektivləri

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Məqalə 30 illik erməni işğalından azad edilmiş Qarabağ ərazisinin su hövzələrində biomüxtəlifliyin elmi tədqiqatlarının perspektivlərinə həsr edilmişdir. İşğalçılar tərəfindən talan edilmiş flora və fauna hərtərəfli bərpa olunmalıdır və bir zamanlar çiçəklənən diyarın inkişafına elmi cəhətdən əsaslandırılmış yanaşmaların işlənilməsi və hazırlanması respublika alimlərinin arxasında qalır. Qarabağ ərazisində yerləşən su hövzələrinin biomüxtəlifliyinin vəziyyətinin təhlili, xüsusilə yerli ixtiofauna aid balıq növlərinin və ehtiyatlarının müəyyən edilməsi, yem bazasının potensialının öyrənilməsi alimlərin qarşısında duran birinci dərəcəli vəzifələrdir. Məqalədə Qarabağ zonasının çaylarının və digər su mənbələrinin adları göstərilir. Qarabağ ərazisində su biomüxtəlifliyinin bərpası və inkişafı üçün zəruri olan multidisiplinar tədqiqatların siyahısı təklif olunur. Məqalənin girişində Respublikanın su hövzələrində balıqların fiziologiyası və ekologiyası üzrə aparılan tədqiqatların qısa xülasəsi verilib və əsas əksent ölkə üçün mühüm sənaye əhəmiyyəti olan nəvəkimilərə yönəlmişdir.

Açar sözlər: Qarabağ, biomüxtəliflik, su hövzələri, nəvəkimilər, balıqçılıq

Перспективные исследования биоразнообразия в водных бассейнах Карабахского региона

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Статья посвящена перспективам научных исследований биоразнообразия в водных бассейнах Карабахской территории, освобожденной от 30-летней армянской оккупации. Варварски разграбленные, уничтоженные оккупантами флора и фауна, подлежат всестороннему восстановлению, и разработка научно обоснованных подходов к развитию некогда процветающего края остается за учеными Республики. Первостепенными задачами, стоящими перед учеными, являются анализ состояния биоразнообразия водных бассейнов, находящихся на территориях Карабаха, в особенности, установление видов и запасов рыб, относящихся к местной ихтиофауне, изучение потенциала кормовой базы. В статье приводятся названия рек и других водных источников Карабахской зоны, где могут быть развиты натуральное рыбоводство и аквакультура. Предлагается перечень мультидисциплинарных исследований, необходимых для восстановления и развития водного биоразнообразия на освобожденных территориях Карабаха. Статью предваряет краткий обзор работ по исследованиям физиологии и экологии рыб в водоемах Республики, акцентируя основное внимание на осетровых, имеющих промышленное значение для страны.

Ключевые слова: *Карабах, биоразнообразие, водные бассейны, осетровые, рыбоводство*