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TARGET INDICATORS FOR FOOD RESERVES IN THE SEASONAL PROPAGATION AND CULTIVATION OF FISH SPECIES HARVESTED DURING THEIR LIFE CYCLES

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Abstract
Although vertebrates—a subphylum within the phylum Chordata—are far fewer in number than invertebrates, they differ significantly due to their larger body size, complex and diverse individual structures, and a wide range of physiological and ecological characteristics. Consequently, chordates hold immense importance for human life and activity; they are harvested for their meat, skin, fur, eggs, and oil. Therefore, it is essential to preserve rare and endangered vertebrate species—specifically fish—by studying their ecology, developmental traits, reproduction, and migration patterns, and by developing technologies for their protection and cultivation. As one of the most pressing issues, it should be noted that fish serve not only as a prized food source for humans but also as a valuable raw material.

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Keywords: Nature, animal kingdom, zoology, phylum Chordata, natural resources, animals, invertebrates and vertebrates, systematics, evolutionary theory, habitat, domestication, individual, fish species, geographical distribution, developmental characteristics, ecological groups, life stages, evolutionary development, distribution, structure, vital activity, ecology, genetics, morphology, anatomy, physiology, biogeography, biological and physiological processes, migration, dispersal, Red Book, national economy, economic significance.

BALIQLARNING HAYOTIY DAVRLARIDA OVLANADIGAN TURLARINI MAVSUMIY KO‘PAYTIRISH VA YETISHTIRISHNING OZIQ-OVQAT ZAHIRASI BO‘YICHA MAQSADLI KO‘RSATKICHLARI

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Annotatsiya
Tabiatda yashaydigan hayvonlar faunasida zoologiyasi sistematik jihatdan umurtqali hayvonlar xordalilar tipiga mansub hisolansada, umurtqasiz hayvonlarga nisbatan ancha kam bo‘lib, gavdasinig yirik bo‘lishi, individlarning murakkab va xilma-xil tuzilganligi, fiziologik va ekologik xususiyatlarining turli-tumanligi bilan ulardan keskin farq qiladi.Shu bois, xordalilar inson hayoti va yashash faoliyatida beqiyos katta ahamiyatga ega bo‘lib, ularning go‘shti, terisi, mo‘ynasi, tuxumi va yog‘i uchun ovlanadi.Shuning uchun noyob va yo‘qolib borayotgan umurtqali hayvonlardan baliqlarning turlarini ekologiyasi, rivojlanish

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xususiyatlari, ko‘payishi, migratsiyasi, muhofaza qilish va yetishtirish texnologiyalari orqali ularni saqlab qolish eng dolzarb masalalardan bo‘lib, baliqlar insonlar uchun tansiq oziq-ovqat manbai bo‘lishi bilan birga qimmatli xomashyo ham hisoblanadi.

Kalit so‘zlar: Tabiat, hayvonot dunyosi, zoologiya, xordalilar tipi, tabiiy resurslar, hayvonlar, umurtqasiz va umuurtqalilar, sistematika, evolyusion nazariya, yashash muhiti, xonakilashtirish, individ, baliq turlari, geografik tarqalishi, rivojlanish xususiyatlari, ekologiya guruhlari, hayotiy bosqichlari, evolyusion taraqqiyoti, tarqalishi, tuzilishi hayotiy faoliyati, ekologiyasi, genetikasi, morfologiya, anatomiya, fiziologiya, biogeografiya, biologik va fiziologik jarayonlar, migratsiya, tarqalish, qizil kitob, xalq xo‘jaligi, iqtisodiy ahamiyati.

INTRODUCTION

Indeed, since achieving national independence, Uzbekistan has placed great emphasis on fundamentally re-evaluating and transforming its education system to align with international standards. Key initial steps in this endeavor included the adoption of the new Law on Education and the National Program for Personnel Training. In this context, the new generation of textbooks and study guides—developed by professors and educators who are actively contributing to the realization of the goals set for the higher education system—reflect the finest examples of the nation’s pride, spirit, mindset, and ideology across every field; this serves as clear evidence of our assertion. Therefore, the creation of a new generation of textbooks and study guides tailored to local and national conditions is a requirement of the times. Although vertebrates—from a systematic perspective—belong to the phylum Chordata, they differ sharply from invertebrates; they are far fewer in number, generally larger in body size, possess more complex and diverse individual structures, and exhibit a wide range of physiological and ecological characteristics. Chordates hold immense significance for human life and activity, as they are hunted or raised for their meat, hides, fur, eggs, and fats.

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Furthermore, the use of selective breeding to improve domestic animal breeds and increase the population of highly productive livestock is of great importance. It is no exaggeration to say that the conservation of rare and endangered vertebrate species—through the study of their ecology and migration patterns, combined with active protection efforts—is one of the most pressing issues today. Consequently, domesticated animals serve not only as a source of high-quality food for humans but also as a valuable source of raw materials.

In particular, scientific research of vital importance to human life and health has been conducted on various vertebrate animals. This research provides practical assistance in studying and addressing issues related to the origin, systematic classification, evolutionary development, distribution, structure, and life processes of vertebrates—encompassing fields such as ecology, genetics, morphology, comparative anatomy, physiology, and biogeography.

Object and subject of research: The study focuses on the immense diversity, habitats, ecology, and general characteristics of animals belonging to the phylum Chordata. Specifically, it involves conducting research and comparative analysis on fish—which, like other chordates, inhabit aquatic environments and have adapted to various water conditions. This includes examining the ecology, migration patterns, cultivation technologies, economic value, and economic efficiency of fish across different ecological groups. Scientific and practical significance and discussion: In terms of their life cycles and development, fish are considered cold-blooded animals; their body temperature is not constant but fluctuates directly in accordance with the temperature of the surrounding environment. Consequently, the process of heat generation within the organism—which depends on its specific physiological characteristics—occurs at a relatively slow rate. Therefore, based on general principles and an analysis of the observed phenomena, an increase in water temperature leads to higher food consumption and intensified gas exchange in fish, which in turn accelerates their growth rate, aging process, and the maturation of their reproductive organs.

Furthermore, each fish species has a specific temperature range within which it can survive. Many fish native to tropical regions thrive in water temperatures of 31°C.

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Some species even inhabit hot springs with temperatures reaching up to 45°C; for instance, fish belonging to the genus *Cyprinodon* have been observed living successfully in the waters of a hot spring in California with a temperature of 52°C. Notably, some types of fish can even withstand freezing conditions. Because these fish are capable of enduring changes in water temperature while maintaining their viability, they are classified as eurythermal animals. Conversely, some types of fish perish even with slight changes in water temperature; these belong to the group of stenothermal animals. For instance, the existence of both thermophilic (warm-loving) fish—such as catfish and carp—and psychrophilic (cold-loving) fish—such as salmon, cod, and trout—illustrates their adaptation to diverse ecological conditions. Furthermore, variations in the levels of oxygen and salt within the aquatic environment are also of significant practical importance.

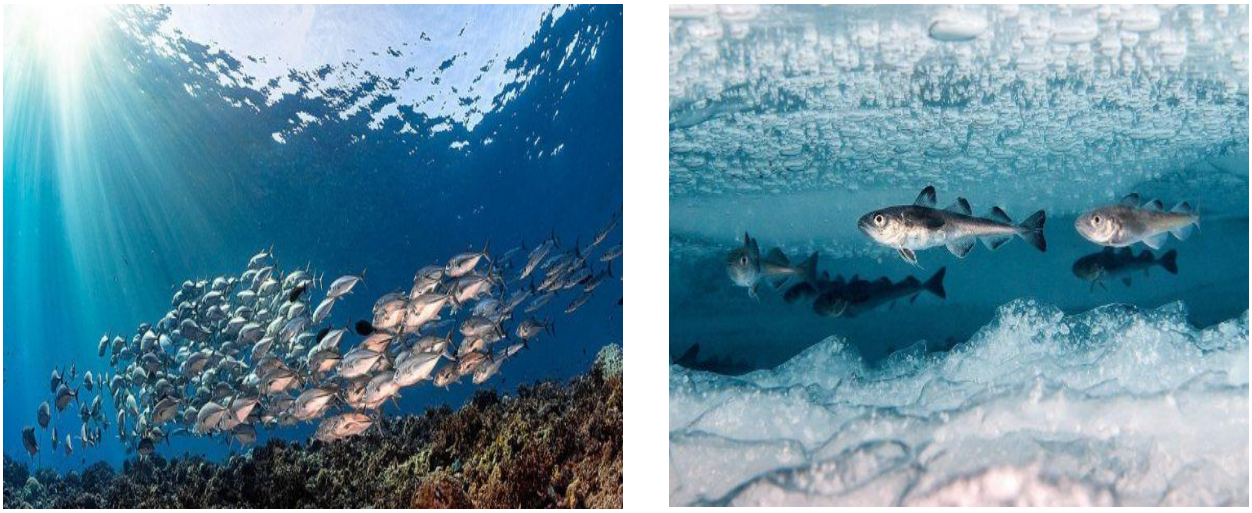


Figure 1: The ability of fish to live in various aquatic environments and their developmental stages.

Seawater is generally saturated with oxygen, and in some cases, oxygen levels can be extremely high. While some freshwater fish species also have a high demand for oxygen, seawater is primarily characterized by the presence of chloride salts, such as magnesium chloride and magnesium sulfate. Consequently, different fish species have adapted to live in waters with varying salinity levels; some can

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tolerate high salt concentrations, whereas others perish if the salt content in the water increases even slightly.

Fish feed on a wide variety of organisms. Their diet fluctuates significantly depending on the conditions of the aquatic environment, the season, and the age of the fish. Species adapted to a plant-based diet include the silver carp, grass carp, rudd, and *marinka* (a type of snow trout).

Pike, catfish, and perch are predatory; they feed on small vertebrates and invertebrates. Many fish do not feed at all during the winter, remaining in a state of torpor. In general, fish are categorized into several groups based on their dietary habits.

1. Herbivorous fish
2. Carnivorous fish
3. Predatory fish



Figure 2: Classification of fish based on feeding habits and species that are caught

Fish hold great social and economic significance for humans; in various countries, fish account for between 17% and 83%—averaging 40%—of the animal protein consumed. They are harvested as a valuable food source.

Furthermore, fish are used to produce vitamins, fish meal, fish oil, and other products. Consequently, the demand for fish products in Uzbekistan has been

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steadily increasing in recent years. To address this, intensive fish-farming methods—based on international best practices—are being developed within the republic, utilizing the Amu Darya and Syr Darya rivers as well as other water bodies.

To this end, species such as bighead carp, grass carp, and other highly productive varieties have been imported and acclimatized. Additionally, a number of fisheries in Uzbekistan currently cultivate common carp, catfish, bream, crucian carp, marinka, asp, roach, snakehead, perch, zander (pike-perch), northern pike, and various other fish species.



Figure 3: Seasonal breeding and rearing of fish throughout the year

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1-table Target indicators for fish farming in the Republic of Karakalpakstan and the regions for 2026

n	Name of Regions	In 2026 (tonnes)
1.	Republic of Karakalpakstan	25 000
2.	Andijan Region	35 000
3.	Bukhara Region	10 000
4.	Jizzakh Region	zo 000
5.	Kashkadarya Region	13 000
6.	Navoi Region	15 000
7.	Namangan Region	45 000
8.	Samarkand Region	25 000
9.	Surkhandarya Region	10 000
10.	Sirdaryo Region	40 000
11.	Tashkent Region	35 000
12.	Fergana Region	35 000
13.	Khorezm Region	45 000
	Total:	363 000

To foster the cultivation and conservation of fish in natural environments, increase their populations, and enhance economic viability, the Head of State has issued a series of decrees. Based on the tasks outlined therein, a set of measures has been planned, including the following:

1. Protecting fish spawning and breeding grounds.
2. Keeping water bodies clear of excessive debris and aquatic vegetation.
3. Safeguarding rivers, lakes, reservoirs, and ponds from toxic industrial wastewater, chemical substances, and oil spills.
4. Acclimatizing commercially valuable fish species to boost economic returns.
5. Protecting fish species whose populations are in decline, including those listed in the "Red Book" of Uzbekistan.

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Conclusion

Among chordates, the shape and size of fish change as they grow. Fish grow rapidly during the summer, while their growth ceases in the winter. This uneven growth pattern leaves an imprint on their scales and bones. Such patterns are linked to the fact that the biological conditions in which fish live—determined by their ecological groupings and taxonomic classification—fluctuate in accordance with the changing seasons of the year. Accordingly, factors such as the ecological environment, nutrition, overwintering, and migration—which occur during the most critical stages of a fish's biological development—lay the foundation for increasing food reserves and enhancing economic stability in seasonal fish farming.

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