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Bioecological Characteristics Of Fish In Natural Water Bodies (Lakes)

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Abstract: This article comprehensively examines the bioecological characteristics of fish in natural water bodies, particularly lakes. The influence of abiotic and biotic environmental factors on fish vital functions, their adaptive mechanisms, trophic relationships, and population structure is analyzed. The role of hydrological and ecological characteristics of water bodies in the formation of ichthyofauna is substantiated. The ecological groups of fish—rheophiles and limnophiles—are characterized, along with their requirements for oxygen levels, water flow, and food supply. The role of fish in the ecosystem through food chains and trophic levels is revealed. The results obtained have practical implications for the conservation of biodiversity, the rational use of fish resources, and the environmental sustainability of natural water bodies.

Keywords: Bioecology, ichthyofauna, environmental factors, rheophiles, limnophiles, population, trophic level, food chain.

Introduction: Natural water bodies, especially lakes, are among the most important ecological systems preserving biodiversity. The ichthyofauna that develops in these bodies of water develops in close connection with the hydrological, physicochemical, and biological properties of the aquatic environment. Fish play a key role in the circulation of matter and energy in aquatic ecosystems, serving as a vital link in the food chain.

In recent years, increasing anthropogenic pressure on natural water bodies, changes in water regimes, and pollution processes have had a negative impact on the bioecological state of fish. Therefore, studying fish adaptation to their environment, ecological groups, diet, and population structure is a pressing scientific challengeThe purpose of this article is to scientifically analyze the bioecological characteristics of fish in natural bodies of water (lakes), their relationship with environmental factors, and their ecological place in the aquatic ecosystem.

Fish have always lived in aquatic environments, adapting to the conditions of a particular body of water. Depending on the water bodies they inhabit, fish can be divided into various groups: marine (highly saline) fish, freshwater fish, brackish-water fish, and migratory fish.

Marine fish permanently inhabit the saltwater of oceans and seas. Oceans are large bodies of water with their own characteristics and constantly interact with the atmosphere and the Earth's crust. Some fish spend most of their lives in the seas, but migrate from salt water to fresh water to reproduce. Such fish are called migratory fish. An example is the Far Eastern salmon. Lakes differ from each other in their origin, location,

shape, size, hydrological regime and a number of other features. There are no exactly similar lakes on Earth. The lakes of Central Asia are divided into two large groups - natural and anthropogenic lakes. While natural lake basins are associated with internal and external forces of the Earth, the formation of anthropogenic lakes is the result of human economic activity. The formation, i.e. genesis, of lakes is associated with internal (endogenous) and external (exogenous) forces of the Earth, as well as the geographical location of the place, climatic conditions, geological structure, relief and other factorsAt the moment, the formation of the lake is caused by the interaction between the water mass and the lake, the lake basin and the surrounding environment. As a result, every lake has its own unique development conditions.

Water object, schitaiushchiysya azerom, following conditions:

1) predstavlyat soboy odnu ili neskolko vzaimosvyazannyx vpadin, zapolnennyx vodoy (inogda chastichno zapolnennyx);

2) raspolagatsya na opredelennnom rasstoyanii ot okeana, morey;

3) Imet pochti odinakovyy uroven vody and vodoeme i allego sostavlyayushchih chastyakh;

4) kolichestvo vody, postupayushchey v zero, malo po sravneniyu s ob'emom vody v nem, to est vodoobmen medlennyy;

5) skorost techenia v kotlovine dostatochno mala, chtoby pozvolit vzveshennym chastitsam osedat; Elements that influence a given environment in one way or another can be called influencing factors or, more simply, factors. Ecological factors are properties that influence organisms or their environment (for example, the effect of dissolved gases in water on fish). Fish ecology is a branch of ichthyology devoted to the study of fish lifestyle, specifically the nature of populations, intraspecific (gala, schooling, colonial) and interspecific changes, distribution, migration, daily and seasonal life rhythms, feeding relationships, reproduction, etc. Fish can be divided into various groups depending on the water bodies in which they live: marine (highly saline) fish, freshwater fish, brackish-water fish, and migratory fish.

METHODS

The study was conducted using literature review, synthesis, and comparative analysis. Scientific sources, textbooks, and monographs on the ichthyofauna of fish inhabiting natural waters of Uzbekistan and adjacent regions were examined.

The study included a bioecological analysis of the division of fish into ecological groups (rheophilic, limnophilic, and pelagic) and their relationships with hydrological parameters of water (flow velocity, oxygen content, and mineralization). A theoretical analysis of the food web and trophic levels was also conducted.

RESULTS AND DISCUSSION

An analysis of lakes Guk, Adzhali, and Shorkol in the Khorezm region revealed that the origin, hydrological regime, and ecological state of natural water bodies are decisive factors in shaping the fish ichthyofauna. The lakes differ in their distribution, location, water exchange, and physicochemical parameters, which directly influences the species composition and ecological adaptation of fish.

Freshwater fish are adapted to low water mineralization and constitute a significant portion of the total fish species composition. Rheophilic fish inhabit primarily flowing, oxygen-rich waters, while limnophilic fish are widespread in stagnant waters. These ecological groups are important for the feeding habits, reproductive strategies, and territorial distribution of fish. The bioecological properties of the aquatic environment support the physiological processes of fish. Water serves not only as a habitat but also as a support system and a source of oxygen and food. Fish are sensitive to dissolved gases in the water, temperature, and light conditions, and changes in these factors influence their behavior and population dynamics.

Analysis of food webs has shown that fish are an important link in aquatic ecosystems, ensuring the exchange of substances and energy between trophic levels. A significant amount of energy is lost during the transition from one trophic level to another, which directly impacts ecosystem stability. Freshwater fish spend all or most of their lives in freshwater bodies (rivers, lakes, reservoirs, canals, ponds). The habitat of freshwater fish differs from that of marine fish in the degree of water mineralization. Salinity in freshwater bodies reaches 0.05%. 41.2% of known fish species are freshwater. This diversity is due to the uniqueness of their habitat and rapid speciation. Freshwater fish can also be divided into groups:

• Rheophilic fish – adapted to life in flowing waters (streams, canals, rivers, shallow waters). Rheophilic fish require water with a high dissolved oxygen content (goldfish, marinka, false shovelnose, etc.);

• Limnophilic fishes live in permanently standing water bodies (lakes, reservoirs, ponds). (Kumi; carp, whitefish, carp, etc.). In addition, in addition to the above-mentioned groups, there are other groups: pelagic fishes—those living in the water layers—and bottom-dwelling fishes.

Organisms living in the air on Earth depend on the conditions of the atmosphere: climate, weather, gas composition of the air, type of soil on the surface, etc. Animals living in water, in turn, also depend on the properties of the water in which they live. However, the aquatic environment is very different from the air. It regularly influences organisms living in aquatic environments and satisfies their physiological needs (just as the atmosphere satisfies the needs of terrestrial animals). Furthermore, water serves as a support for the organisms living in it, supplying oxygen and nutrients, carrying away metabolic waste products, and facilitating the movement of mature reproductive products and aquatic organisms. The properties of water can be considered a set of factors important to aquatic organisms. Bioecology is an important branch of ecology that studies the interactions of living organisms (plants, animals, microorganisms) with the environment at the biological level.

Biotic factors refer to the interactions of fish with other living organisms in their habitat. Throughout their lives, fish interact with other members of their own species and with members of other taxonomic groups: microorganisms, fungi, plants, animals, including other fish species. Both types of interactions are important, so there are (a) intraspecific relationships, i.e., with other members of the species, and (b) interspecific relationships, i.e., with members of other species. Fish bioecology studies their aquatic life, behavior, feeding, reproduction, interactions with the environment (water temperature, oxygen, current, light), and ecological niche. They are adapted to perceive water flow, sound, and chemicals using their lateral lines, inner ear, and taste buds, which determines their habitat, feeding habits, and migration. In freshwater bodies, fish behavior often includes actions such as feeding, reproduction, territoriality, and the formation of simple social structures (grouping, colony formation), which ensure species survival and ecological balance.

A food chain—in its most general form—producers (plants) in bodies of water use solar energy to produce organic matter from mineral compounds, which are consumed by consumers, who then reproduce the organic matter produced by plants in their own bodies. Meanwhile, saprophytes decompose the waste products and remains of all organisms and convert them into simple mineral compounds—biogenic compounds. The organic matter produced by producer organisms is transformed (a series of changes occur) and forms the trophic level of the body of water. The first level includes plants, the second level includes herbivores, the third level includes carnivores, and so on. According to the data of scientists who conducted scientific research before me, analyzing the obtained P values, it can be noted that the main role in the external phosphorus load of the lake belongs to the external flow coming in the form of DIP (its consumption by the river flow is 0.197 mg P / (l per year) or 70.7% of the total phosphorus consumption. The share of DP and DOP is 21.2 and 2.1%, respectively. As can be seen from the modeling results, DIP predominates among the phosphorus forms (76.4%). The greatest removal of phosphorus by the water flow occurs in the form of DIP (50.6%) and in the sum of phytoplankton and bacteria F + B (23.4%), as well as phosphorus in detrital DP

(17.3%) and organic phosphorus in DOP (8.7%). This is probably due to the fact that the above-mentioned part of the phosphorus forms is associated with phytoplankton and bacteria, and some is carried by the flow. Path The process of transformation of organic matter into trophic levels This is called a food chain. During the transition from one trophic level to another, some organic matter is lost as undigested residues, which are used for metabolism. During the transition from one trophic level to another, 60-70% of the energy received with food is lost.

CONCLUSION

The ecological and hydrological characteristics of natural water bodies are among the main factors determining the bioecological state of fish. The division of fish into rheophilic and limnophilic ecological groups is closely linked to water flow, oxygen levels, and feeding conditions. Bioecological research in natural water bodies must be intensified to ensure the rational use of fish resources and the conservation of biodiversity.

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