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Certain fish species of fishery importance in the part of aras reservoir within Nakhchivan autonomous republic

Shafa Karımova*

Department of Fishery, Fergana State University, Nakhchivan

*Corresponding authors. E-mail: universitet26781@gmail.com

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ABSTRACT

The study is dedicated to the identification of fish species that have fishery importance and distributed over the part of Aras water reservoir within the Nakhichevan Autonomous Republic. The study was conducted between 2018 and 2021. Samples were collected by means of nets, strainers and fishing rods. Materials (samples) captured by "Nakhchivan Fish Farm" were also used during the study. 14 fish species with fishery importance were identified in the study area: *Acipenser stellatus kurensis, Rutilus (rutilus) caspicus, Ctenopharyngodon idella, Aspius aspius taeniatus, Luciob arbus capito, L. lacerta cyri, Blicca bjoerkna transcaucasica, Abramis brama orientalis, Cyprinus carpio, Hypophth almichthys molitrix, Carassius auratus gibelio, Capoeta sevangi, Silurus glanis* and *Sander lucioperca*. The article provides detailed information on 6 species with fishery importance (*Aspius Aspius taeniatus, Blicca Bjoerkna, Abramis Brama Orientalis, Carassius Auratus Gibelio, Cyprinus Carpio, Silurus glanis)* that bear essential significance for the territory of Autonomous republic.
Keywords: Aras water reservoir, Fisher, species, *Cyprinus carpio,* Biodiversity, Taxonomic status

INTRODUCTION

Water is very valuable and irreplaceable resource not only for humans, but also for all the plants and animals that make up the ecosystem, and one of the most important environmental factors that sustain life. Groundwater and surface water are used in agriculture, transport, mining, in many areas up to drinking, including for economic purposes.

However, there is double-sided pressure on water resources as a result of both human activities and changes in nature (Azerbaijan, 2014). The Nakhchivan Autonomous Republic, with an area of 5,500 km^2, has more than 400 large and small rivers, with a total length of 504.8 km. In addition, reservoirs with an increasing capacity of 1,603.52 million m^3 were constructed. The diversity of environmental conditions in the region, differences in altitude, diversity of relief and different climatic conditions have led to a very abundant biological diversity (Bayramov A et al. 2014).

Biodiversity is a great information treasure, a huge natural library that humanity can use in the future. Self-renewable natural resources serve as the future insurance of mankind. Sustainability of human life mainly depends on these resources that continue to renew themselves. Throughout the history, the study of the morphology and taxonomy of fish was the main source of information in the stages of development of living things.

Although almost the entire world is covered by water, freshwater resources constitute a very small part of it. In terms of natural resources, freshwater is the main source of human life; there is a need for water in all areas of life. Since our country has different basins, rich biodiversity has been formed in our freshwaters. The Aras River, which flows through the area, is one of the most important habitats of the autonomous republic and many other fish species that have significance for fishery (Aliyev AR et al. 2016).

Although genetic, physiological behaviour and environmental data are also available for taxonomic and systematic research, ichthyologists who deal with

systematics mainly use signs and symbols based more on classical morphology in determining taxonomic traits (Mammadov TM. 2006).

The taxonomic status of many freshwater fish species distributed in the region is not fully understood and clarified (Mammadov TM et al. 2006). To date, many studies have been conducted to identify freshwater fish fauna in the area, and these studies are still on-going. Since 1926, numerous works have been developed based on studies on the systematics of inland waters of the Autonomous Republic, and at the end of the assessment it was determined that the area is inhabited by 33 species and sub-species that pertain to 6 orders, 9 families, and 28 genera (Mustafayev NJ et al. 2016)

MATERIALS AND METHODS

Fish samples for the study were collected from the main characteristic biotopes of the reservoir during spring, summer and autumn seasons of years of 2018-2021.

Morphological and bio-ecological features of fishes distributed broadly in the reservoir and having fishery importance (carp, asp, white bream, common bream, catfish, silver bream) was learned during the study. Upon the collection of existing samples, study activities were conducted over those samples. Commonly recognized study methods were used in collection and analysis of materials.

The hunted fish samples were transferred to the laboratory and were fixed in 4% formaldehyde solution in the jars and special container. After the samples were identified at the species level, 15-20 individuals of each species and subspecies were taken, and their morphometric and meristematic characteristics were studied. Photographs of individuals of each species were taken, and body colors and patterns were determined on fresh samples. The index of morphological features is expressed as a percentage of body length (L) and head length (C). The following symbols were used in the analysis of the study:

L=Total body length of the fish; l=The distance from the tip of the head to the end of the scales; c=The length of the head; hc=height of the head; o=Eye diameter; ao=Length of the nose; io=width of forehead; po=The tear part of the head; AD=Antidorsal Distance; PD=Postdorsal Distance; aV-Antiventral distance; aA=Antianal distance; lcaud=length of the tail body; H=maximum Height of the body; h=Smallest height of the body; lD=The length of the base of the dorsal fin; hD=Height of dorsal Fin; lA=Length of the anal fin base; hA=Height of Anal Fin; lP=Length of pectoral fin; lV=Length of Ventral (pelvic) fin; P-V=Distance Between Pectoral And Ventral Fins; V-A-Distance Between Ventral And Anal Fins; Cl=Length of Upper Part of Tail Fin (caudal fin); C2=Length Of Lower Part of Tail Fin; ll=the number of scales in the lateral line body; nss=the number of scales above the lateral line body; nsi=the number of scales below the lateral line body.

Southern Caspian *asp-Aspius aspius taeniatus* (Eichwald)

Asp. A. aspius taeniatus (Eichw). Besides creating a local population in the Nakhchivan Reservoir within the Nakhchivan Autonomous Republic, local forms are also widespread in the Aras and Arpachay rivers. The local form of asp is important for fishery only in the Nakhchivan reservoir. Currently, it is spread in all areas of the reservoir (Figure 1).

Figure 1: Southern Caspian Asp-*Aspius aspius taeniatus*.

Meristematic omens (signs): The semi-migration asp population widespread in Nakhchivan water reservoir owns the following meristematic omens: D III 8-9, A III 12-14. ll 74(11-13/5-6)78. The gullet teeth are in two rows; the number is 3,5-5,3. There are 8-11 small teeth in first gill circle.

Plastic omens. The percentage (%) ratio of plastic omens to the body length: c-23,84 ± 0,17; hc-14,17 ± 0,09; r-6,16 ± 0,08; po-14,73 ± 0,07; o-3,40 ± 0,07; io-7,59 ± 0,05; H-23,39 ± 0,20; h-9,44 ± 0,08; aD-51,66 ± 0,24; pD-38,31 ± 0,44; pl-21,91 ± 0,18; lD-11,14 ± 0,11; hD-18,59 ± 0,15; lA-13,83 ± 0,10; hA-16,77 ± 0,02; lP-17,81 ± 0,13; lV-14,17 ± 0,11; lC-20,93 ± 0,14; P-V-22,05; ± 0,19; V-A-19,59 ± 0,16.

The percentage (%) ratio of plastic omens to the head length: r-24,50 ± 0,21; o-14,23 ± 0,24; io-31,90 ± 0,46; po-61,87 ± 0,43; hc-59,42 ± 0,50.

White bream-*Blicca bjoerkna* Linne (1758)

The Southern Caucasus white bream is distributed over all areas of Nakhchivan water reservoir. In fish hunting, the white bream is the secondary important fishery species in water catchment. The white bream is found within the reservoir, the areas that are not too much deep (Garachug, Shorsu, Yamkhana etc.). The conducted studies and results of fish hunting organized by fishery artel demonstrated that the white bream fries are third among the captured fish according to the quantity (Figure 2).

Figure 2: Southern Caucasus white bream-*Blicca bjoerkna transcaucasica.*

Meristematic omens (signs): According to the results of the conducted studies, meristematic omens of Nakhchivan population of Southern Caucasus white bream own the following features: ll 43 (7-8/5-6) 46, D III 8-9, A III 17-19. The gullet teeth are located in two rows; the number is 2,5-5,2. The teeth are concave on the sides; the chewing surface is slightly sloping and there is a weak hook at the end. Some of them are in jagged forms. The number of small teeth in first gill circle (in studies 21 fish) is 12-19.

Plastic omens: The percentage (%) ratio of plastic omens to the body length: c-20,28 ± 0,69; hc-17,68 ± 0,36; H-43,00 ± 0,20; h-12,06 ± 0,09; aD-57,71 ± 0,34; pD-33,61 ± 0,59; pl-11,55 ± 0,78; lD-13,61 ± 0,17; hD-28,59 ± 0,42; lA-23,66 ± 0,29; hA-18,86 ± 0,19; lp-18,44 ± 0,19; lV-17,16 ± 1,20; p-V-23,54 ± 0,39; V-A-22,08 ± 0,27; r-5,09 ± 0,10; o-5,72 ± 0,06; po-10,81 ± 0,17

The percentage (%) ratio of plastic omens to the head length: p-24,59 ± 0,66; o-27,66 ± 0,08; no-52,80 ± 0,70; uo-43,12 ± 0,48.

Common bream-*Abramis brama orientalis* Berg

Common bream belongs to widespread semi-migration fish group. Common bream is found in Nakhchivan water reservoir since 1995 (Figure 3).

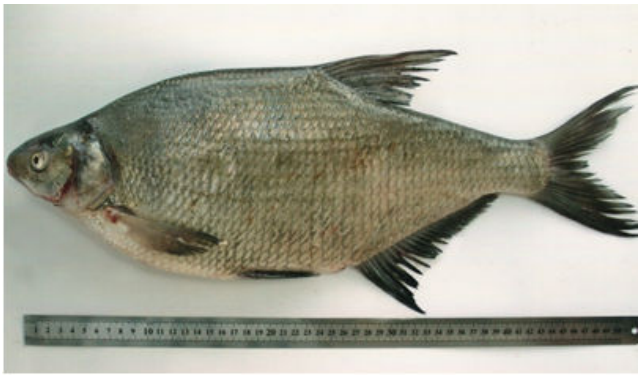

Figure 3: Eastern bream-*Abramis brama orientalis*.

Meristematic omens (signs): The common bream widespread in Nakhchivan water reservoir is characterized by the following meristematic omens: D III 9-10, A III 24-29, the number of scales on the lateral line body makes 53-57 rows; number of scales above the lateral line body: 10-12 rows; number of scales below the lateral line body is 6-7 rows. The number of small teeth in first gill circle; the number of spinal vertebras is 39-43; the gullet teeth are located in one row; their number is either 5-5 or 6-5.

Plastic omens. The ratio of omens to body length (l), in (%): c-21,99 ± 0,09; hc-18,47 ± 0,07; o-5,13 ± 0,04; ao-7,66 ± 0,07; io-8,32 ± 0,04; po-11,69 ± 0,06; H-40,67 ± 0,10; h-11,26 ± 0,05; aD-60,05 ± 0,12; aV-42,24 ± 0,12; aA-64,30 ± 0,17; pD-40,01 ± 0,11; lcaud-14,47 ± 0,06; lD-13,63 ± 0,04; hD-29,38 ± 0,05; lA-29, ± 0,05

Silver Crucian carp-*Carassius auratus gibelio* (Bloch)

Crucian carp is widespread almost all over the water reservoir; it is especially dense in the shallow areas where the bottom is silty and higher aquatic plants are developed intensively. In 1977-1987, it was among the last positions in important fish hunting *via* fishery artels. However, its portion increased up to 256 tons in general fish hunting during 1990-2000, thus taking second place (Figure 4).

Figure 4: Silver Crucian Carp-*Carassius auratus gibelio*.

Meristematic omens (signs): The meristematic omens of Nakhchivan population of silver carp are expressed through the following indicators: the number of scales on the lateral line body varies between 24-34, while being on average 31,55 ± 0,13; the number of rays on dorsal fin is D III.16-18, sometimes 19, in anal fin-A III. 5-6, and the number of small teeth in first gill circle varies between 40 and 50's.

The percentage (%) ratio of plastic omens to the head length: ao-6,39 ± 0,10; o-4,97 ± 0,08; po-12,89 ± 0,16; c-24,41 ± 0,22; hc-21,60 ± 0,20; io-10,00 ± 0,23; H-44,64 ± 0,90; h-16,66 ± 0,18; aD-50,09 ± 0,27; oD-20,35 ± 0,39; aA-74,79 ± 0,79; pl-17,17 ± 0,37; lD-39,55 ± 0,29; hA-19,57 ± 0,15; lA-11,85 ± 0,71; hA-14,64 ± 0,20; lp-18,25 ± 0,57; lv-20,15 ± 0,17; lc2-26,78 ± 0,35; P–V-20,27 ± 0,19; V-A-29,94 ± 0,32; hc-88,39 ± 0,77;

The ratio of omens to the length of the head in percentage (%): o-20,77 ± 0,36; ao-26,87 ± 0,47; io-41,65 ± 0,32; po-54,53 ± 0,36

Common carp-*Cyprinus carpio* Linne

The morphological features of carp in Nakhchivan water reservoir are characterized due to their meristematic and plastic omen indicators. The plastic and meristematic omens were calculated based on the ratio of average value of biometric measurements done over 50 fish samples (13 females, and 37 males) to the body length in %. No sexual dimorphism was found between female and male individuals neither in our studies nor other

conducted research works (Figure 5) (Talybov TH et al. 2016).

Figure 5: Common carp-*Cyprinus carpio.*

Meristematic omens (signs): The carp individuals of Nakhchivan water reservoir population have the following meristematic omens: ll 36 (5-6/5-6) 40, D III-IV 17, 21, in most cases 18, 19, A III-5 (4); the gullet teeth are located in three rows; they own chewing surfaces, the number is 1.1.3-3.1.1. The number of spines is 36-40, on average-38,4.

Plastic omens: c-21,99 ± 0,09; hc-18,47 ± 0,07; o-5,13 ± 0,04; ao-7,66 ± 0,07; io-8,32 ± 0,04; po-11,6 ± 0,06; H-40,67 ± 0,10; h-11,26 ± 0,05; aD-60,05 ± 0,12; aV-42,24 ± 0,12; aA-64,30 ± 0,17; pD-40,01 ± 0,11; lcaud-14,47 ± 0,06; lD-13,63 ± 0,04; hD-29,38 ± 0,05; lA-29,61 ± 0,05

Catfish-*Silurus glanis* Linne

The catfish is widespread in all areas of Nakhchivan water reservoir. It mainly is observed with groups in the areas where rivers collude with the reservoir. The catfish has formed local population in Nakhchivan water reservoir (Figure 6).

Figure 6: Catfish-*Silurus glanis*.

Meristematic omens: The derived results were as the following: D 3-4, A 83-91, PI. 13-17, V 10-13., C 14-17.

Plastic omens: The ratio of plastic omens to the body length, in %: c-17,38 ± 0,18; hc-11,64 ± 0,15; o-1,37 ± 0,03; po-12,95 { 0,08; aD-30,01 ± 0,41; pD-67,20 ± 0,70; p-V-17,36 ± 0,16; V–a-6,45 ± 0,10; H-21,64 ± 0,65; lD-0,99 { 0,01; hD-6,04 { 0,05; lA-60,75 ± 0,17; lP-11,94 ± 0,15; lv-7,10 ± 0,18; io-10,80 ± 0,08; r-5,26 ± 0,06; er-10,61 ± 0,09.

The percentage for the ratio of head length (%): io-49,08 ± 1,03; o-6,24 ± 0,19; po-58,71 ± 1,07; hc-52,71 ± 1,07; r-23,87 ± 0,49; lr-48,04 ± 0,84.

RESULTS AND DISCUSSION

According to the results of the conducted studies, there was an objective set for the identification of important fish species in the part of the Aras River belonging to the Nakhchivan Autonomous Republic. During the study period, 14 fish species were identified in the aquifers of the autonomous republic, including 11 species from the family Acipenseridae, 11 species from the family Cyprinidae, 1 species from the Siluridae family, and 1 species from the Percidae family; the sum was 14 species belonging to 4 families. Out of these species, 6 are the most important species among the fish species of the autonomous republic that have significance for fishery (Derzhavin AN et al. 1949).

According to general assessment, fish fauna of Aras River mainly consists of the representatives of Cyprinidae family. The results of the study were compared with the results of similar previous studies, and no significant differences were found in terms of taxonomic and geographical distribution (Kuliev ZM. 1976). It is believed that small differences may be due to regional and environmental factors.

All freshwater systems around the world, along with the creatures that live there, are expose to danger from human activity and human interaction. These hazards include habitat degradation and fragmentation, competition for water resources, species distribution, pollution, commercial exploitation, and climate chang (Mamedov TM et al. 1987). Such activities lead to erosion and sedimentation, destruction of waterfront vegetation, and changes in water flow and temperature. These, in turn, have a major impact on the reproductive biology and survival of aquatic organisms (Mamedov TM et al. 1989).

During the study, illegal hunting was observed in summer and winter months. For this reason, in order to ensure the sustainability of our country's natural resources and pass them on to future generations without destruction, legal protection measures such as combating biological contraband must be strengthened, and the education and awareness of the local population must be enhanced (Farajov GR et al. 1989).

CONCLUSION

One of the most important issues is the development of a modern fish fauna map of our country and the establishment of a database, bringing together the inland water fauna studies conducted by the relevant agencies. It is necessary to discuss the information obtained from the studies within the relevant organizations of the region, to protect water resources, to educate the

population of the region, to conduct regular monitoring of fauna data of water resources at certain annual intervals.

It is important to develop an important model for endangered fish species in the Nakhchivan Ministry of Ecology and Natural Resources Action Plan for Species Conservation, which will play an important role in protecting key fish species in future generations for biodiversity. Because fish are an economically valuable resource, they are even more important in biodiversity.

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