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Some Ecological Features of Fish Species Common in Lake Dengizkul, Uzbekistan

Atamuratova Mukhayya Sh.[2], Sobirov Jobir J.[2], Namozov Sirojiddin M.[2], Quvatov Asqar Q.[1], Karimov Nariman A.[3], Akhmedov Vakhidjon N.[4]

[1]Alfraganus University, Tashkent, Uzbekistan
[2]Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan, Tashkent
[3]Academy of Accountants" Limited Liability Company, Tashkent, Uzbekistan
[4]Republican Research and Production Center for Termite Control, Tashkent, Uzbekistan

*Corresponding Author: a.quvatov@afu.uz; asqarquvatovxabb@mail.ru

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ABSTRACT

The article presents both literary sources and field research data on the ecological characteristics of commercially and non-commercially important fish species inhabiting Lake Dengizkul. It reviews information on the distribution of fish species relative to the lake's water level, their occurrence along the shoreline, their depth-related distribution at different life stages, and their numerical dominance. Habitat coordinates for the identified species were recorded, and a geographic information system (GIS) map was developed. For test catches, fishing nets with mesh sizes ranging from 10 to 70mm and lengths between 70 and 100m, made of silk and synthetic fibers, were employed. More than 900 individuals representing various fish species were recorded during over 100 net casting and retrieval trials. Based on these scientific observations, 18 fish species were identified in Lake Dengizkul. It was further noted that the salinity of the lake water is relatively high, reaching 20– 25g/ L along the eastern shore.

INTRODUCTION

Lake Dengizkul is located 75– 80km southwest of the center of Bukhara and 30km south of the center of the Alot district (coordinates: 39.142207, 64.117346), with a total area of 45 thousand hectares. The reservoir borders the Republic of Turkmenistan. Dengizkul was originally the last confluence of the Zarafshan River, with a water content of 0.08–1.5 billion m³, a maximum depth of 30m, an average depth of 10m, and a total water content of 5700 million m³. Currently, the total water volume of this reservoir is 2800 million m³, and the main sources of water in the lake are the discharge channels of ABMK-1, ABMK-2, and the Dengizkul collector **(Abdullayev & Urchinov, 1989)**.

Lake Dengizkul is one of the largest natural reservoirs in Uzbekistan, where fishing activities are conducted at a high level. Each year, a certain number of juvenile carp species are stocked into the lake system. At present, the study of individual ecological features—such as distribution, depth-related location, and the condition of species composition in schools—of commercial fish species living in Lake Dengizkul is considered an important task for advancing

theoretical aspects of fish science. This, in turn, emphasizes the necessity of studying the ecological characteristics of commercial fish species.

In Uzbekistan's reservoirs, studies of ichthyofauna have been carried out, focusing on species composition, distribution, and morphological and ecological features **(Kessler, 1874, 1877; Berg, 1905, 1948, 1949a, b)**. In particular, ichthyologists have conducted significant research on the biology and ecology of both native and acclimatized fish species in natural lakes and commercially important reservoirs, as well as their reproductive characteristics and morphological indicators **(Kamilov, 1973; Nuriyev, 1985; Abdullayev & Urchinov, 1989; Amanov *et al.*, 1990; Khakberdiyev, 1994; Mirzayev, 1994)**.

Additionally, studies have been conducted on the ichthyofauna and species composition of fish in Lake Dengizkul, as well as the hydrobionts of the reservoir **(Bo'riyev *et al.*, 2022; Shodmonov *et al.*, 2022)**.

Research has also addressed the hydrobiological state of Lake Dengizkul, its composition, and its significance in fisheries management **(Abdullayev *et al.*, 1981)**. Furthermore, bioecological indicators of economically important fish species that historically inhabited the Zarafshan River—once a natural source of nutrition for Lake Dengizkul—were examined **(Khasanov & Ergashev, 1983; Sayfullayev, 1983)**.

Despite this research, the study of bioecological indicators of fish species common in Lake Dengizkul remains one of the pressing issues of our time.

Lake Dengizkul was once a natural lake of great importance for fisheries. Today, however, the potential for fish farming is declining due to reduced water volume and increasing salinity. Scientific studies are currently being carried out on Lake Dengizkul as part of the State program for fisheries development.

MATERIALS AND METHODS

The data collected in Lake Dengizkul during studies conducted in the spring and summer of 2025 were used as scientific material. Approximately, 100 test catches were carried out in different parts of the lake (Fig. 1). Following standard ichthyological measurements and recording procedures, more than 900 specimens representing 18 species were examined and subsequently released back into the lake.

Material was collected in the evening (18:00–19:00) using fishing nets of various mesh sizes (silk, synthetic, "chameleon") by the evening setting and morning lifting method. To capture small fish species and juveniles in coastal zones, specially prepared fine-mesh nets and a "Breden" installation (10–12 meters wide) were employed. Sampling of fish species inhabiting the mid-lake zone (1– 3km from shore) and deeper areas (10– 15m) was conducted with the aid of a Garmin echo sounder (model 2019, range up to 3m). Additionally, the species list was supplemented with fish specimens obtained from local fishermen.

Processing, correlation, regression, and statistical analyses were carried out according to the methodology of G.F. Lakin **(Lakin, 1990)**. In ichthyological research, generally accepted standard methods were applied **(Pravdin, 1966)**, while digital data were analyzed using methods of

variational statistical analysis **(Rokitskiy, 1967)**. The species composition of fish was determined based on established references **(Kessler, 1874, 1877; Berg, 1905, 1948, 1949a, b)**.

Determination of fish sample parameters, data processing, enumeration, and computational work were performed using computer programs and statistical tools **(Microsoft Excel, 2019)**.

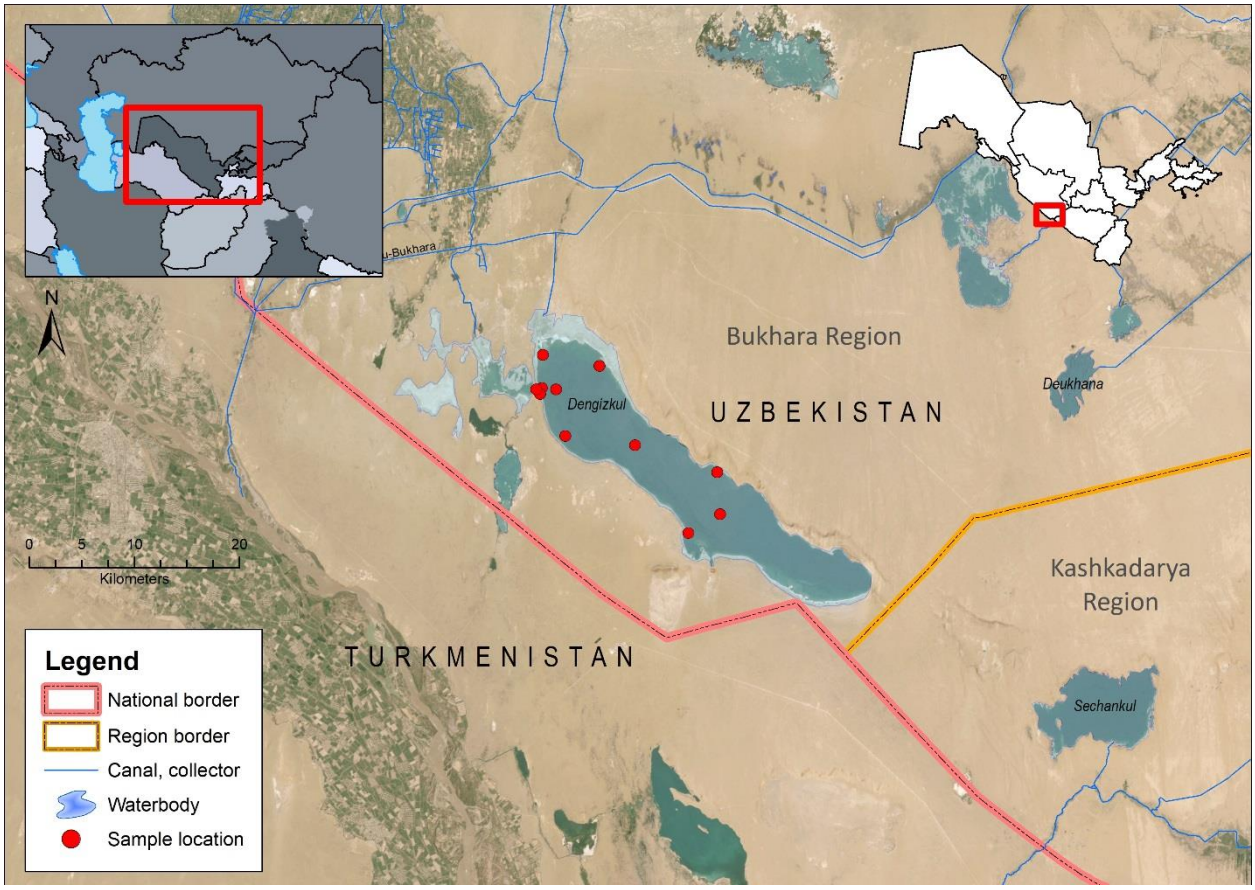

Fig. 1. Points of ichthyological research and map of the Geographic Information System of Lake Dengizkul. The coordinate 39.142207, 64.117346

RESULTS

During ichthyological studies conducted in Lake Dengizkul, 18 fish species were identified. The ichthyofauna of the lake consists of species of both commercial importance and low-value (weed) species.

Twelve fish species of commercial importance were recorded: silver crucian carp (*Carassius gibelio* Bloch, 1782), common carp (*Cyprinus carpio* Linnaeus, 1758), pike perch (*Sander lucioperca* Linnaeus, 1758), white amur (*Ctenopharyngodon idella* Valenciennes, 1844), Aral roach (*Rutilus aralensis* Berg, 1916), eastern bream (*Abramis brama orientalis* Berg, 1949), Aral shemai (*Chalcarburnus chalcoides aralensis* Berg, 1923), silver carp (*Hypophthalmichthys molitrix* Valenciennes, 1844), bighead carp (*Aristichthys nobilis* Richardson, 1845), Aral asp (*Aspius aspius*

iblioides Kessler, 1872), Amur snakehead (*Channa argus* Cantor, 1842), and European catfish (*Silurus glanis* Linnaeus, 1758).

In addition, six fish species of no commercial value were identified: stone moroco (*Pseudorasbora parva* Temminck & Schlegel, 1846), sharpbelly (*Hemiculter leucisculus* Basilewsky, 1855), brook abbottina (*Abbottina rivularis* Basilewsky, 1855), Turkestan gudgeon (*Gobio lepidolaemus* Kessler, 1872), eastern mosquitofish (*Gambusia holbrooki* Girard, 1859), and long-nosed goby (*Rhinogobius brunneus* Temminck & Schlegel, 1845) (Table 1).

Table 1. Species composition of the ichthyofauna of Lake Dengizkul (as of the summer period of 2025)

No	Species name	Species status	Population status of a species	Coordinates
1	*Carassius Gibelio* (Bloch, 1782)	Commercial species	Satisfactory	39°11'20.02"N, 64°6'1.32"E 39°6'11.65"N, 64°14'9.19"E 39°4'2.52"N, 64°14'28.84"E
2	*Cyprinus carpio* (Linnaeus, 1758)	Commercial species	Satisfactory	39°11'20.02"N, 64°6'1.32"E 39°6'11.65"N, 64°14'9.19"E 39°4'2.52"N, 64°14'28.84"E
3	*Ctenopharyngodon idella* (Valenciennes, 1844)	Commercial species	Unsatisfactory	39°10'0.02"N, 64°3'14.06"E 39° 7'38.56" N , 64° 4'0.87" E
4	*Rutilus aralensis* (Berg, 1916)	Commercial species	Fine	39°7'21.55"N, 64°8'39.00"E 39°7'38.56"N, 64°4'0.87"E 39°11'20.02"N, 64°6'1.32"E
5	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	Commercial species	Unsatisfactory	39°10'0.02"N, 64°3'14.06"E 39°6'11.65"N, 64°14'9.19"E
6	*Aristichthys nobilis* (Richardson, 1845)	Commercial species	Unsatisfactory	39°10'1.85"N, 64°2'18.53"E 39°10'0.02"N, 64°3'14.06"E
7	*Sander lucioperca* (Linnaeus, 1758)	Commercial species	Satisfactory	39°11'20.02" N , 64°6'1.32"E 39°6'11.65"N, 64°14'9.19"E 39°4'2.52"N, 64°14'28.84"E
8	*Chalcarburnus chalcaoides aralensis* (Berg, 1923)	Commercial species	Unsatisfactory	39°7'21.55" N , 64°8'39.00"E
9	*Abramis Brama orientalis* (Berg, 1949)	Commercial species	Unsatisfactory	39°10'0.02"N, 64°3'14.06"E
10	*Hemiculter leucisculus*	It has no commercial	Satisfactory	39°11'43.82"N, 64°2'14.52"E 39°9'43.74"N, 64°2'11.63"E

	(Basilevsky, 1855)	value.		
11	*Pseudorabora parva* (Temminck et Schlegel, 1846)	It has no commercial value.	Satisfactory	39°9'43.74"N, 64°2'11.63"E
12	*Aspius aspius iblioides* (Kessler, 1872)	Commercial species	Unsatisfactory	39°11'20.02"N, 64°6'1.32"E 39°6'11.65"N, 64°14'9.19"E 39°4'2.52"N, 64°14'28.84"E
13	*Abbottina rivularis* (Basilevsky, 1855)	It has no commercial value.	Unsatisfactory	39°11'43.82"N , 64°2'14.52"E 39°9'43.74"N, 64°2'11.63"E
14	*Gobio lepidolaemus* (Kessler, 1872)	It has no commercial value.	Satisfactory	39°11'43.82"N, 64°2'14.52"E 39°9'43.74"N, 64°2'11.63"E 39°9'57.34"N, 64°1'55.16"E
15	*Channa argus* (Cantor, 1842	Commercial species	Unsatisfactory	39°2'59.94"N, 64°12'27.69"E 39°10'1.85"N, 64°2'18.53"E
16	*Silurus glanis* (Linnaeus, 1758)	Commercial species	Unsatisfactory	39°10'1.85"N, 64°2'18.53"E
17	*Gambusia holbrookii* (Girard, 1859)	It has no commercial value.	Fine	39°11'43.82"N, 64°2'14.52"E 39°9'43.74"N, 64°2'11.63"E 39°9'57.34"N, 64°1'55.16"E
18	*Rhinogobius brunneus* (Temminck et Schlegel, 1845)	It has no commercial value.	Fine	39°11'43.82"N, 64°2'14.52"E 39°9'43.74"N, 64°2'11.63"E 39°9'57.34"N, 64°1'55.16"E

Note: In the table: the column “Species Status” provides information on the current status of the species in Lake Dengizkul; the column “Population Status” provides data on the distribution of the species in the lake; the column “Coordinates” provides information on the locations where the species were recorded during test catches.

A total of 12 species of commercial importance and 6 species of no commercial importance were recorded in Lake Dengizkul. Their brief ecological characteristics are provided below.

Commercially important species

- **Silver crucian carp (*Carassius gibelio*)**

  This species is widespread throughout the lake. During research in April 2025, test fishing with five synthetic nets (70 m long, 2 m wide, mesh size 32 mm) recorded 19 specimens. Juveniles up to age group 1+ primarily inhabit coastal zones, while adults are distributed at depths of 7–9 m. At depths greater than 15 m, the species is rare.

- **Common carp (*Cyprinus carpio*)**

  Observations in spring and summer 2025 confirmed the presence of carp in all parts of the lake in satisfactory numbers. Test catches using five nets (70m long, 2m wide, mesh size 28– 55mm) yielded 10–20 specimens per set. Juveniles were found mainly in shallow

waters (2– 3m), while adult fish (age groups 5+–6+) were located at depths of 8– 12m or deeper. During spawning, adults were also observed in coastal zones.

- **Pike perch (*Sander lucioperca*)**
  Found throughout the lake, but in small numbers. Test catches generally yielded 3–8 specimens per set of nets (70m long, 2m wide, mesh size 28– 55mm). Juveniles occupied shallow waters (2– 3m), while adults (5+–6+) were found at depths of 14– 17m or more. Large individuals occurred mainly in deep-water areas (18– 20m), but were rare in catches. Fishermen's catches consisted primarily of 2+–3+ age groups.
- **Aral roach (*Rutilus aralensis*)**
  Recorded in large numbers across all parts of the lake. Test catches averaged 50–150 specimens per set of nets (70m long, 2m wide, mesh size 28 mm). The species concentrated at depths of 2– 5m, with only occasional presence at depths greater than 6m. It fed on small aquatic organisms in vegetated coastal zones. Most of the catch consisted of individuals aged 2+–3+. Although widespread, the species has no significant economic value.
- **Eastern bream (*Abramis brama orientalis*)**
  Found in small numbers, mainly in freshwater inflow zones supplied by the Amu–Bukhara Canal. During summer 2025, individuals 20– 25cm long (age groups 2+–3+) were recorded in the western part of the lake, preferring coastal depths of 3– 5m.
- **Aral shemai (*Chalcarburnus chalcoides aralensis*)**
  Found everywhere in the lake but in small quantities. During summer 2025, individuals were concentrated near inflow areas, especially within 500– 800m of wastewater discharge zones. Most individuals were observed at depths of 4– 6m.
- **White amur (*Ctenopharyngodon idella*)**
  An acclimatized species found in different parts of the lake, though in small numbers.
- **Silver carp (*Hypophthalmichthys molitrix*)**
  The population is maintained mainly by stocking and juvenile releases, although some individuals also enter via canals and collectors. Most were found in the western part of the lake, especially in discharge zones. Juveniles inhabited vegetated coastal areas, while adults were recorded at depths of 3– 7m.
- **Bighead carp (*Aristichthys nobilis*)**
  Present in small numbers, with populations sustained by annual stocking conducted by local fishermen.
- **Aral asp (*Aspius aspius iblioides*)**
  Found in small numbers across the lake. Test catches in summer 2025 recorded individuals in the western part of the reservoir, while fishermen reported captures elsewhere. This species is most often found 0.5– 2km from the shore at depths of 6– 8m.
- **Amur snakehead (*Channa argus*)**
  Extremely rare in the lake. Recorded only in the western part during summer 2025, in reed-covered coastal zones at depths of ~0.5 m. Juveniles occupied vegetated shoreline habitats.

- **European catfish (*Silurus glanis*)**
  Also, extremely rare. Test catches using five nets (70m long, 2m wide, mesh size 28–60 mm) yielded only 3–6 specimens per set. Fishermen occasionally reported additional captures.

Non-commercial species

- **Stone moroko (*Pseudorasbora parva*)**
  Recorded mainly in discharge zones and areas where canal and collector waters enter the lake.
- **Chinese false gudgeon (*Abbottina rivularis*)**
  Numerous in the western part of the lake, particularly in coastal areas and shallow waters (0.5– 1m).
- **Turkestan gudgeon (*Gobio lepidolaemus*)**
  Found in small numbers, mainly in western coastal areas near inflows.
- **Sharpbelly (*Hemiculter leucisculus*)**
  Distributed mainly in canal and collector inflow zones and adjacent coastal areas. Control catches using fine-mesh nets (70m long, 1.5m wide, mesh size 10mm) yielded about 20 individuals.
- **Eastern mosquitofish (*Gambusia holbrooki*)**
  Widespread throughout the lake, but most abundant in vegetated coastal zones (0.5– 1m in depth).
- **Long-nosed goby (*Rhinogobius brunneus*)**
  Common across all parts of the lake, with primary habitats in coastal zones. Often forms mixed aggregations with mosquitofish.

DISCUSSION

In general, the number and resources of commercially important fish species inhabiting Lake Dengizkul are in an unsatisfactory state. The lake system is annually stocked with juvenile herbivorous carp species, which helps sustain the populations of silver carp and bighead carp.

Historical data indicate that between 1990 and 1995, fishing yields in Lake Dengizkul were high: in addition to pike perch, carp, Aral roach, and silver carp, significant catches of eastern bream, Aral asp, catfish, and snakehead were also recorded **(Niyozov & Gaffarov, 2012)**. However, according to the results of our test catches, the most abundant and frequently encountered species were pike perch, carp, silver carp, and Aral roach. Many species previously documented in the literature **(Abdullayev *et al.*, 1981; Shodmonov *et al.*, 2022)** were not observed during the present study.

In the coastal zone at depths of 3–4 m, the Aral roach dominated in terms of abundance. Overall, the number and biomass of non-commercial species were lower than those of commercially valuable fish. The main reasons for this are likely the increased salinity of certain lake areas (20–25g/ L) and the artificial stocking practices carried out by local fish farms.

Among commercial fish, the Aral roach was identified as the most widespread species, occurring in large numbers across all areas of the lake. Silver carp also demonstrated stable occurrence rates compared to other commercial species. Additionally, ecological characteristics of non-commercial species were examined, and it was established that their presence is largely linked to the influx of wastewater.

CONCLUSION

Thus, to date, 18 fish species have been recorded in the ichthyofauna of Lake Dengizkul. Of these, 12 are of commercial importance: 11 species possess economic value, while 1 species does not. The remaining 6 species are of no commercial value.

This study presents the ecological characteristics of both commercial and non-commercial species occurring in Lake Dengizkul, with particular attention to their distribution along lake contours, in discharge water areas, at varying depths, and at different distances from the shoreline, as well as their population dynamics. It was established that adult individuals of commercially valuable species—such as carp, pike perch, silver carp, and Aral asp (5–6 years old)—are primarily concentrated in the middle and deep-water zones of the lake. In contrast, juveniles and most other species inhabit coastal zones, typically within 1– 2km from the shore.

The findings are based on test catches carried out in spring and summer 2025, supplemented by reports from local fishermen and external observational data.

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AUTHORS’ CONTRIBUTIONS

Collection of scientific material, recording, office processing and analysis were carried out by M.Sh. Atamuratova, preparation of the article A.Q. Quvatov all practical processes were carried out by the other authors.

REFERENCES

Abdullayev, M.A.; Niyozov, D.S. and Ergashev, M.R. (1981). Hydrobiological regime and fishery importance of Lake Dengizkul // Biological foundations of fishery in reservoirs of Central Asia and Kazakhstan // Abstracts of reports of the XVII scientific conference. – Frunze. – 207 p.

Abdullaev, M.A. and Urchinov, D.U. (1989). Commercial fish of the reservoirs of the lower reaches of the river. Zarafshan. – Tashkent: Fan. – 72 p.

Amanov, A.A.; Kholmatov, N.M. and Sibirtseva, L.K. (1990). Acclimatized fish from water bodies of Uzbekistan. – Tashkent: Fan. – 116 p.

Berg, L.S. (1905). Fishes of Terkestan. Izvestiya Turk.otd. Rus.geogr. society. – St. Petersburg. – 261 p.

Berg, L.S. (1948). Freshwater fishes of the USSR and adjacent countries. Publ. USSR Academy of Sciences, Part 1. – Moscow: Leningrad. – 466 p.

Berg, L.S. (1949a). Freshwater fishes of the USSR and adjacent countries. Part 2. – Moscow. – PP. 470-925.

Berg, L.S. (1949b). Freshwater fishes of the USSR and adjacent countries. Part 3. – Moscow. PP. 930-1381.

Bo‘riyev, S.B.; Shodmonov, F.Q. and Okilova, G.A. (2022). Fish fauna of lake Dengizkol // International Conference on Innovations in Applied Sciences, Education and Humanities. PP. 23-28.

Kamilov, G.K. (1973). Fishes of reservoirs of Uzbekistan. – Tashkent: Fan. – 220 p.

Khakberdiev, B. (1994). Ecology of fishes of reservoirs of the middle and lower reaches of the Amu Darya River under anthropogenic impact: Abstract of author's diss. ... doctor of biological sciences. – Tashkent. – 48 p.

Khasanov, A.Kh. and Ergashev, M.R. (1983). Some features of biology of silver carp of reservoirs of the Zeravshan River // Biological bases of fisheries of reservoirs of Central Asia and Kazakhstan // Abstracts of reports of the XVIII scientific conference. – Tashkent. – 248 p.

Kessler, K.F. (1874). Travels of A.P. Fedchenko in Turkestan // Fishes. News of the Society of Natural Science Anthropology and Ethnography, 2 (3). – Moscow: St. Petersburg. – 63 p.

Kessler, K.F. (1877). Fishes found and encountered in the Aral-Caspian- Pontic ichthyological region. – Moscow: St. Petersburg. – 360 p.

Lakin, G.F. (1990). Biometrics. Textbook for biological specialty universities. 4th ed. – Moscow. – 352 p.

Mirzaev, U.T. (1994). Morpho-ecological features of acclimatized pike perch in irrigation reservoirs of the south of Uzbekistan: Abstract of Cand. Biological Sciences Dissertation. Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan. – Tashkent. – 24 p.

Niyozov, D.S. and Gafforov, G.G. (2012). Baliklarning oziklanishi. – Tashkent. “Dizayn-press”. – 225 p.

Nuriyev, H.N. (1985). Acclimatized fish of reservoirs of the Zeravshan River basin. Publishing house “Fan”. – UzSSR: Tashkent. – 104 p.

Pravdin, I.F. (1966). Guide to the Study of Fish. 4th ed. – M.: Food Industry. – 376 p.

Rokitskiy, P.F. (1967). Biological statistics. Higher school, – Minsk. – 328 p.

Saifullaev, G. (1983). Distribution and place in the fishery of predatory fish in the reservoirs of the lower reaches of Zeravshan // Biological foundations of fisheries in the reservoirs of Central Asia and Kazakhstan // Abstracts of reports of the XVIII scientific conference. – Tashkent. – 215 p.

Shodmonov, F.K.; Toshov, H.M. and Yuldoshov, L.T. (2022). The Current Condition of Ichthyofauna of Dengizkul Natural Water Basin // Jundishapur Journal of Microbiology, 15 (1): 5933-5944.