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Characteristic of Aquatic Biocenosis of the Talimardjan Reservoir in Uzbekistan

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Abstract: ***Hydrochemical, hydrobiological and fish species composition in Talimardjan reservoir (Uzbekistan) was studied under conditions of newly created culture based fisheries. Water quality characteristics are suitable for freshwater aquaculture. Macrophytes developed poorly. Totally 131 species of phytoplankton were determined in samples including Cyanophyta (42), Bacillariophyta (54), Chlorophyta (22), Dinophyta (7), Cryptohyta (3), Euglenophyta (3). Quantity of algae was 150.20*10^3 -46620 *10^3 cells/l; biomass 55.8 - 355,9 mg/l. Zooplankton was represented by 40 species; quantity varied 290.1 – 410.1 thousands specimen /m^3, biomass 0.6 – 1.1 g/m^3. Zoobenthos was represented with 5 species of chironomids; quantity varied 406 – 601 speciemens/m^3, biomass 3.9 – 5.1 g/m^3. Totally 35 fish species were determined in reservoir including 11 native and 14 invasive species.***

Keywords: Phytoplankton, zooplankton, macrophytes, ichthiofauna, zoobenthos, reservoir, Uzbekistan

1. Introduction

Due to geographical peculiarities, fish productivity of water bodies in Uzbekistan is very low (1 - 5 kg/ha) (Kamilov, 1973; Salikhov et al., 2001). In order to increase productivity, fish summerlings stocking was installed in some plane water bodies including Talimardjan reservoir. In 1990 – 2000s, yield of fish capturing was 0.2-0.4 t/year in the water body. Since 2014, reservoir is stocked with 70 – 100 summerlings/ha of cultured cyprinids. In 2018, fish catch increased to 20.5 t. This is new ecological situation in reservoir: considerable stocks of silver carp (*Hypophthalmichthys molitrix*) as main object of culture based fisheries with additional smaller quantities of common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*) and bighead carp (*Hypophthalmichthys nobilis*) use reservoir as fattening water body and habitat there for several years. Quantitatively, biomass of that commercial fishes is much higher than in natural conditions. Data of hydrochemical, hydrobiological and ichthyological peculiarities in such new regime of reservoir are unknown.

Talimardjan reservoir was created in Karshi Steppe (Uzbekistan) for irrigation purposes; water supply is from middle stream of Amudarya River through Karshi Main Canal using 8 pump stations. Reservoir has total area 7735 ha, length 11.8 km, width 5.5 km, maximal water depth 40 m, average depth 20 m. This is an arid zone with an extremely continental temporary climate. Summer is hot (average monthly air temperature is about 30,2^{o}C in July; it often reaches 35-42^{o}C in daytime and can be even higher). Winter is rather cold (average monthly temperature in January is 2.5^{o}C).

The goal of this work was to study of hydrochemical, hydrobiological peculiarities so as fish species composition in Talimardjan reservoir under conditions of newly created culture based fisheries.

2. Materials and methods

Study was conducted from the January up to the December in 2018. Samples were taken every month from 5 stations covered the whole reservoir area (fig. 1). In total, 70 samples of phytoplankton were fixed from depth 1 m using generally recognized methods. Binocular loupe MBR-5 and binocular microscope MBI-12 were used. Quantity organisms and there biomass were determined by using Goryaev'scamera (Usachev, 1961; Kiselev, 1969; Abakumov, Ganshina, 1987; Mustafaeva et al., 2017). Phytoplankton species were determined by using of identification guides (Opredelitel, 1951; Opredelitel, 1957; Kursanov et al, 1977; Muzafarov et al., 1988). Water quality parameters were determined in the same stations using generally recognized methods (Alekin, 1970) and portable thermoxymeter "HANNAHI 9147" and portable pH-meter "pHscan 30S". In March – May and in October fish were weekly caught using gillnets with mesh 16, 24, 36, 40, 50, 60, 70, 80, 100 mm.

3. Results

Water temperature had appreciable seasonal variability (table 1). In Summer, water temperature was rather high, in Winter was low, a small part of reservoir was covered by ice for several days.

Water transparence was 220 – 550 cm of Sekky disc. Water was fresh, mineralization varied 840 – 940 mg/l. Dissolved oxygen level was high during the whole year: in winter, it was higher than 11.5, in Spring and Autumn – higher than 7.2, in Summer – higher than 5.3 mg/l. Water pH was 8.3 – 8.45. Total ammonia nitrogen varied 0.016 – 0.041 mg/l, nitrites were 0,01-0,03. Reservoir has sandy - slimy bottom.

Macrophytes developed poorly, dominant complex was represented by pondweeds *(Potamogeton crispus, P. pectinatus, P. perfoliatus)*, parrot's-feather *(Myriophyllum spicatum)* and hornwort (*Ceratophyllum submersum).* Coastal strip covered by plants on the territory less than 10%, there were such plants as reed *(Phragmites communis)*, reed mace *(Typha angustipholia)*, parrot's-feather, hornwort.

Phytoplanknon. Totally 131 species, varieties and forms of phytoplankton were determined in samples including blue-green algae (*Cyanophyta*) – 42, diatoms *(Bacillariophyta)* –

54, green algae *(Chlorophyta)* – 22, dinophytes *(Dinophyta)* – 7, cryptophytes *(Cryptohyta)* - 3, евгленовых *(Euglenophyta)* – 3 species. Such species as *Cladophora glomerata, Cl. fracta, Vaucheria geminate* were dominant in shallow places with heated water. Such species as *Ceratium hirundinella, Dinobryon divergens, Peridinium cinctum, Glenodinum quadridens* were dominants in the water columns. Also species from genera *Spirogyra, Chara, Oedogonium, Oscillatoria, Lyngbia, Nodularia, Synedra, Fragilaria, Cyclotella, Amphora, Rhopalodia, Navicula, Nitzschia* were determined in samples.

Quantity of algae varied from 150.20*10^3 to 46620 *10^3 cells/l; biomass of algae varied from 55.8 to 355,9 mg/l.
Zooplankton was represented by 40 species. Such species as*: Euchlanis dilatata, Keratella tropica, Daphnia longispina, Cyclops vicinus, Thermocyclops vermifer* were dominant. Quantity of zooplankton organisms varied 290.1 – 410.1 thousand specimens /m^3, there biomass was 0.6 – 1.1 g/m^3.

Zoobenthos was represented with 5 species of chironomids which habitat in hard thick clay and slimy sand. Quantity of benthos organisms varied 406 – 601 speciemens/m^3, biomass 3.9 – 5.1 g/m^3.

Fish species that were founded in catches in reservoir and nearby canals are given in table 2.

Table 2: Fish species recently habitat in Talimardjan reservoir and irrigation network in neighbourhood

N	Видырыб	Native species	Alien species
1	Big Amudarya shovelnose, *Pseudoscaphirhynchus kaufmanni*	+	
2	Common carp, *Cyprinus carpio*	+	
3	Pike – perch, *Sander lucioperca*		+
5	Asp, *Aspius aspius taeniatus*	+	
6	European catfish, *Silurus glanis*	+	
8	Grass carp, *Ctenopharyngodon idella*		+
9	Silver carp, *Hypophthalmichthys molitrix*		+
10	Bighead carp, *Hypophthalmichthys nobilis*		+
11	Samarkand khramulya, *Varicorhynus capoeto heratensis*	+	
12	Roach, *Rutilus rutilus*	+	
13	Crucian carp, *Carassius gibelio*		+
14	European bream, *Abramis brama*		+
15	White amur bream, *Parabramis pekinensis*		+
16	Amur snakehead, *Channa argus warpachowskii*		+
17	Shemaiah, *Chalcalburnus chalcoides*	+	
18	Sabrefish, *Pelecus cultratus*	+	
20	Turkestan barbell, *Barbus capito conocephalus*	+	
21	Aral barbell, *Barbus brachycephalus*	+	
22	Sharpbelly, *Hemiculter leucisculus*		+
26	Riffle minnow, *Alburnoides bipunctatus*		
28	Amudarya loach, *Noemacheilus oxianus*	+	
30	Chinese false gudgeon, *Abbotina rivularis*		+
32	Stone moroko, *Pseudorasbora parva*		+
33	Mosquitofish, *Gambusia affinis*		+
34	*Rhinogobius similis*		+
35	*Micropercops swinhonis*		+

4. Discussion

Majority of phyto- and zooplankton species determined in Talimardjan reservoir are widely spread in inland water bodies in temporary climate; those species have high ecological valency. Diatoms, blue-green algae were the most numerous; blue-green algae were dominant the whole year, only in December diatoms quantity increased sharply. Green algae were sufficiently presented in all samples; quantity of dinophytes was rater less. Biomass of green algae and diatoms was predominant the whole year, biomass of blue-green algae was less because size of their cells is very small.

Irrigation regime strongly impacts plankton dynamics in reservoir: water accumulation permanently increase volume and depth in reservoir from September up to May; watering provoke fast lowering from May to August. Another strong factor impacted plankton (especially – phytoplankton) is presence of substantial (numerous) stock of silver carp and other stocked species. Stocking density of silver carp summerlings is 30 – 50 specimen/ha every autumn still 2014-2015. The strongest impact of silver carp is in Summer when size of reservoir is the smallest; but this period is on the peak of silver carp (phytoplanktophage fish) fattening.

Totally 35 fish species were determined in reservoir. Eleven species are native. Such species as common carp, shemaiah and roach had noticeable quantity (were marked in all seasons, fish of different size and age including immature ones, etc.). Other native species were represented by single specimen in catches. Such species as shovelnoses, asp, two species of barbels were represented by 1-2 fish per year.

Invasive species were represented by 14 species. Such species as silver carp, grass carp, bighead carp are regularly stocked by fishing company. All other species reproduce in reservoir naturally. All invasive species has developed stocks with noticeable quantities.

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Table 1: Average water temperature in Talimardjan reservoir, 2018

Mongths	1	2	3	4	5	6	7	8	9	10	11	12
T°C	5,2	6,4	13,4	17,2	22,6	26,7	28,9	27,8	21,2	15,8	11,9	5,4

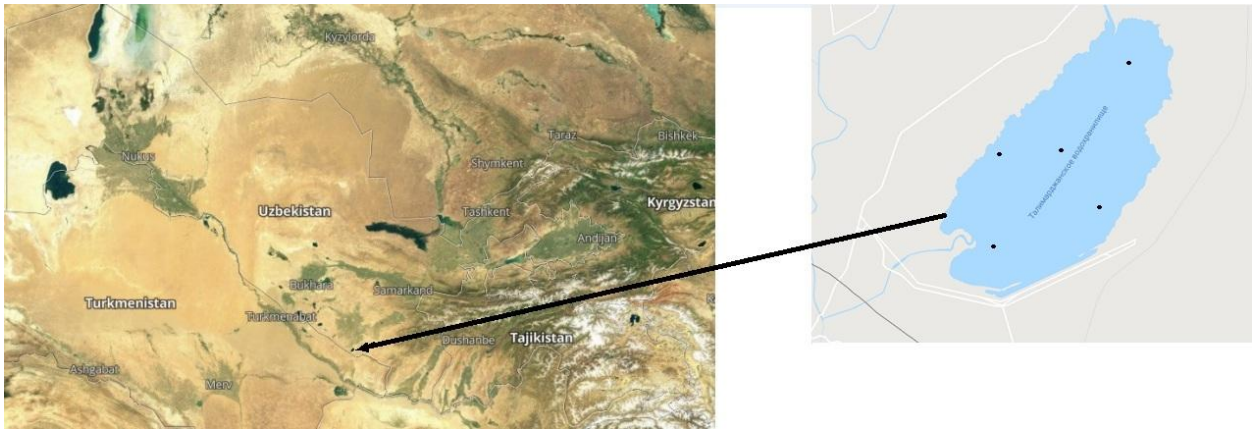

Figure 1: Talimardjan reservoir in Uzbekistan and sampling points

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