Effect of hydrochemical indicators of Sangzor river water on mollusk population indicators

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Abstract. The article presents information about the influence of hydrochemical parameters of Sangzor river water on mollusk population parameters. The hydrochemical indicators of the water of the Sangzor River are oil and oil products, the level of mineralization is not higher than REM, and the water temperature, flow speed, clarity are favorable for bivalve mollusks of the families Unionidae and Sorbiculidae and bubble growth was determine to be high. Its downstream is in the water after the city of Jizzakh (Khairabad) oil and oil products, mineralization level is higher than REM, pollution of water environment factors, weight, shell length, height, and bubble growth of bivalve mollusks of Unionidae and Sorbiculidae families were determined to be small, affecting the growth of shells to a certain extent as limiting factors.

1 Introduction.

Changes in hydrological regime, annual and seasonal volume of rivers affect biodiversity of molluscs in aquatic ecosystems. Intensive exploitation of natural ecosystems with strong influence of anthropogenic factors leads to environmental change and loss of biodiversity, including bivalve diversity, and in general to the reduction of biological resources. It is necessary to conduct numerous studies on the inventory of bivalves in climate change-prone areas of natural ecosystems of Uzbekistan, to assess the status of populations of endemic and rare species on the basis of modern methods, and to conserve species in need of protection [1, 2, 3].

Izzatullaev Z.I. , Boymurodov H.T. (2009)[4], Huber Marcus. (2010) [5], Annabel Cattelode, (2011), Yanovich L.N. (2013), Bogatov V.V. (2014), Froufe , E. et al. (2016) [6], Zieritz , A. et al. (2016) [7], Lopez-Lima, M. et al. (2017) [8]. Bolotov, I. N. et al. (2017,2018)[9, 10] , Bolotov, I. N. et al. (2018) [11] , Pfeiffer, JM et al. (2018) [12] , Konopleva, E.S. et al. (2017, 2019) [13,14] , Izzatullaev, Z.I. (2019)[15] , Boymurodov, H. Jabbarov, T. (2022)[3] , Boymurodov, H. (2017,2022,2022) [1, 16, 17] , Boymurodov, H. et

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al. (2021, 2022, 2023) [2, 18, 3] investigated the distribution, ecological groups, populations of species of the families Unionidae and Sorbiculidae and analysed possible conservation measures [2, 18, 17].

At the same time, the peculiarities of mollusk populations of the Sangzor River and the influence of hydrochemical parameters of the river water on the population parameters of mollusks have not been studied so far. The main objective of our study was to investigate the influence of hydrochemical parameters of river water on the population density of molluscs, their distribution, variability and shell age.

2. Materials and methods.

On the banks of the Sangzor River during 2012-2022, we studied the species of the families *Unionidae* and *Sorbiculidae.* In total 785 pieces of mollusks belonging to the families *Unionidae* and *Corbiculidae* were studied. The research methods by Izzatullaev , Boymurodov [4, 1, 17], Huber Marcus[5], Bolotov, IN *et al*. [9,10], Izzatullaev[15], Boymurodov *et al*. [2, 18, 3] were used [18, 3, 9].

3. Results and Discussion.

There is a large amount of irrigated land in the Sangzor River basin, and most of this land is irrigated with water from the Sangzor River, and some of the wastewater returns to the river after irrigation. There is no collector system in the upper and middle part of the Sangzor to divert wastewater outside the basin. Due to this, various wastewater flows into the river. This leads to a drastic deterioration in water quality. In addition, mollusk populations are also affected by river sand quarries.

The study determined that the hydrochemical parameters of the Sangzor River water are influenced by the age and density of mollusk populations (Figure 1). The influence of hydrochemical water parameters on the age and population density of bivalve mollusks of the families Unionidae and Corbiculidae was analysed. It was studied that the population in the middle reaches of the Gallaorol (Sangzor village) is increasing, and the population in the lower reaches after Jizzak (Khairabad village) is decreasing (Table 1).

In the upper reaches of the Sangzor River, the salinity level of the river is 250-320 mg/l and increases towards the lower reaches. In the middle reaches in the Gallaorol area this indicator is 650-884 mg/l, after the city of Jizzak it increases to 822-1014 mg/l. The increase in population in the Sangzor River basin, intensive use of land, extensive use of chemicals in agriculture, expansion of towns and villages, increase in the number of various enterprises have a strong impact on the water quality of the river.

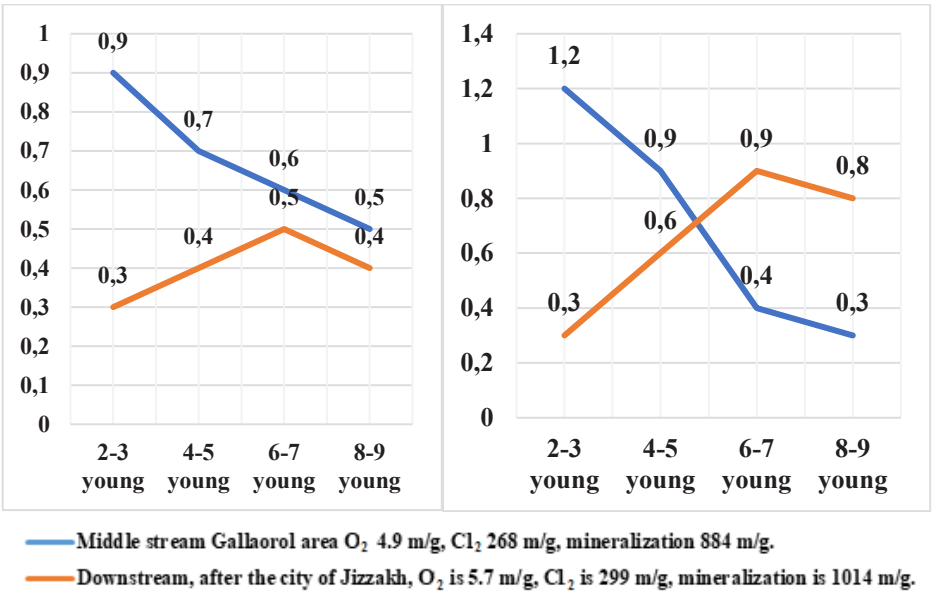

Fig. 1. The effect of water hydrochemical parameters on the age and density of individuals in populations of *Colletopterum bactrianum* (a) and *Colletopterum cyreum sogdianum* (b)

Table 1. Influence of water hydrochemical parameters on the age and density of individuals in populations of bivalve molluscs of the families Unionidae and Sorbiculidae distributed in the Sangzor River (m 2 /piece, n=10)

Types	The population of the middle stream Gallaorol (Sangzor village). O 2 4.9 ± 1.6 m/g (REM K-4 Yo-6), Sl 2 268 ± 41 m/g (300), mineralization 884 ± 62 m/g (1000)				The population of the downstream area after the city of Jizzakh (Khairabad). O_2 5,7 ± 0,9 m/g (REM K-4 Yo-6), Sl_2 299±26 m/g (300), mineralization 1014 ± 43 m/g (1000)			
	2-3	4-5	6-7	8-9	2-3	4-5	6-7	8-9
Colletopterum bactrianum	0.9±0.1	0.7±0.2	0.6±0.2	0.5±0.1	0.3±0.1	0.4±0.1	0.5±0.2	0.4±0.2
Colletopterum cyreum sogdianum	1,2±0.3	0.9±0.1	0.4±0.1	0.3±0.1	0.3±0.1	0.6±0.1	0.9±0.2	0.8±0.1
Corbicula cor	1,1±0,1	0.8±0.2	-	-	0,5±0.2	0.9±0.1	-	-
Corbicula purpurea	1.6±0.3	0.6±0.1	-	-	1.1±0.1	1,6±0.2	-	-
Corbicula fluminalis	1.3±0.2	0.9±0.2	-	-	0.9±0.1	1.4±0.3	-	-

During the study, the water quality indicators of the Sangzor River coast from bivalve mollusks *Sinanodonta gibba* and *Corbiculina ferghanensis* the effect on the parameters of mass, shell size was studied (Table 2).

Table 2. Influence of water environment factors of the Sangzordarya coast on the weight and shell variability of bivalve molluscs (n=10, m 2 /piece)

Indicators	The population of the middle stream Gallaorol (Sangzor village). O_2 4.9±1.6 m/g (REM K-4 Yo-6), neft and oil products 0.04±0.02mg/l (0.05),mineralization 884±62 m/g (1000)	The population of the downstream area after Jizzakh city (Khairabad). O_2 5.7±0.9 m/g (REM K-4 Yo-6), neft and oil products 0.06±0.01 mg/l (0.05), mineralization 1014 ± 43 m/g (1000)
Synanodonta gibba		
Weight of molluscs, g	380 ± 9.4	312 ± 8.9
Shell length , mm	146 ±3.1	131 ±3.1
Shell height , mm	6 8 ±2.1	54 ±2.1
Shell bubble , mm	74 ±2.6	65 ±2.2
Corbiculina ferghanensis		
Weight of molluscs, g	3.1 ± 0.6	2.4 ± 0.3
Shell length , mm	21.5 ±2.3	17.5 ± 1.6
Shell height , mm	18 ±2.4	14,9±1.3
Shell bubble , mm	12±1,1	9,4 ±1.0

The middle stream was analyzed in the area of Gallaorol (Sangzor village) and the downstream area after Jizzakh city (Khairabad village). The amount of O_2 in the middle stream Gallaorol area (Sangzor village) is 4.9 ±1.1 mg/l, oil and oil products 0.04 ±0.02 mg/l, mineralization level 884 ±62 mg/l. 5-year-old *Sinanodonta gibba* species weighs 380 grams, shell length 146±3.1, shell height 68±2.1, shell convexity 74±2.6; *Corbiculina ferghanensis.* It was defined that the weight of 3.1 grams, the length of the shell is 21.5±2.3, the height of the shell is 18±2.4, and the convexity of the shell is 12±1.1.(Figure 2,3). Since this area is located in the middle part of the river, hydrochemical indicators of water did not exceed REM. O_2 content of water near Khayrabad village located in the lower part of the river is 5.7 ±1.0 mg/l. and the abundance of this amount in the middle stream may be related to the abundance of algae in the downstream, in addition, in the downstream oil and oil products 0.06 ±0.01 mg/l, mineralization level 1014 ±42 mg/l, weight of 5-year-old *Sinanodonta gibba* species 312 grams, shell length 131±3.1, shell height 57±2.1, shell convexity 65±2.2, *Corbiculina ferghanensis* the weight of the type is 2.4 grams, the length of the shell is 17.5±1.6, the height of the shell is 14.9±1.3, the convexity of the shell is 9.4±1.0. The hydrochemical indicators of water in this area were higher than the permissible level (Figure 2,3).

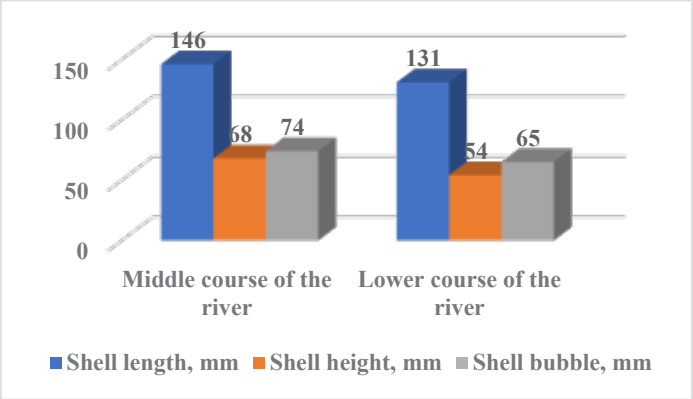

Fig. 2. Variation of the shell of Sinanodonta gibba in different areas of the Sangzor River.

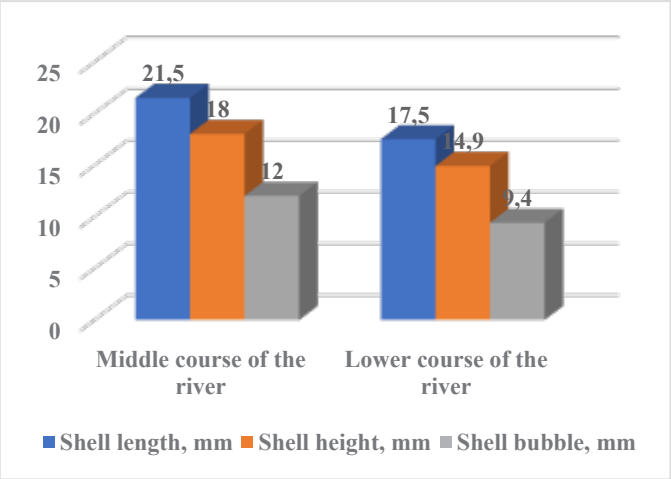

Fig. 3. Variation of Corbiculina ferghanensis shell in different areas of Sangzor River.

Thus, we observe a significant change in shell characteristics of both molluscan species in the downstream, with deterioration of water quality.

4. Conclusion

Thus, it is revealed that pollution of aquatic environmental factors has a significant impact on biological characteristics of bivalves. In the lower reaches of the Sangzor River, the content of oil products and mineralisation exceed the MPL, the oxygen content is also significantly higher than upstream. This has led to growth suppression of molluscs, and in the downstream populations bivalve weight, length, height and shell swelling are significantly lower than in the middle reaches, where hydrochemical water parameters are more favourable.

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