Ichtyofauna as a Determinant of Water Eco-Stress Factors

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Abstract

Bacterial spread in fish gills and muscles with mesophilic aerobic and facultative-anaerobic microorganisms. These microorganisms are caught in 4 points of the river Alazani which depends on seasonal eutrophication of the water ecosystem. It also depends on the existence of microorganisms. In summer months when water gets warm and, at the same time, chemical and fecal masses flow into the water, the amount of microorganisms increase. As the temperature of the water decreases towards autumn-winter, rains increases which leads to reservoirs dilution and decrease in organic substances. They mostly occur in suspended condition and their amount in water decreases and thus in fish gills and muscles.

Keywords: Ichthyofauna, bacteria, river Alazani, stress factors

Introduction

The contamination of reservoirs by allochthonous and autochthonous substances which determines water eutrophication and significantly influence water organoleptic properties has an important role in the study of water ecosystem (Djikia, 2012; Moiseenko, 1978). Changes in water ecosystems, reflected in water organisms, which are very sensitive to water environment changes serves as good indicators. In order to estimate the contamination of certain ecosystem, the organisms of various geneses such as in fish and microflora must be studied in combination (Sazonoba, 1991). As the most sensitive microorganisms, they appear to be the purifier of the

natural ecosystem (Golobkova Yana, 2007). The fish, which are the crowning part of the trophic chain, are objective indicators that enable the estimation of the whole level of reservoir contamination; hence, this is because fish is a migration organism and gives only the integral characterization of water site. Anthropogenic contamination of water sites with chemical agents of various nature, can significantly influence fish viability (Semenchenko N.N. 2007; Sirenko L.A. 1988). Hence, the aim of our work is to study bacterial contamination in fish tissue and gills, as one of the most important ecological factor for human health.

Material and Methods

The river Alazani is the largest river in eastern Georgia. It partially flows through Azerbaijan, along the border of this country. The length of it is 390 km; basin area is 11 800 m^2; and average water consumption is 98 cubic m/sec. The river Alazani possesses a rich diversity of fish species: Catfish, Gobi, trout, chanari, shamaia, bjoerkna, loach, gochala, bleak, carp, pikeperch, river goby, barbell, and Caucasian herring. Consequently, we have studies on "barbell" gills and the quantitative and qualitative content of microorganisms' delamination on the skin. These fish were caught with fishing rods in 3-3 pieces at Akhmeta, Artana, and Gurjaani. Hence, we took water from the surface with a barometer. Analyses were prepared according to normative regulations (1991). Quantitative value of total bacterial contamination in fish tissue and gills mesophilic aerobic and facultative anaerobic microorganisms QMAFAnM was $5x10^4$ colony existing in unit per gR mass (coe/g) (Mudretsova-Viss K.A 1985). In addition, at the same time, we were estimating the quantity of phenyl resistant bacteria (frb) in gills. The obtained data were processed statistically and was represented in the form of average values and corresponding error ($X \pm \alpha$) (Plokhinski N.A. 1970).

Discussion of the Obtained Results

Trials were performed in summer (July-August) and autumn (October-November) in 2014. It is known that reservoirs have outstanding self-cleaning ability. Although if a lot of organic pollutants occurred in it, the reservoir is not capable of reprocessing these substances at high speed. The river Alazani water contains organic compounds of alochatic origin that have humus nature. Thus, the amount of the organic compound changes with seasons. The river Alazani basin is densely populated and is characterized by developed agriculture and industry. It should be noted that in the villages, Artana and Tsnori viticulture is well developed. Also, chemical are intensively used although the quantity of population is smaller compared to Gurjaani and Telavi. Here, agriculture is also well developed and chemicals

are also used. It is added by fecal wastes and agricultural wastewater used for irrigation (Begum Y.A 2000; Bondyrev Igor 2000). The river Alazani at the village Shakriani is the place of amateur fishing and population active recreation. Therefore, it is of great importance in terms of sanitation. It is known to be the most intensive contamination with microorganisms present in gills. The quantitative and qualitative content of microorganisms on gill plates determines water ecological condition. The determinant of these pollutants is organic substances of different origin spilled in water (NikolaiSvili M, 2013). According to our studies, we have established that contamination of fish gills and tissues with microorganisms depends on the quality of the pollution of plankton and benthos. It is also known that in the fish that is newly taken out of the water, damage and microflora outspread are present in gills. This is because they are the closest to water and air. Thus, we have studied microorganisms outspread in water and gills. The water analysis showed that water is most contaminated at Shakriani and Gurjaani, while gills are mostly outspread with heterophilic and phenol resistant bacteria. It could be explained by anthropogenic loading in these areas.

Table 1. Bacterial outspread in fish gills and the quantity of microorganisms in the area of the reservoir where fish was caught

Water	Water quality (cou/ml)				The quantity of bacteria on gills (cou/g)			
2014	hpb, X	±α	prb, X	±α	hpb, X	±α	prb, X	±α
Akhmeta	12,25	6,50	0,34	0.22	12,7	7,15	0,39	0,19
Artana	25,40	12,75	0,49	0.28	15,6	7,80	0,41	0,21
Shakriani	50,34	25.18	1,20	0,58	18,12	9,6	0,65	0,32
Gurjaani	80,54	48,70	1,30	0,60	22,9	8,30	1,20	0,60

Note: hpb-heterophilic bacteria, prb-phenol resistant bacteria. Cou/ml-colony unit in 1 ml water, cou/gm-colony unit in 1 gm water, X ±α average value

Subsequently, high quality outspread with microorganisms in fish muscles is performed on the basis of fish physiological condition. It migrates and get over lots of stress situations in contaminated reservoir, from fish gills and skin heterotrophic to phenol resistant bacteria. Hence, this eventually enters into the fish muscles and contaminates them. Then, it is followed by the weakening of the organism as shown in Table 2 below.

Table 2. Bacterial outspread in fish gills and the quantity of microorganisms in the area of the reservoir where fish was caught

Location	(mafan) (cou/g)		(mafan) (cou/g)	
	In muscles		In gills	
	X	±α	X	±α
Akhmeta	6,3	3,5	25,0	11,2
Artana	22,6	12,9	82,5	43.3
Shakriani	68,5	15,8	144,3	83,5
Gurjaani	86,9	43,0	91,1	48,5

Note: mafan –mesophilic aerobic and facultative-anaerobic microorganisms. cou/gm-colony unit in 1 gm water, X ±α average value

As shown above, the highest volume of microorganisms in fish gills and muscles was at Shakriani and in Gurjaani area. However, this suggests that the water is contaminated by those organic substances which are slightly mineralized substances. There are also organic compounds with aromatic properties; hence, this could be explained by the fact that it is a junction that supports high permeability of transport means which worsens its ecological condition. Moreover, in this area, cars and tractors were washed up. Consequently, aromatic organic compounds are also flowing in and changing its ecological condition.

The study of autumn-summer correlation showed that in autumn, the amount of microorganisms decrease in fish muscles. Also, in autumn, the amount of microorganisms decreases along with the decrease of water temperature. Thus, this is the reason fish are contaminated by only microorganisms that exist on suspended parts. They are not able to pass actively from gills into muscles due to deficiency of proteolytic enzymes. As a result, their amount in fish muscles is reduced.

Table 3. Season correlation of bacterial outspread

Location	Correlation coefficient summer	Correlation coefficient autumn
Akhmeta	0,53	-0,12
Artana	0,77	-0,17
Shakriani	0.90	0,53
Gurjaani	0.99	0,55

Thus, we can conclude that bacterial spread in fish gills and muscles with mesophilic aerobic and facultative-anaerobic microorganisms caught in 4 points of the river Alazani which depends on seasonal eutrophication of the water ecosystem. It also depends on the existence of microorganisms. In summer months when water gets warm and, at the same time, chemical and fecal masses flow into the water, the amount of microorganisms increase. As the temperature of the water decreases, rains increases which leads to reservoirs dilution and decrease in organic substances. They mostly occur in suspended condition and their amount in water decreases and thus in fish gills and muscles.

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