Current Data on Biodiversity of the River Natanebi Ichthyofauna and Water Pollution

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Abstract
Biological diversity, as for water ecosystems, as for terrestrial habitat depends on freshwater resources. Biodiversity of inland waters is critically important to eradicate poverty and to achieve different goals, fishery supports food for millions of humans.
Study of river ichthyofauna, control of water quality and analysis of chemical parameters is essential to maintain freshwater ecosystems . In this paper we report the results of a study of ichthyofauna in the river Natanebi and chemical analysis of water parameters, based on the materials collected on 3 deferent seasons, in 2012.

Introduction
Presently more than 30000 different fish species are described, 40% of this number are identified as freshwater species. To take into account the size of freshwater and marine habitat, freshwater fish species thousand times exceed to saltwater species. Climate regulation, mitigation of floods, water purification and recycling of nutrients and waste materials depends on the water ecosystems. Biodiversity of Inland waters is essential to develop millennium plans and aims (millenniumassessment.org; Japoshvili, 2012).
The river Natanebi is known to be an important spawning area for Black Sea salmonids and sturgeons (Ninua & Guchmanidze, 2013). Nowadays the river is under the anthropogenic pressure, the main threats for important trade fish species. In Natanebi municipality there are three gravel excavation quarries (Losaberidze, 2013). Gravel excavations cause degradation of whole river channel, an exhaustion of river surface and reducing spawning areas for anadromous fish species (Packer et al., 2005). Chemical and physical parameters such as water temperature, conductivity, dissolved oxygen and mineralization has very big impact for normal being of fishes (Yudkin, 1970). Pollution and habitat change causes a change of chemical parameters of water.
At present, up-to-date information on river ecosystem biodiversity is largely unknown for most of the rivers in Georgia, except a few works (Japoshvili et al., 2013; Ninua, Japoshvili and Botchorishvili, 2013; Ninua and Guchmanidze, 2013). In 1975 the Natanebi river ichthyofauna was studied by P. Kheladze (Kheladze, 1976). Our aim was to study ichthyofauna of river Natanebi and compare it with literature data, which is not updated during the four decades.

Methods
The samples were collected during 2012 (June, August and November) in order to describe fish fauna end to detect water pollution level. Fish specimens were obtained from three different sites with different anthropogenic pressure. The first site was near the upstream of the river (undisturbed area), the second near to a village with a fish farm and grazing area (central

basin), and the third near to gravel excavation site and dams (downstream). We preferred the first site as a reference site to compare it with two others (Subramanian & Sivaramakrishnan, 2007). For fish sampling hand net and fishing rod were used. Samples were fixed in 70% ethanol. Identification of fish specimen was performed in the field, and also in the laboratory using the identification key. Morphological study was done with measuring characters like: total length; standard length; head length; eye diameter; body depth; caudal peduncle depth. Simultaneously with collecting fish specimens water samples were collected, altogether 27 water samples were obtained. For each samples 21 water parameters were analyzed.. Water temperature; pH; turbidity; conductivity; dissolved oxygen was defined in the field. Therefore multifunctional measuring device EXTECH – ExStik EC 500 and ExStik DO600 were used. The rests of parameters were defined in laboratory: ammonium ion; nitrites; nitrates; chlorides; sulfates; hydro-carbonates; calcium; magnesium; sodium; potassium; iron; hardness; mineralization; permanganate oxidation; bi-chromatic oxidation; BOD_5; TOC. To analyze main water ions one litre water specimens was taken from each point and before the transportation at the laboratory they were saved in frozen container. To determine the main ions, such as Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, SO_4^{2-}, HCO_3^-, ISO standard methods were used (Benashvili, 2012).

Results

During the study 12 fish species were obtained (147 individuals). Those were: Colchic bitterling (*Rodeus sericeus amarus* (=*Rhodeus colchicus*)); colchic minnow (*Phoxinus colchicus*); colchic nase (*Chondrostoma colchicum*); Caucasian river goby (*Gobius cephalarges constructor* (=*Neogobius (Ponticola) constructor*)); spined loach (*Cobitis taenia*); south minnow (*Alburnoides bipunctatus fasciatus* (=*Alburnoides fasciatus*)); Caucasian gudgeon (*Gobio gobio lepidolaemus* (=*Gobio lepidolaemus caucasica*)); stone morocco (*Pseudorasbora parva*); colchic barb (*Barbus tauricus*); Batumi shamaya (*Chalcalburnus chalcoides derjugini*); trout (*Salmo fario* (=*Salmo trutta fario*)) and chub (*Leuciscus cephalus* (=*Squalius cephalus*)) (Picture 1. a, b, c).

Picture 1. a. Spined loach (*Cobitis taenia*), b. Colchic bitterling (*Rhodeus colchicus*), c. Colchic barb (*Barbus tauricus*).

In our materials most abundant was Caucasian river goby, followed by colchic bitterling, south minnow and caucasian gudgeon; then stone morocco, Batumi shamaya, colchic minnow, colchic nase, chub and spined loach. Very few amount of trout and colchic barb were caught. Morphometric measurements of different fish species is given in table 1.

Table 1. Mean morphometric characters of caught fish

Spice\Measurement	Total length (mm)	Standard length (mm)	Head length (mm)	Eye diameter (mm)	Body depth (mm)	Caudal perduncle depth (mm)
Rhodeus colchicus	55.05	45.25	10.56	2.97	17.79	5.94
Phoxinus colchicus	60.76	50.2	11.75	2.72	12.3	5.92
Chondrostoma colchicum	61.09	49.61	12.5	3.23	12.4	5.46
Neogobius constructor	76.21	63.62	17.86	3.37	12.75	6.18
Cobitis taenia	77.64	68.26	12.7	2.3	11.41	7.03
Alburnoides fasciatus	84.56	70.26	15.14	3.81	20.17	7.92
Gobio caucasicus	30.59	26.12	6.76	1.82	5.59	2.71
Pseudorasbora parva	67.92	56.62	13.53	2.82	14.15	6.44
Barbus tauricus	210.32	180.79	32.11	4.78	42.72	18.21
Chalcalburnus chalcoides	161.78	134.66	24.58	6.62	31.07	12.01
Salmo trutta fario	179.97	150.76	41.57	7.79	39.12	15.96
Squalius cephalus	212.72	175.92	45.92	7.70	43.05	18.31

Two new species has been found in our materials, those were: stone morocco (*Pseudorasbora parva*) and colchic minnow (*Phoxinus colchicus*). Fish species, such as northern pike (*Esox lucius*); colchic khramulya (*Capoeta sieboldi*)); vimba bream (*Vimba vimba tenella* (=*Vimba vimba*)); common carp (*Cyprinus carpio*); catfish (*Silurus glanis*); mosquito fish (*Gambusia affinis holbrooki* (=*Gambusia holbrooki*)); golden gray mullet (*Mugil auratus* (=*Liza aurata*)); river perch (*Perca fluviatilis*) and monkey goby (*Gobius fluviatilis* (=*Neogobius fluviatilis*)) were not detected in our materials, but mentioned in Kheladze's paper. Additional study and materials are needed to prove, that above mentioned fish species disappeared from Natanebi River. However it is obvious, that their quantity has decreased significantly, as they are absent in our catch data.

Common bitterling mentioned in Kheladze's paper was described incorrectly. Bitterling which inhabits in Natanebi River, was described as a new species – colchic bitterling (*Rhodeus colchicus*) by Bogutskaya and Komlev in 2001.

Water chemical analysis showed, that water mineralization is low (80-103 mg/l), dissolved oxygen is within the accepted range (6-8.1 mg/l), permanganate and bi-chromatic oxidation is high, but it doesn't exceeds limited permissible norms. Natanebi river water is sodium-hydrocarbon type.

Table 2. R. Natanebi water chemical parameters

Season	April			June			November		
Parameter\Site	I	II	III	I	II	III	I	II	III
Water temperature ^{o}C	12	16	22	14.5	20.5	21	6	14	9
pH	7.9	7.9	7.7	6.9	7.1	7.8	8.3	6.9	6.9
Turbidity cm	24	24	24	30	30	30	17	17	17
conductivity	120,2	120	122,5	156,2	149,9	150,2	147,8	140,5	149,2
Dissolved oxygen mg/l	8	8,2	8,1	6,4	6,4	7,2	6	6,1	6,5
(NH_4^+) mg/l	0,2	0,2	0,2	0,2	0,2	0,2	0,15	0,15	0,15
(NO_2^-) mg/l	0,1	0,1	0,15	0,001	0,001	0,001	0,001	0,001	0,001
(NO_3^-) mg/l	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1
(Cl^-) mg/l	8,2	8	8,1	8,2	8,1	8,1	8	8	8,1
(SO_4^{2-}) mg/l	10	11	12	10	12	11	5,5	6	6
(HCO_3^-) mg/l	40,2	40	40	61,24	61	61	61	61	48,8
(Ca^{2+}) mg/l	8,4	8,4	8,4	9,4	9,4	9,4	9,1	8,9	8,8
(Mg^{2+}) mg/l	2,6	2,6	2,6	2,16	2,36	2,36	2,76	2,76	2,76
(Na^+, K^+) mg/l	10,58	10,58	10,58	10,4	10	10,3	10	10	10
hardness	0,65	0,65	0,65	0,65	0,66	0,66	0,68	0,68	0,67
($Fe^{+2,+3}$) mg/l	0,2	0,2	0,21	0,2	0,2	0,1	0,15	0,1	0,1
Mineralization mg/l	79,78	79,58	81,68	101,4	102,86	102,16	96,36	96,66	84,46
Permanganatic-ox mg/l	2,4	2,5	2,3	3,2	3,68	3,84	2,4	2,8	2,8
Bichromatic ox (COD) mg/l	10	10,2	10	15	19	21	12,1	12,2	12
(BOD_5) mg/l	1,1	2,1	2,2	1,2	2,1	2,4	1	2,1	2,5
TOC mg/l	3,75	4,69	5,02	5,63	7,13	7,88	3,45	4,5	4,5

Conclusions

Our study indicates, that the ichthyofauna of river Natanebi changed considerably during the last forty years. . Chemical analysis of water has shown that the second site is the most polluted

[15 mg/l, 19 mg/l, 21 mg/l,], where village and grazing area is located. Downstream of river is less polluted which may be a result of water filtration capacity.

To detect the changes in fish species composition along the river channel and to show how it relates to pollution intensity in Natanebi River, additional work is needed. Also monitoring program should be applied in order to detect long term trend of freshwater ecosystem changes in the river.

Acknowledgements

We would like to thank Levam Mumladze, Zhanetta Shubitidze and Giorgi Nozadze for their help during the expeditions. The work was supported under the project of Institute of Zoology "Biodiversity of Guria Region".

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