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Composition of Heavy Metals in the Water of the River Lopota and Floating Silt

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Abstract. Like other small rivers in Georgia, the river Lopota, which is one of the most important left tributaries of the river Alazani, is ecologically less studied. Although, phosphorus - potassium fertilizers containing heavy metals from agricultural lands, leaching sediment, composts made of municipal and household waste are systematically leached into the river Lopota, the composition of heavy metals, copper, zinc, iron, lead, nickel, manganese is lower than it is accepted. This fact is promoted by water pH, under which these metals are hydrolyzed and their main mass is accumulated at the bottom, and the rest of it is absorbed in the floating silt. Therefore, they cannot have a negative impact on self-scouring and ecological condition of the river.

Keywords: the river Lopota; heavy metals; floating silt.

Introduction.

Georgia is very rich in fresh water resources. Unfortunately, the quality of water in surface objects does not correspond with the European norms. The pollution of reservoirs threatens the uniformity of bio variety and eco-system, as well as the human health. Heavy metals are among the existing numerous harmful wastes, the compositions of which reach the threatening limit. Their small composition can also have a toxic impact. Under the influence of natural processes they can be transformed into more dangerous forms. They are characterized by the rigidity in the

environment and destructive effects. Therefore, polluting rivers with heavy metals is a serious ecological threat, which is especially dangerous for small rivers. [1, 2].

99, 4 % of the existing 26000 rivers in Georgia are small rivers. Most of them are short shallow mountain rivers. Their average length is 2,3 km. Proceeding from that, ecological monitoring and keeping the environment clean is very important.

The river Lopota is the left tributary of the river Alazani which is one of the most important rivers of western Georgia. The river Alazani takes its source from the south slope of the Caucasus (2560m high). Like other Georgia's small rivers, it is also ecologically less studied [3].

The surrounding territory of the Lopota is tightly populated and is characterized with the developed agriculture, winegrowing, winemaking and cattle-breeding. The Lopota is significantly polluted with the household waste, unfiltered water from local farms and pesticides used in agriculture. Using incorrect methods in agriculture may cause pollution with heavy metals, which will have a serious impact on the ecological condition of the river [4].

Materials and Methods.

Collecting the samples was carried out according to the field research scheme. In order to identify the composition of heavy metals in the river water and floating silt, we monitored seasonally in 2013-14, according to the scheme which was selected in advance and we used corresponding with the research methods. We collected the samples in three control points: Village Lapankuri (point №1), village Napareuli (point №2), and village Saniore (point №3).

Before the field work we planned standard procedures for field analyzes and we tested the apparatuses and reactivities. Collecting and wrapping up the samples were done according to the standard methods [5,6,7].

The samples were collected and stored according to the method which is recommended in the literature of hydrochemistry. The separation of floating particles from water phase was done by filtration with a 0, 4 mmk diameter membrane filter. After this the separated particles were dried until they were transformed into soft- dry mass. In addition ground and bottom sediments were gathered within 50cm. The mass method was defined and samples were stored in biux. The composition of heavy metals was defined with an atomic-absorbing method.

Results and discussion.

2013-14- year results show (Figure №1,2), that in the water of the river Lopota the lowest index of composition of dissolved iron, copper, zinc, lead, nickel and manganese was fixed in Lapankuri, but the highest was found in Saniore. The results of the research show that the pollution is low in the source and upper part of the river, while the composition of heavy metals grows alongside the flow, but it does not exceed the accepted limit.

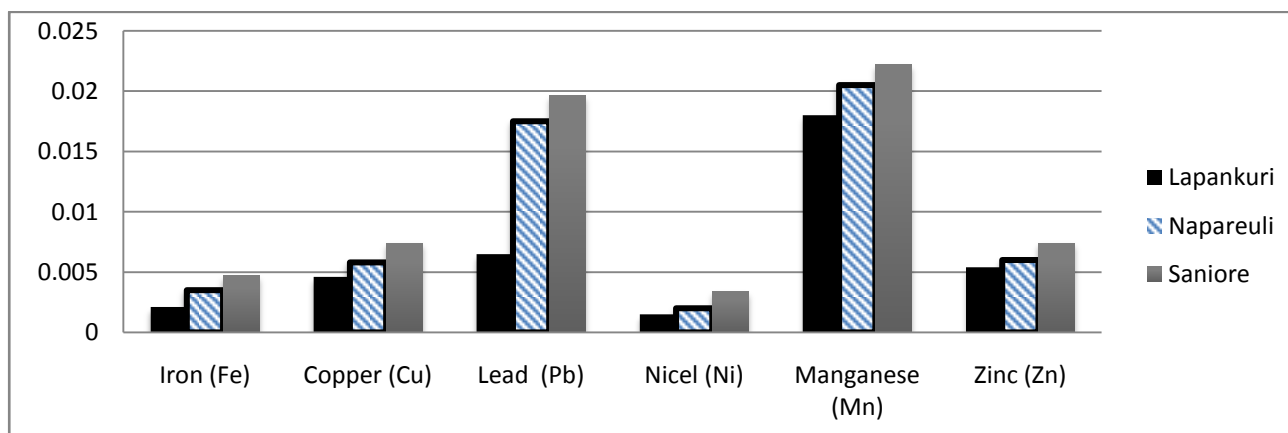


Figure 1. Composition of heavy metals in the water of the river Lopota

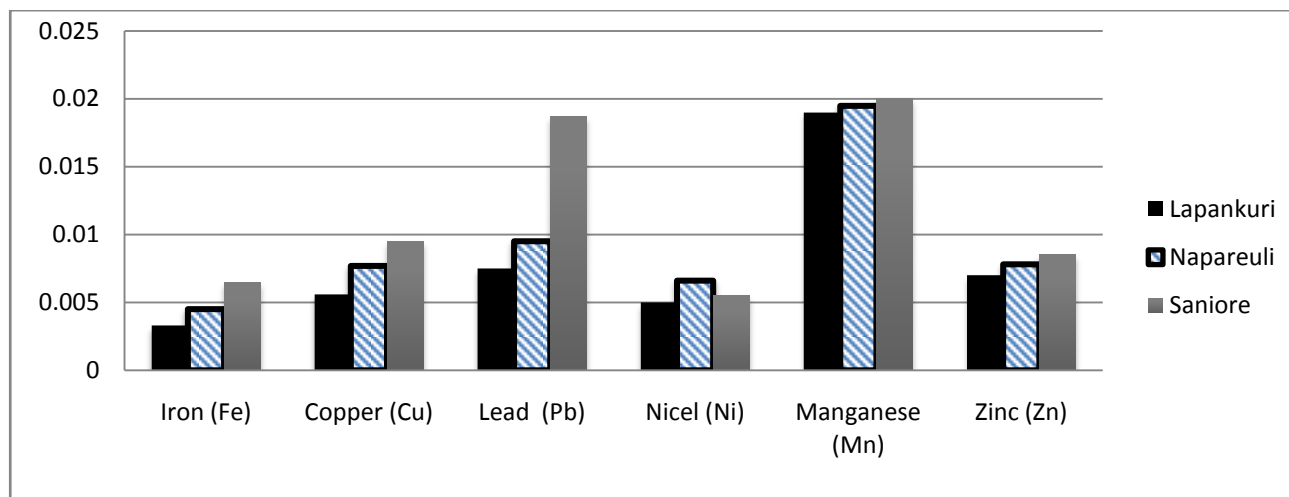


Figure 2. Composition of heavy metals in the water of the river Lopota

In order to estimate the eco-toxic condition of the river Lopota we also studied the composition of heavy metals in the floating silt. The results of 2013 monitoring showed (chart №4) that the composition of copper, nickel, and zinc in the floating silt of the river Lopota is the lowest in Lapankuri and it equals-0,0170 mg/l; 0,0070 mg/l; 0,0240 mg/l, but the composition of copper (0,0340 mg/l) and manganese (0,0265 mg/l) is the highest in Napareuli. Composition of nickel (0,0090 mg/l), lead (0,0080 mg/l), zinc (0,0440 mg/l) and iron (0,0242 mg/l) is the highest in Saniore.

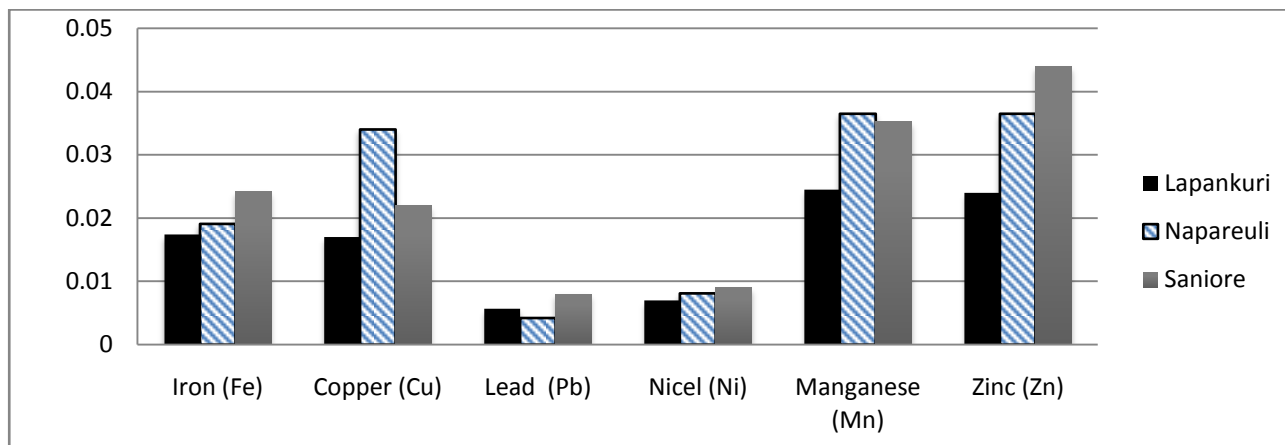


Figure 3. Composition of heavy metals in the floating silt in the river Lopota

According to the research done in 2014 (Figure 4), the highest index of copper (0,0415 mg/l), nickel (0,0088 mg/l) and manganese (0,0386 mg/l) was fixed in Napareuli, but in Saniore – iron (0,0302 mg/l), lead (0,0087 mg/l) and zinc (0,0480 mg/l). As for the low index of iron (0,0195 mg/l), nickel (0,0085 mg/l), zinc (0,0255 mg/l), lead (0,0055 mg/l) and manganese (0,0260 mg/l) was fixed in Lapankuri.

The samples were collected on the territory of tightly inhabited points. The points that were chosen for the research are characterized with developed agriculture, cattle breeding and industry. Because of this the river Alazani is substantially polluted with household used water, unfiltered water leaching from local farms and pesticides that are used in agriculture.

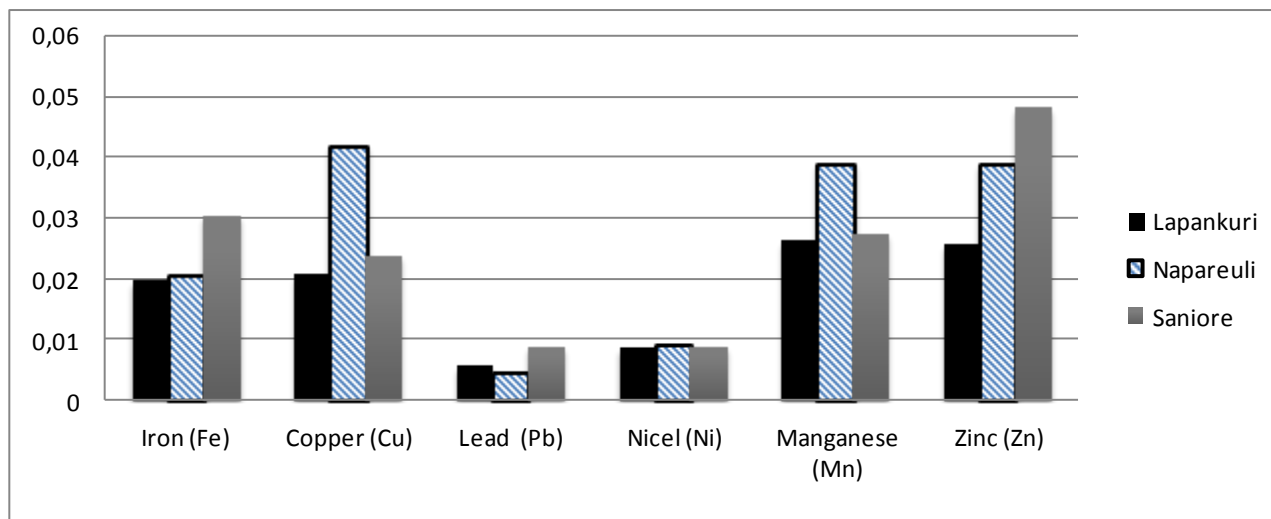


Figure 4. Composition of heavy metals in the floating silt of the river Lopota

Conclusion.

Although, phosphorus – potassium fertilizers from agricultural lands containing heavy metals, leaching sediment, composts made of municipal and household waste are systematically leached into the river Lopota, the consistence of heavy metals, copper, zinc, iron, lead, nickel, manganese is lower than it is accepted. This fact is promoted by water pH, under which these metals are hydrolyzed and their main mass is accumulated at the bottom, and the rest of it is absorbed in the floating silt. Therefore, they cannot have a negative impact on self-scouring and ecological condition of the river.

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