PRELIMINARY ASPECTS REGARDING SOME PHYSICO-CHEMICAL, CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF THE WATER IN THE ŞOROGARI CREEK

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Abstract

This paper aims at underlying some physico-chemical, chemical, and biological characteristics of the water in the Şorogari creek in the in the sector Vânători locality – Podul de Fier – Iaşi. Field observations and physical – chemical (pH, conductivity, the total content of solid substances dissolved - TDS) and chemical analysis (sulphates, nitrites) of water samples were performed; the species of algae were identified. The results obtained emphasize specific values of the analyzed indicators (pH, conductivity, TDS) according to the interval of time and the station of water sampling. The pH was slightly alkaline. The water samplings taken from station five (Vânători locality) are noticeable for higher values of the conductivity and TDS during the whole period taken into study. The species of algae identified in the water samples belong to the groups *Cyanophyta*, *Bacillariophyta; Euglenophyta*, *Chlorophyta*, *Xantophyta*. The results of physico-chemical and chemical analysis and the species of algae identified indicate the existence of some human influence on the creek water in the studied sector.

Key words: physical / chemical indicators, algal taxons, Şorogari creek

The stream Sorogari (called also Cacaina) is a tributary on the left side of Bahlui river. The stream Sorogari has a length of 21 km and a surface of the basin of 63 km² (Buza M., et al., 2008; Minea I., 2009; www.isujis.ro). The geographical coordinates of the stream are: 47°09` latitude North and 27°36` longitude East (Buza M., et al., 2008). It streams from a swamp area located very near the intersection between the rivers Bahlui and Jijia. It flows into Bahlui river on the territory of Iasi (Minea I., 2009). In the city of Iasi, from the area Podul de Fier (street C.A. Rosetti) and until its flowing into Bahlui, the course of the stream is channelled underground.

In the period 1980-1983, there were executed and set into function two non-permanent lakes of accumulation (Carlig and Vanatori), for the protection against the floods in the neighbourhoods Tudor Vladimirescu and C.A. Rosetti (www.rowater.ro/daprut). In a report recently written (www.ipa.ro /) there are also mentioned three lakes of accumulation in the basin of the stream, located on the territory of the commune Popricani: the lake Livada I, Livada II and Vechiuleasa. They are arranged for fish growing.

This paper aims at underlying some physico-chemical, chemical, and biological characteristics of the water in the Şorogari stream in the sector Vânători locality – Podul de Fier – Iaşi

The physical-chemical and chemical characteristics of the courses of water (rivers and tributaries) vary according to the mineralogical composition of the rocks in the areas they cross, the regime of precipitations, temperature, seasonal variation of the flow, the level of underground water, etc. Among the organisms living in the water, the algae were used by many authors as bio-indicators to estimate the quality of the rivers (O'Farell I., et al., 2002; Kalyoncu H., et al., 2009; Barinova S., et al., 2010; Rishi V., Awasthi A. K. (2012). According to the Water Frame Directive 60 /2000 / EC (http //:www.mmediu.ro), the algae represent one of the biological elements used to estimate the ecological state of the surface of the water bodies.

The basin of the stream Sorogari represented the object of the study of geomorphologic nature (Niculiță I., 2009). Brief data of physical-chemical nature regarding the stream Sorogari near the city Iasi are presented by Romanescu Gh. et al., 2005.

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MATERIAL AND METHOD

Determinations have been done on water samples, periodically taken in April 2012 (noted: sampling 1 - date 13 April; sampling 2 - 27 April), May 2012 (noted: sampling 3 - 11 May) and June 2012 (noted: sampling 4 - 11 June). Water samples were taken from five different areas (measurement stations) located on the course of the Sorogari stream: station 1 - Podul de Fier (Iasi); stations 2 and 3 – the area of input of the stream in the city (before – 3 - and after -2 – a drainage channel of pluvial water and wastewater in the vecinity of human dwellings); station 4 – Cârlig bridge, station 5 - locality Vânători.

The following physical and physical-chemical parameters were considered in the study: temperature, pH, conductivity (determinated with a multi-parameter of type Consort C532), the total content of solid substances dissolved – TDS (determined with a TDS-meter). Qualitative determinations were done for sulphates and nitrites (Ghimicescu G., Hâncu I., 1979). There were identified the species of algae in the samples of water taken in the sector analysed. For the identification of the species, there were done microscopic observations by means of an Olimpus microscope. The water samples were examined in fresh and preserved condition in formalin 4%. The determinations were done using the determinators published by Hindak F.,(1977), John D. M., et al., (2002). Also, field observations were done.

RESULTS AND DISCUSSIONS

Temperature *(tab. 1*). It was determined for the samples 3 and 4. There were recorded values between 23 ^{0} C - 28 ^{0} C for sample 3 and between 26 ^{0} C - 32 ^{0} C for sample 4. For both samples, the highest values were recorded for the water samples taken from the stations 4 and 5. The water temperature is influenced by the solar radiation, the air temperature and the hydrological characteristics of the river (water volume, flow speed, concentration of salts, etc.) (Pantazică M., 1974).

PH *(tab. 1).* It is an important indicator of water quality and influences the development of the activity of hydrobionts. During the investigations, the pH recorded values within the range 8.3 and 8.85 (slightly alkaline). In most cases, the pH presented values between 8.5 and 8.85. Mălăcea I., (1969) shows the fact that the biological productivity of waters is assured at pH with values between 6.5 and 8.5. According to the Normative regarding the classification of the quality of the surface waters in order to establish the ecological state of the water bodies (2006), the pH of the river water must be between 6.5 – 8.5.

Conductivity and TDS of the water samples *(tab. 1)* varies in a similar way, according to the station where the samples were taken, and the moment of sampling. Conductivity presented values between 1010 µS/cm - 1650 µS/cm. The water samples taken from station 5, comparing with the water samples from the stations 1 - 4, presented high turbidity and slightly higher values of conductivity and TDS during the period studied. In that area, the river bed has a wider width; the depth is very low; the flow speed is low; the deposit of river deposits (represented by solid materials, still from erosion, from the decomposition of plant remains, from products of des-assimilation of water organisms) is more active.

Table 1

Indicatori fizici şi fizico-chimici

Station	Indicators	Sampling 1	Sampling 2	Sampling 3	Sampling 4
Station 1	Temperature (^{0}C)	-	-	26	27
	pH	8.4	8.75	8.5	8.3
	TDS (ppm)	1130	977	1020	750
	Conductivity (µS/cm	1150	1170	1210	1185
Station 2	Temperature (^{0}C)			24	26
	pH	8.49	8.72	8.57	8.45
	TDS (ppm)	1100	960	884	1920
	Conductivity (µS/cm	1010	1130	1110	1785
Station 3	Temperature (^{0}C)	-	-	23	28
	pH	8.5	8.73	8.56	8.41
	TDS (ppm)	1150	977	948	680
	Conductivity (µS/cm	1150	1150	1160	1033
Station 4	Temperature (^{0}C)	-	-	28	31
	pH	8.58	8.71	8.84	8.63
	TDS (ppm)	1250	976	1110	900
	Conductivity (µS/cm	1060	1180	1300	1365
Station 5	Temperature (^{0}C)	-	-	28	32
	pH	8.56	8.5	8.66	8.85
	TDS (ppm)	1630	1620	1100	895
	Conductivity (µS/cm	1430	1650	1550	1510

Table 2

The taxons of algae identified in the sector of creek analysed'

No.	Phylum / Taxons	Sampling - April/Station					Sampling- May/Station					Sampling- Junie/Station				
		S1	S2	S3	S4	S5	S1	S2	S3	S4	S5	S1	S2	S3	S4	S5
	Cyanophyta															
1	*Anabaena variabilis* Bonnet et Flahault	+														
2	*Anabaena catenula* Kurtz.ex Bornet &Flahault					+										
3	*Aphanizomenon flos-aquae* Ralfs ex Born et Flah								+	+			+		+	
4	*Chamaesiphon sp*			+												
5	*Merismopedia glauca* (Ehr.) Nageli	+	+	+	+		+	+	+	+		+	+	+	+	
6	*Merismopedia punctata* Meyen	+	+	+	+		+	+	+	+				+	+	
7	*Oscillatoria plantonica* Wolosz.			+	+					+			+			
8	*Oscillatoria limnetica* Lemmerman	+	+		+	+										
9	*Oscilatoria cortiana* Gomont		+													
10	*Oscilatoria formosa*(Boryde Saint –Vincent)Gomont			+							+					
11	*Oscilatoria tenuis*(Agardh) Gomont				+											
12	*Phormidium sp.*					+										
13	*Phormidium inundatum* (Kutz.) Gomont	+														
14	*Mycrocistis aeruginosa* Kutz.		+													
	Bacillariophyta															
1	*Achnantes minutissima* Kutz.	+	+	+	+	+	+	+	+	+	+		+		+	
2	*Amphipleura pellucida* Kurtz.				+											
3	*Amphora acutiuscula* Kutz.	+														
4	*Anomoeoneis sphaerophora* (Ehr.)Pfitzer	+		+												
5	*Asterionela formosa* Hassall	+	+	+	+								+	+		
6	*Cyclotela meneghiniana* Kurtz.											+		+	+	
7	*Cyclotella comta* (Ehr.) Kutz.	+	+				+	+						+	+	
8	*Cymbella lanceolata* Her.van Heurck						+	+	+	+			+	+	+	
9	*Cymbella prostrata* (Berckeley) Cleve						+	+	+	+			+	+		
10	*Ceratoneis arcus* Kütz							+	+	+				+	+	
11	*Diatoma vulgare* Bory	+	+				+	+					+	+	+	
12	*D. hiemale* Lyngbye Heiberg.						+	+	+				+	+		
13	*Fragilaria crotonensis* Kitton					+										
14	*Gomphonema acuminatum* Ehr.							+	+	+						
15	*G. parvulum* Kutz Grun.						+	+	+	+					+	
16	*Gomphonema olivaceum* Lyngbye	+						+	+	+						
17	*Hantzschia amphioxys* (Ehrenb.)Grunow			+		+										+
18	*Melosira sp.*					+										
19	*Navicula cryptocephala* Kutz.	+	+	+	+		+	+	+	+				+	+	
20	*Navicula lanceolata* (Agardh)Ehrenberg								+				+			
21	*Navicula rhynchocephala* Kurtz			+												
22	*Nitzichia hungarica* Grun	+														

Table 2 (continuation)

The taxons of algae identified in the sector of creek analysed'

No.	Phylum / Taxons	Sampling - April/Station					Sampling- May/Station					Sampling- Junie/Station				
		S1	S2	S3	S4	S5	S1	S2	S3	S4	S5	S1	S2	S3	S4	S5
	Bacillariophyta															
23	*Pinnularia gibba* Ehr.		+	+									+	+		
24	*Surirella linearis* Smith															
25	*Surirella ovata* Kurtz															+
26	*Synedra tabulata* Kurtz											+				
27	*Synedra ulna* (Nitz.) Ehr.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	Euglenophyta															
1	*Euglena sp.*								+				+	+		
2	*Phacus acuminatus* A. Stokes	+					+						+	+	+	
3	*Trachelomonas granulata* Svireko	+	+										+	+		
	Chlorophyta															
1	*Chlorella vulgaris* Beijerinck	+	+	+	+					+	+	+	+	+		
2	*Cladophora glomerata* Kutz	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	*Closterium moniliferum* Her. ex Ralfs	+					+							+	+	
4	*Coelastrum microporum* Nageli in A. Braun	+					+	+	+	+						
5	*Gongrosira fluminensis* F. E. Fritsch	+	+													
6	*Kirchneriella obesa* West & G. S. West		+				+									
7	*Koliella spiculiformis* (Vischer) Hindak	+	+	+	+		+	+	+	+				+		
8	*Monoraphidium arcuatum* (Korshikov) Hindak		+													
9	*Monoraphidium contortum* (Thuret) Komarkova Legnerova	+							+							
10	*Monoraphidium tortile* Komarkova Legnerova	+	+													
11	*Pediastrum duplex* Meyen										+					
12	*Scenedesmus acuminatus* (Lagerkeim) Chodat		+				+									
13	*Scenedesmus communis* E. H. Hegewald	+					+	+		+		+			+	
14	*Scenedesmus falcatus* Chodat							+	+							
15	*Scenedesmus granulatus* W. West & G. S. West		+													
16	*Spirogyra sp*.	+		+	+		+	+				+	+			
17	*Stigeoclonium tenue* Kutz.	+			+											
18	*Tibonema viride* Pascher		+													
	Xantophyta															
1	*Xanthonema* sp.										+					

The values recorded for conductivity and TDS indicate a high degree of mineralisation. According to Pantazică M. (1974), the degree of water mineralisation depends on a series of local geographical factors (precipitations, types of soil, temperature, etc). The author mentions the fact that, according to the content of salts, the river waters in the basin of Bahlui river are waters with high mineralisation (500mg/l - 1000mg/l)/ very high (≥1000mg/l).

The sulphates were present in all the water samples. The sulphate ion has an important role in the mineralisation of the river water in the Bahlui basin (16-28 %) (Minea I., 2009). The nitrites were present in the case of the stations 1 - 4 during the whole period analysed. For the samples taken from the station five, the nitrites were slightly noticeable once (the sampling 4). The specific coloration of the reaction of highlighting (pink - red) was more pronounced in the case of the samples taken from station 1. This fact is explained by the existence in the neighbourhood of the bridge of a canal of flow into the stream of the rain waters, and also of the waters coming from the housing by the river.

There were identified 63 taxons of algae that belong to five groups: *Cyanophyta* (14 taxons), *Bacillariophyta* (27 taxons); *Euglenophyta* (3 taxons), *Chlorophyta* (18 taxons), *Xantophyta* (one taxon) *(tab.2)*. On analysing comparatively the results obtained on the five sampling stations, the following as noticed : as number of taxons identified on the first place there is the phylum *Bacillariophyta* followed in decreasing order by *Chlorophyta (*which presents a larger number of taxons at the stations 1 and 2) and *Cyanophyta.* Among *Xantophyta* it was identified one taxon only at station 5 (sampling 3). According to Rishi V., and Awasthi A. K. (2012), some species of the genera *Oscilatoria, Merispopedia,* etc. (*Cyanophyta*) are main species indicating the pollution. Some species we identified are present in moderately polluted water *(Achnantes minutissima, Diatoma vulgare, Synedra ulna, Navicula criptocephala, N. lanceolata, Hantzschia amphioxys)* or unpolluted (*Achnantes minutissima, Diatoma vulgare*) (Mălăcea I., 1969; Kalyoncu H., and colab., 2009).

CONCLUSIONS

The physico-chemical indicators present specific value variations, according to the data of sampling water and the station of sampling.

The water samplings taken from stations 5 (Vânători) are noticeable for higher values of the conductivity and TDS during the whole period taken into study; low algal diversity.

The species of dominant algae as number of taxons are the diatoms (*Bacillariophyta*), followed by the *cyanophyceae* and *chlorophyceae*; less represented are the *euglenophyceae* and x*antophyceae.*

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