ECOLOGICAL STATUS OF THE TIMIŞ STREAM, AFFLUENT OF THE OLT RIVER

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Abstract

All rivers, streams, estuaries, and lakes are assigned to a class based on the beneficial uses they could support if they had good water quality. The purpose of this study is the monitoring of the quality of water in order to set the framing Timiş stream into quality classes. Samples were collected between the period of January 2009 to July 2010 to determine the following parameters: pH, total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate and orthophosphates. The values of the calculated average concentrations of monitored parameters were compared with the limit values presented in Order 161/2006. The concentrations of the BOD, COD and nutrients fall the section in the III-IV class of the quality. Total suspended solids in samples taken from Timiş stream section showed concentrations which considerably exceeded value established in classification of the surface waters quality from Order 161/2006. Concentrations of BOD and COD corresponded to III class of quality and concentrations of nutrients corresponded to IV class of quality of water surface. Timiş Stream represent a critical point in terms of the quality of surface waters because is also, the wastewater receptor for some industrial units in the city of Braşov taking along with them also a part of untreated domestic wastewater trough the city sewer overflows.

Key words: water, quality, stream, parameters.

INTRODUCTION

In Romania, the biomonitoring activity is an integrated part of the complex monitoring of water quality and this specific activity is performed systematically and periodically at local and national scale in order to obtain the main elements regarding water quality and decision-making.

The assessed biological observations are connected with a series of characteristics of some quality chemical parameters: oxygen content, oxygen saturation, BOD, COD (organic substances), biogenic elements (nitrogen and phosphorus), some toxic components, bacterial charge degree.

In general, the most important danger of pollution potential in the case of point sources comes from the units belonging to the public utilities, chemical industries, animal-growing industries and commercial enterprises for extraction (including mining) and metallurgic industries (Chirilă, 2007).

Classification of the surface water quality in order to establish the ecological condition is done according to the Order 161/2006. The establishment of the quality condition of different water categories is done by the quality indicators correlated with the different uses of water, purpose of the legislation in force.

According to Order 161/2006, five quality classes are distinguished as follows: the quality class I – very good condition – no alterations (or very small alterations) of the quality of physico-chemical and hydromorphological elements; the quality class II – good condition – the quality of the biological elements values present low levels of change due to human activities; the quality class III – moderate status – moderate signs of disturbance as a result of human activities; the quality class IV – low quality – major alterations of the quality of the biological elements values; the quality class V – bad water quality - major alterations of the quality of the biological elements values –large parts of important biological communities are absent.

MATERIALS AND METHODS

The study was made in the hydro-graphic Basin of Olt River and the water samples were collected from Timiş stream, the section code 8050, kilometer 14.

Timiş stream is the section located between Braşov downstream – downstream Ghimbăşel confluence (Ghimbăşel is the affluent of the Olt River). This section is in beta-alpha-mesosaprobic conditions. Water quality was studied during the years 2009-2010.

The water sampling, transport and preservation were made according to the minimum recommendations included in SR ISO 5667/2002.

The following physical and chemical parameters were measured to describe the water quality of Timiş stream in laboratory: pH, total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate-N and orthophosphates.

The methods used for determining the parameters were the following: pH was determined using the pH-meter; total suspended solids (TSS) were determined by filtration method; BOD was measured by determination of dissolved oxygen content before and after incubation of samples (5 days at 20^0C); COD was measured using potassium dichromate; nitrate-N and orthophosphates by spectrophotometric method, in conformity with relevant ISO's.

The values of the calculated average concentrations of monitored parameters were compared with the limit values presented in Order 161/2006. (Table 1) The overall quality of the water in the sampling section was estimated by the weighting of the quality indicators from each group and the final quality state of water was established after more unfavorable concentration groups.

Table 1

The limits values of the monitored parameters for the quality classes of surface waters

Physical and chemical parameters of water	Unit of measurement	Categories of the quality classes of surface waters				
		I	II	III	IV	V
		Limit values (Order 161/2006)				
pH	pH units	6,5-8,5				
Total suspended solids (TSS)	mg/l	<63				
Biochemical oxygen demand (BOD)	mg O_2/l	3	5	10	25	>25
Chemical oxygen demand (COD)	mg O_2/l	10	25	50	125	>125
Nitrate-N (N-NO_3)	mg N/l	3	3	6	15	>15
Orthophosphates (P-PO_4)	mg P/l	0,05	0,1	0,2	0,5	>0,5

RESULTS AND DISCUSSION

The values of the quality parameters obtained from the methods of investigation and data processing are presented in the tables.

A slightly elevated concentration of hydrogen ions (pH 7-7,54) was detected in water samples except for the months of January, February and March of the year 2009 when concentrations of hydrogen ions below the minimum limit of 6,5 were registered (table 2). Numerous studies have confirmed that a pH range from 6.5 to 9 is the most appropriate for the maintenance of fish communities.

The concentration of suspended solids (table 2) exceeded values corresponding to all defined classes of ambient surface water quality outlined in the System of Classification for Ambient Surface Water Quality (Order 161/2006) which requires annual average value equal or below 25 mg/l (table 1).

The sources of suspended solids in the section may include soil erosion and raw sewage. Inorganic suspended solids attenuate light, primarily through the process of scattering. High concentrations of suspended solids degrade optical water quality by reducing water clarity and decreasing light available to support photosynthesis. Suspended solids also influence metabolic activity and provide surface area for the sorption and transport of an array of constituents (Galatchi, 2006).

BOD and COD values were satisfactory for water bodies designated for fishery purposes and showed absence of obvious contamination with organic substances. According to the classification of the surface water quality from Order 161/2006 during the monitored period (January 2009 –J uly 2010) water in Timiş stream corresponded to quality class III.

Table 2

The average concentrations values of the physical and chemical parameters of the water collected from Timiş stream

Period (month/year)		The average concentrations values of the physical and chemical quality parameters of water					
		pH (pH units)	Total suspended solids (TSS) (mg/l)	Biochemical oxygen demand (BOD) (mg O_2/l)	Chemical oxygen demand (COD) (mg O_2/l)	Nitrate-N (N-NO_3) mg N/l	Orthophosphates (P-PO_4) mg P/l
January	2009	6,39	125,56	15,94	37,31	8,21	0,28
February		6,25	133,93	21,36	42,19	6,35	0,46
March		6,13	123,00	17,62	41,34	7,52	0,27
April		7,19	132,80	9,14	37,27	3,49	0,37
May		7,5	121,10	8,00	31,24	8,18	0,58
June		7,29	136,20	7,91	29,30	13,90	0,53
July		7,32	122,00	6,69	26,34	16,20	0,60
August		7,54	108,20	7,23	26,79	38,36	0,39
September		7,48	145,50	6,33	32,99	37,31	0,21
October		7,48	122,19	8,10	31,26	6,82	0,26
November		7,50	125,50	6,97	34,65	13,02	0,32
December		7,50	113,80	5,50	26,34	15,04	0,27
January	2010	7,45	155,50	11,09	28,76	16,64	0,49
February		7,00	124,90	18,10	31,30	7,30	0,39
March		7,10	143,80	18,50	31,90	12,90	0,69
April		7,46	134,00	12,90	27,40	13,50	0,95
May		7,51	130,00	13,00	24,55	17,30	0,39
June		7,51	105,00	9,67	23,70	6,60	0,36
July		7,46	128,00	5,72	23,40	8,00	0,24

In ecological terms, because of its important role in biological systems, phosphate is highly sought after resource. Once used, it is often a limiting nutrient in environments and its availability may govern the rate of growth of organisms. Water quality criteria for phosphorus compounds, such as phosphates, are set at a concentration that prevents excessive growth of algae. In freshwater or estuarine systems close to land, nitrate can reach high levels that can potentially cause the death of fish (Varduca, 1997). The concentrations of nutrients (nitrate-N and orthophosphates) in water of Timiş Stream corresponded to water quality class IV (major alterations of the quality of the biological elements values) (table 2).

CONCLUSIONS

The main pollution problem of the surface waters in Romania is the excessive volumes of nutrients entering the rivers, mainly from agricultural

fertilizers, and unthreatened or not adequately threatened municipal sewage, including feces and household products.

Further, organic pollution can cause significant changes in the oxygen balance of rivers and lakes. As a consequence this can impact the composition of aquatic species. Organic pollution is mainly caused by untreated or only partially treated wastewater from cities/villages, industry and agriculture. Hazardous and toxic substances are also a major threat, made worse by occasional industrial accidents or floods when deadly toxins may be flushed directly into watercourses.

A recent analysis also shows that the surface waters suffer significantly from hydromorphological alterations. Interruption of river and habitat continuity, disconnection of adjacent wetland/floodplains, hydrological alterations and future infrastructure may impact water status and therefore need to be addressed in the future (Bologa, 2001).

Total suspended solids in samples taken from Timiş stream section showed concentrations which considerably exceeded the value established in classification of the surface waters quality from Order 161/2006. Concentrations of BOD and COD corresponded to quality class III and concentrations of nutrients corresponded to quality class IV of water surface. Timiş Stream represents a critical point in terms of the quality of surface waters because it is also the wastewater receptor for some industrial units in the city of Braşov taking along with them a part of untreated domestic wastewater through the city sewer overflows.

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