QUALITY OF WATERS FROM THE ORNITHOLOGICAL RESERVATION SATCHINEZ

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Abstract
The Ornithological Reservation Satchinez is located 28 km away from Timisoara and represents a vestige of an archaic marsh of great size covering the west part of Banat in past times. Aquatic macroecosystems have consolidated in this area. Ornithological activity is done in humid areas such as freshwater pans and marshes alternating with herbaceous forms, meadows, bushes, glades, shrubs, etc. The study was carried out after a three-year dryness period resulting in a solute matter concentration. The studied periods are the prevernal, vernal and serotinal. Due to the meteorological conditions specific to these periods, reservation supply with water was done from small streams originating in the underground waters. The correlation of dissolved and suspensed matter concentrations' variation with the meteorological factors and ornithological activity allows an objective analysis of the reservation water quality. Water impurification exceeded the self-purifying capacity of waters during summer leading to birds' activity focussing in the cleaner humid areas, that is surface water supply sources. Alkaline, alkaline earth and toxic metals were monitored, as well as organic load (COD, BOD_5) and self-purifying parameters (oxygen level, saprobiologic characterization). The physical-chemical and biological characteristics of waters are influenced by the climate change of the Western Romania.

Introduction

Agricultural lands and human accommodations surround the Ornithological Reservation Satchinez. It comprises of 236 ha of protected area, of which 104 ha have the status of ornithological reservation. The reservation consists of fresh water habitats (water pans), marshes and land covered with herbaceous plants, bushes, trees, etc. (1,2).

The reservation is supplied by small, continuously flowing, fresh water streams. Underground water is at small depth and may easily up to the surface resulting in land marshing. Seasonal, when rainfalls, areas are flooded by the two major streams flowing in the region.

The study was carried out to establish whether the reservation area is to become a fauna life affected area.

This area is a nesting or passage area for many bird species of interest (protected species), being known as the "Banat's Delta". Here are some of these species: *Podiceps ruficollis, Botarus stellaris, Grus grus, Ixobrychus minutus, Nycticorax nycticorax, Ardeola ralloides, Egretta alba, Egretta garzetta, Ciconia ciconia, Ardea cinerea, Ardea purpurea, Calidris*

minuta, Larus ridibundus, Tringa glarelula, Tringa hypoleucos, Chlidonias niger, Chlidonias leucopterus, Chlidonias hybrida, Larus argentatus cachinans, Larus minutus, Porzana porzana, Vanellus vanellus, Anas penelope, Anas crecca, Anas querquedula. This area shelters as well other protected species belonging to mammals, reptiles, amphibians, fish and some invertebrates (2).

Water flow within the reservation is very reduced, status that in correlation with the meteorological conditions of the analyzed period modifies the physical and chemical parameters.

This study was aimed to analyze the physical-chemical and saprobiological characteristics of the small fresh water sources compared to the waters from within the reservation and those exiting the reservation, as well as to correlate the ornithological activity with the global processes of bio-chemical transformation (impurifying – self-purifying) (4,5,6).

Methods

Physical-chemical analyze was carried out on samples taken from the epilimnion, influenced by the atmospheric air temperature. Water depth at sampling points was of 50-80 cm, giving access to sunrays to get to the bottom.

Water was sampled in glass bottles and then fixed and transported according to the norms of the surface water quality standards. Physical-chemical and biological analyses were carried out according to current norms and normatives.

At the same time with the water samples, mud was sampled from the bottom to identify and analyze the species comprising the benthal biocenosis, the saprobiotic organisms biodegrading the organic substances. Microscopic preparations were done to examine the samples and identify the present species. Examination was done with a Nikon TE 200 microscope. Species identification was done using specialty guidebooks (3).

Water was sampled monthly during March-May and on September 2002. Water sampling and transportation was done according to the current Romanian technical norms. Temperature was taken on the spot. Turbidity (using a HACH A 2100 A turbidimeter), pH (with Icolab), BOD, COD were determined. The cations were determined using a Varian atomic absorption spectrophotometer.

The physical-chemical and the saprobiological characteristics were assessed analyzing the sampled water. There were three different fresh water sources, one source from the reservation itself and one from the exiting water.

Results

Table 1 shows the results of the water analyses sampled from the five mentioned points, in March, April, May and September.

From table 1, one can notice the variation domains of pH, conductibility, temperature, total hardness, turbidity for the supplying waters compared to the reservation waters and exiting waters. Calcium, magnesium, sodium, potassium, iron, manganese, chromium, cadmium, zinc, nickel, copper concentrations are also presented.

Figure 1 shows the organic load variation (COD and BOD) as well as oxygen level in the spring and fall studied months.

Table I

Inorganic parameters in the sampled waters

No.	Parameter	Samples				
		Supplying waters			Reservation waters	Exiting waters
		1	2	3	4	5
1.	pH	7.5-8.1	7.8-8.3	7.5-8.3	7.4-7.8	7.5-8.5
2.	Conductibility (µS)	670-880	730-970	745-940	745-940	782-1180
3.	Hardness (ºD)	19.6-22.4	21.3-25.7	21.3-25.7	21.3-24.1	24-26.8
4.	Turbidity (ºSiO_2)	25-29	25-105	20-145	25-75	112-250
5.	Calcium (mg/l)	50-75	18-50	25-59	25-55	50-76
6.	Magnesium (mg/l)	43-63	28-97	37-72	37-72	41-81
7.	Sodium (mg/l)	31-85	41-85	40-96	37-102	117-125
8.	Potassium (mg/l)	2.3-6.5	3.6-6.0	2.4-4.7	2.4-6.5	6.3-9.8
9.	Iron (mg/l)	0.159	0.164	0.062	0.058	0.182
10.	Manganese (mg/l)	0.032	-	-	-	-
11.	Chromium (mg/l)	0.077	0.053	0.1	0.078	0.113
12.	Cadmium (mg/l)	0.155	0.169	0.173	0.163	0.176
13.	Zinc (mg/l)	-	-	0.03	0.015	-
14.	Nickel (mg/l)	0.256	0.237	0.287	0.253	0.277
15.	Copper (mg/l)	0.004	-	-	0.001	-

(-) below limit of detection

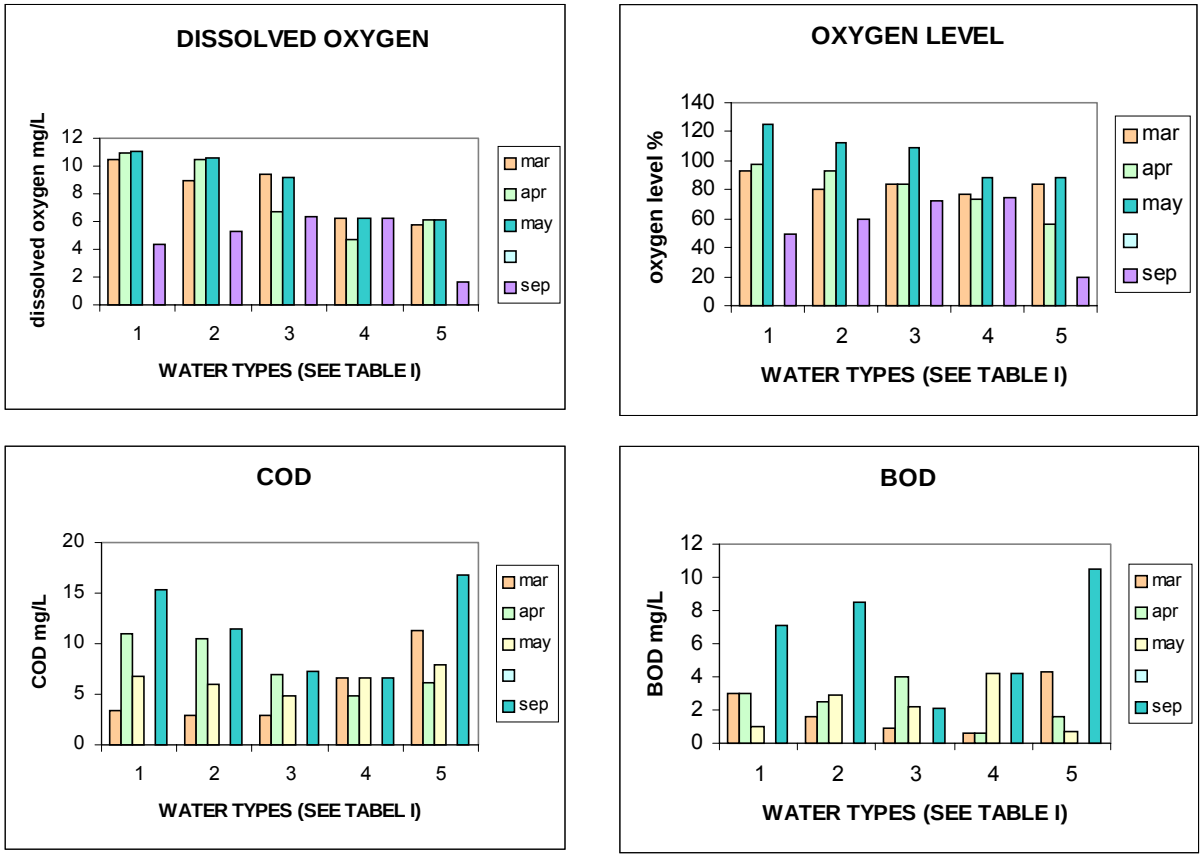

Figure 1. Organic load variation (COD and BOD) and oxygen level

Discussion

As it can be noticed from table 1, waters pH is neutral or slightly alkaline (8.5). Conductibility is higher for the waters exiting the reservation due to the conditions created by the slow flow to concentrate matter. Water supply sources also have a series of chemical species coming from the underground waters. This area was well known for its artesian wells that were closed in time because of some anthropic activities. Waters have an alkaline metals content, sodium and potassium, that concentrate in the reservation waters, having at the reservation exit values of 125 mg/l and 10 mg/l respectively. As well, calcium and magnesium concentrate in the waters reaching a value of 80 mg/l at the exit. Iron has a value of 0.182 mg/l. Manganese was evidenced only in one of the studied supplying sources. Chromium is present in all the analyzed waters, reaching a concentration of 0.113 mg/l (it concentrates 1.5 times). Zinc and copper were found only in some of the supplying sources. The greatest problem is represented by the cadmium and nickel ions, nickel ions exceeding three times the admitted value.

Water turbidity variations are seasonal and local, depending on the autotrophic/heterotrophic activity. Periods of debris formation that give waters high turbidities are followed by periods of debris sedimentation and thus water clarifying. Exiting waters had high turbidities due to the accumulations of decomposing matter and faunistic activity.

Organic load due to the contribution of the biogene matter resulted from the ornithological activity, is supplemented with debris coming from the metabolization of the nutritive substrate. In March, supplying waters are relatively low loaded but the reservation load increases approx. three times. Exit waters have a 3-4 times higher load than the supplying waters. In April, there is a raise of the organic load of the waters getting in the reservation. In May, there can be noticed an improvement of the organic matter load of the supplying waters, coming back to the quality evidenced in April. In the fall, the organic load increases in the supplying and reservation waters. Correlating these variations with waters oxygen saturation level, it can be noticed that the supplying waters, that reduce their debit because of the prolonged drought and dry winds – favoring the evaporation phenomena, the following alterations take place: oxygen concentration increases along with weather warming up (from April to May) when the three water sources reach oxygenation values over 100%; in the same period, in the reservation waters, there is maintained a relatively constant level of the dissolved oxygen of 75-85%. Exit waters have values of 60-85%, sufficient for the undergoing of the specific metabolic processes. In the fall, supplying waters have a lower level of dissolved oxygen reaching down to 50% of the saturation level, and the exit waters have a 20% level. Under these circumstances, water evacuation canal was temporarily closed in order to preserve the water (7).

Taking under consideration the saprobic aspects, supplying waters were characterized by meso-saprobity, having in May a series of oligo-saprobic elements. In the reservation waters, because of the ornithological activity impurification of waters, the meso-saprobic specificity is maintained with polysaprobic elements. Exit waters are meso-saprobic throughout the studied period. The decrease of the exiting debit and, finally, its closing determined in the neighboring area the accumulation of an aquatic biocenosis with beta – meso-saprobic character. Of the aquatic saprobic organisms, species belonging to the following classes *Bacillariophyta, Chlorophyta, Cilliata, Flagellata, Copepoda, Cladocera, Rotatoria, Hexapoda*, were identified. The presence of a reach bacterial activity was also evidenced (3,7).

In conclusion, during the studied period, supplying waters bring an inorganic load represented by alkaline, alkaline-earth and some toxic metals, especially cadmium, nickel and chromium; some of the present chemical species concentrate up to 1.5 times in the exiting waters; high temperatures, drought and strong air streams decreased the supplying waters debit, resulting after closing the evacuation canal, in the concentration of the

inorganic substances; organic load comes from the winter inheritance and the ornithological activity, and the warming up of the weather determines the undergoing of self-purifying and eutrophyzation processes which maintain the alternation of the biocenotic trophic levels, having recorded transitions from the mesosaprobic to oligo- and polysaprobic (seasonally) zones; autotrophic activities determine a suprasaturation with oxygen in the supplying waters and a decrease of the oxygen level in the reservation waters with 10-30% than the saturation level; exit waters decrease of the oxygen level can reach down to 40% during spring and 80% in September.

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