Current Trends in Natural Sciences Vol. 3, Issue 6, pp. 88-95, 2014

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

RESEARCH ON THE ENVIRONMENTAL QUALITY IN THE OLT RIVER, DRĂGĂŞANI CITY

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Abstract
The Olt River is an important component of the Danube Hydrographic Basin, with a total area of 24 050 square kilometers. At EU level, concern for the quality of the aquatic environment has always been a very topical issue. Implementation of strategies and policies related to water management were materialized through the adoption of the Framework Directive "Water" 2000/60 / EC by the European Parliament. The aim of these strategies is the balanced management of water resources and the protection of aquatic ecosystems, with the main objective to achieve a "good condition" of surface and groundwater water. Following the objectives of the Directive 2000/60/EC, the present study aims at assessing the environmental quality in the Olt River, Drăgăşani city, thus highlighting the influence of the city's wastewater discharge on the river water quality.

Key words: Olt River, Drăgăşani city, phytoplankton, environmental quality.

1. INTRODUCTION

Situated in the central and southern part of Romania, the Olt River lies in the lower Danube basin and borders on Siret, Ialomita-Buzau and Arges-Vedea in the East, Danube in the South, Mures in the North and Jiu in the west. The basin total area is 24 050 square kilometers (***PMB Olt) and runs out from central to southern Romania (Figure 1).
Starting with the downstream area of Râmnicu Vâlcea, Olt Hydrographyc Basin falls into the Pontic Province in terms of ecological regions (Figure 2).
What is really important, is that the Olt River is entirely laid out in the middle and lower course.
The Olt River provides 25 energy producing cascade reservoirs (Figure 3), which can be grouped according to position, in the middle Olt River cascade (reservoirs Voila, Vişlea, Scorei, Arpaş, Avrig) and lower Olt cascade (Cornetu, Gura Râului, Turnu, Călimăneşti, Dăeşti, Rm.Vâlcea, Râureni, Govora, Băbeni, Ioneşti, Zavideni, Drăgăşani, Strejeşti, Arceşti, Slatina, Ipoteşti, Drăgăneşti Olt, Frunzaru, Rusăneşti, Izbiceni).
All surface water resources in Olt hydrographic basin total 5480 mil. m^3, out of which only 1682 mil. m^3 are usable. This is approximately 81% of all resources and consists mainly of the Olt River and its tributaries. Olt hydrographic basin consists of 62 reservoirs with complex use and a useful volume of 1800 mil. m^3.

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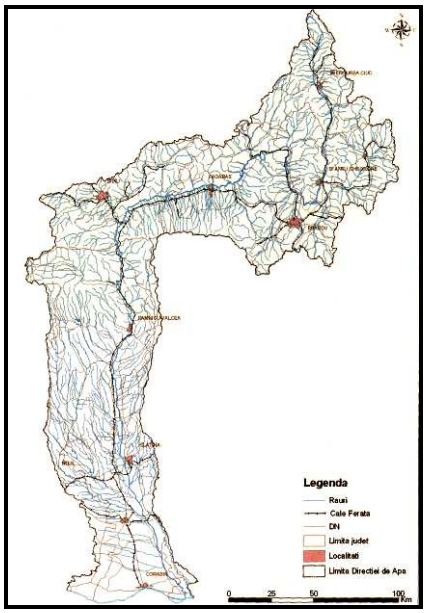

Figure 1. Olt Hydrographic Basin (http://www.rowater.ro/daolt/Plan Management)

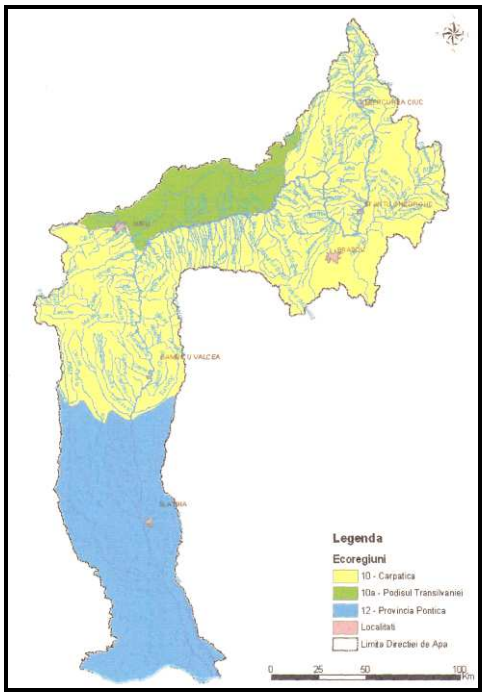

Figure 2. Olt Basin Ecoregions

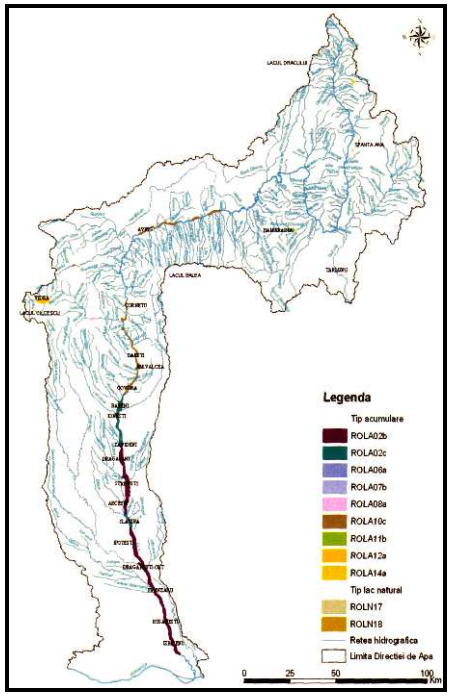

Figure 3. Lakes in Olt Hydrographic Basin (http://www.rowater.ro/daolt/Plan Management)

The present study aims to assess ecological quality in the Olt River, Drăgăşani city, thus highlighting the influence of the city's wastewater discharge on the river water quality.
The objectives of the study:
- to identify taxa in phytoplankton and phytobenthos biocoenosis in the Olt River, Drăgăşani city;
- to study seasonal dynamics of phytoplankton and phytobenthos biocoenosis during research;

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- to establish the river quality based on chemical and biological analyses;
- to highlight the influence of wastewater discharge on the Olt River by comparing the main physical-chemical and biological parameters upstream and downstream of Drăgăşani city.

2. MATERIALS AND METHODS

To research human impact on the Olt River, Drăgăşani city, there were taken water and planktonic samples from two monitoring stations: Prundeni, upstream of Drăgăşani and Voicesti downstream of Drăgăşani in order to compare both the evolution of the physical – chemical parameters and the planktonic biocenosis structure of the river before and after crossing Drăgăşani city (Figure 4).
Plankton and phytobenthos quantitative specimesn were sampled in October 2011 - May 2012, following the seasonal variation of biocenosis.
Plankton specimens were sampled using the internationally standardized Schindler – Patalas device. Plankton samples were analyzed quantitatively and qualitatively to determine the number of organisms / dmc and dominant taxonomic groups.
Phytobenthos sampling was done using stones removed from the river and washed in a tap water container. The sampling concentration was done by filtering, using 200µ diameter mesh sieve. The stone surface was approximated to estimate density, reporting being made in square meters. Samples were preserved in glacial acetic acid: Lugol solution 1:100 concentrated for 48 hours by sedimentation according to the standards in force.
Samples were transported and processed in the Hydrobiology Laboratory at the University of Pitesti. Preparation of samples: In the present study, the sample was concentrated for 48 hours by sedimentation and the supernatant was removed by siphoning according to STAS 6329-90.

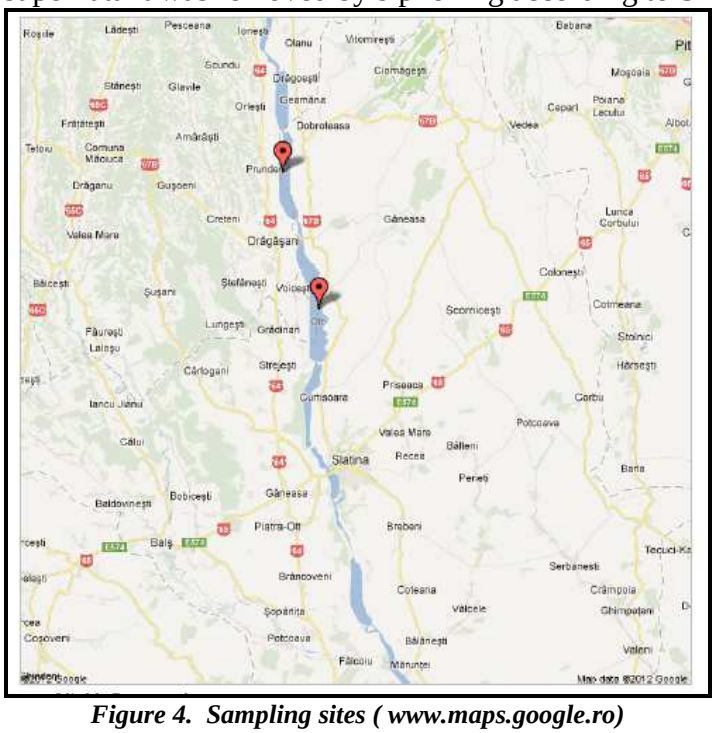

Figure 4. Sampling sites (www.maps.google.ro)

3. RESULTS AND DISCUSSIONS

Qualitative and quantitative data on biomarkers analyzed are shown in Tables 1 - 3.

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List of algal taxa in phytoplankton and phytobenthos is shown below:

- **Phyllum *Cyanophyta***
  Ord. *Nostocales*
  Fam. *Nostocaceae: Anabaena, Cylindrospermum*
  Ord. *Synechococcales*
  Fam. *Merismopediaceae*
  Subfam. *Merismopedioideae: Merismopedia*
- **Phyllum *Bacillariophyta***

Subcls. *Pennatibacillariophycideae*
Ord. *Fragilariales*
Fam. *Fragilariaceae: Diatoma, Centronella, Asterinella, Synedra*
Ord. *Naviculales*
Fam. *Naviculaceae: Pinnularia, Navicula, Gomphonema, Cymbella, Gyrosigma*
Ord. *Bacillariales*
Familia *Bacillariaceae/ Nitzschiaceae: Bacillaria, Nitzschia*
Ord. *Surirellales*
Fam. *Surirellaceae: Cymatopleura*

- **Phyllum *Chlorophyta***

Cls. *Chlorophyceae*
Subcls. *Prasinophycidae*
Ord. *Chlorococcales*
Fam. *Hydrodictyaceae: Pediastrum*
Fam. *Scenedesmaceae: Scenedesmus, Actinastrum*
Ord. *Zygnematales: Closterium, Staurastrum*
Fam. *Zygnemataceae: Zygnema*

- **Phyllum *Euglenophyta***

Cls. *Euglenophyceae*
Ord. *Euglenales*
Fam. *Euglenaceae: Euglena*

Table 1. Dynamics of biological indicators in water quality monitoring stations of Olt River, October 2011 – May 2012

Sampling site	**Months**	**Types of indicators**			
		Phytoplankton		Phytobenthos	
		No. taxa	**ex/l**	**No. taxa**	**ex/m²x10⁴**
Prundeni	OCT	15	200000	18	5476
	MART	14	180000	15	4850
	MAY	17	480000	28	46128
Average		**16**	**330000**	**22**	**25489**
Voicești	OCT	26	580000	22	137221
	MART	22	1520000	22	312000
	MAY	28	3420000	28	232875
Average		**24**	**1642500**	**25**	**182840**

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Planktonic and benthic algofloristic spectrum in **Prundeni** section contains 33 and 30 taxa belonging exclusively to Bacillariophyta systematic group. The largest number of taxa (Figure 5) for phytoplankton was recorded in May 2012 (17 taxa), as well as for benthic algae (28 taxa).
The benthic algae recorded the highest density in Prundeni station, in May, (46. 128 samples. / l (Figure 5), and the lowest density in March (4.850 samples / l).

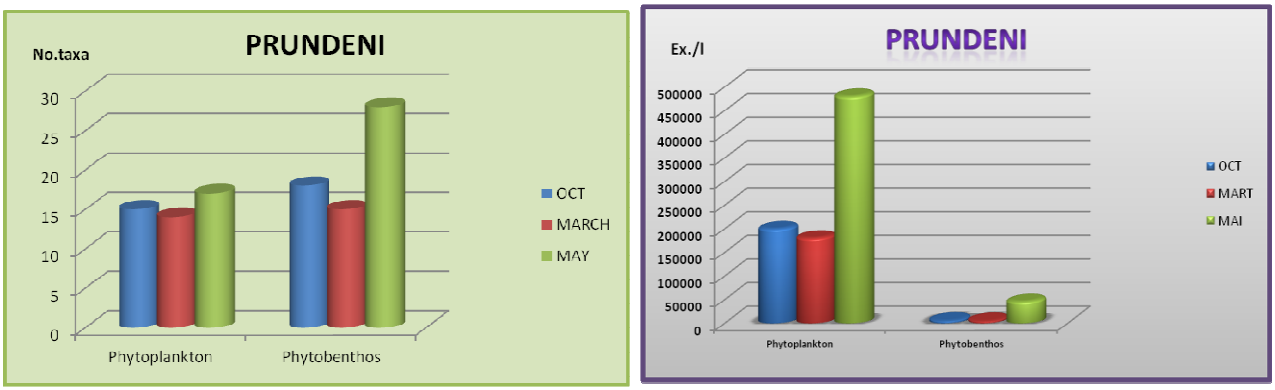

Figure 5. Variatin in number of taxa and variation of numerical density in Prundeni station

The number of taxa in Voicesti station was high (over 22) in all samples (Figure 6). The highest density (3,400,000 ex. / L) was recorded in phytoplankton specimens sampled in May.

Figure 6. Variation in number of taxa and variation of numerical density in Voicesti station

Biocenotic formations numerical abundance is as follows: phytoplankton and phytobenthos are clearly dominated by diatoms. The average values of **saprobic index** for biotic components correspond to 1st class quality, indicating **a very good ecological status,** which confirms the reduced contamination of the area.
There is an increase in the number of taxa identified in Voicesti, compared to Prundeni section. The qualitative structure is as follows: planktonic algoflora totals 43 species, of which cyanophytes - 1 and diatoms - 42; benthic algocenosis totals 35 species, of which cyanophytes - 2 and diatoms - 33. Variation in time of numerical densities highlights an increase in the number of phytoplankton samples from October to May.

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Analysis of numerical abundance of phytoplankton systematic groups shows predominance of diatoms over the phytoplankton and phytobenthos (Figure 7).

Table 2. Numerical abundance (%) on taxonomic groups of phytoplankton and benthic algae in the Olt River, October 20122 – May 2012

Systematic groups	Prundeni			Voicești		
	OCT	MARCH	MAY	OCT	MARCH	MAY
Phytoplankton (%)						
CYANOPHYTA	1,7	-	-	-	-	-
BACILLARIOPHYTA	98	100	100	95,69	99,34	99,12
CHLOROPHYTA	-	-	-	0,86	-	0,88
EUGLENOPHYTA	0,3	-	-	2,59	0,66	-
Benthic algae (%)						
CYANOPHYTA	0,2	-	-	-	0,24	0,48
BACILLARIOPHYTA	98,5	100	100	100	99,04	98,88
CHLOROPHYTA	0,7	-	-	-	0,72	0,48
EUGLENOPHYTA	0,3	-	-	-	-	0,16

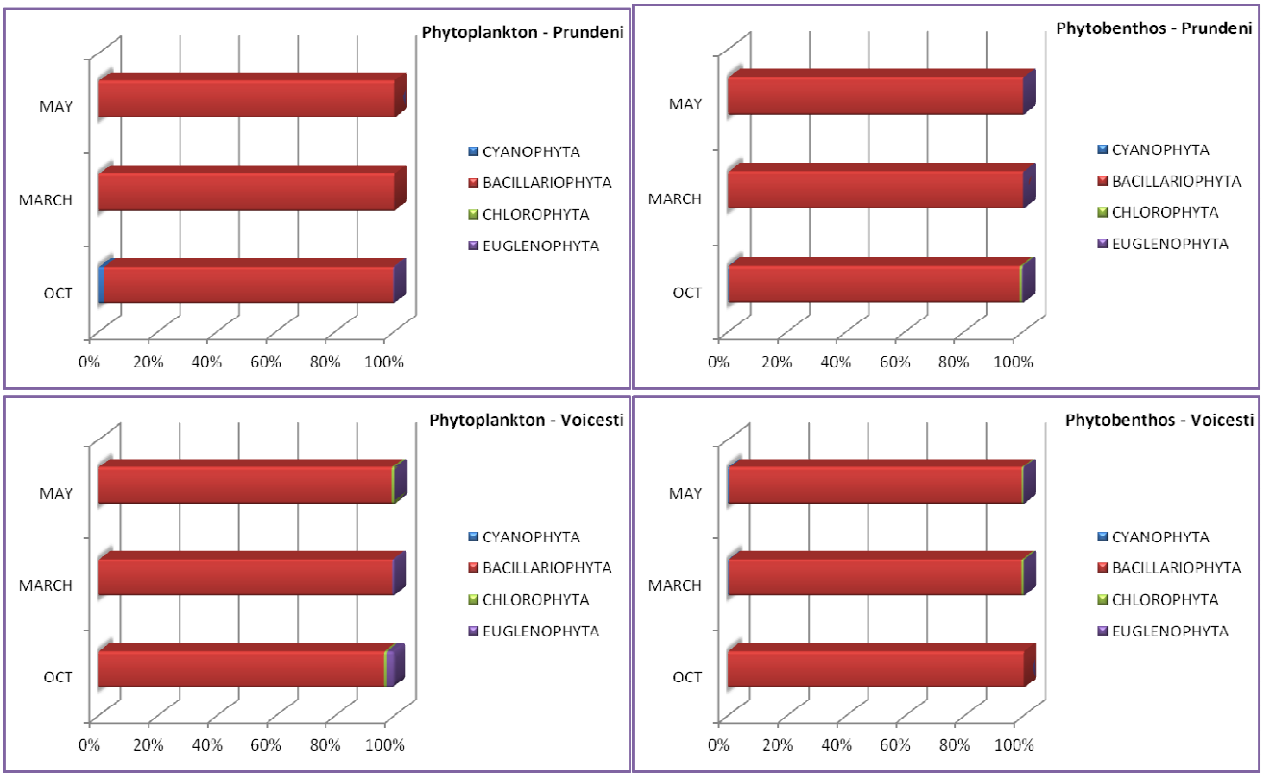

Figure 7. Numerical abundance (%) of taxonomic groups

The average values of saprobic index show that the phytoplankton falls into the 2nd class quality, whereas phytobenthos falls into the 3rd class quality. This indicates a high organic load, due to water contamination by the city's wastewater discharge (Figure 8).

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Table 3. Establishing the ecological status of quality based on its saprobity, Dragasani city, October 2011 – May 2012

Control sections	Months	Phytoplankton			Phytobenthos		
		saprobic index	**Class of quality**	ecological quality status	saprobic index	**Class of quality**	ecological quality status
Prundeni	OCT	1,64	I	very good	1,65	I	very good
	MAR	1,69	I	very good	1,69	I	very good
	MAY	1,75	I	very good	1,70	I	very good
Average		**1,72**	**I**	very good	**1,70**	**I**	very good
Voiceşti	OCT	1,89	II	good	2,14	II	good
	MAR	1,93	II	good	2,33	III	mild
	MAY	2,1	II	good	2,73	IV	low
Average		**1,94**	**II**	good	**2,4**	**III**	**mild**

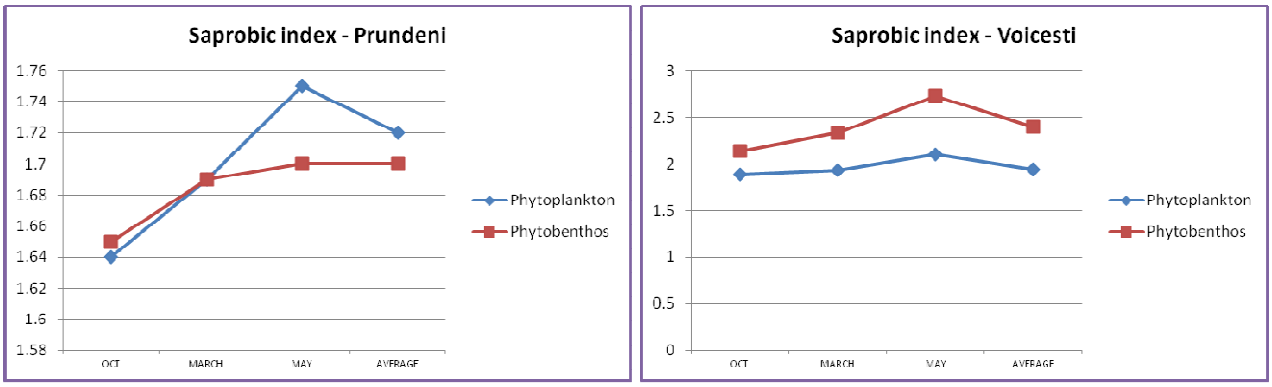

Figure 8. Variation of saprobic index in the Olt River monitoring stations, Dragasani city, October 2011 – May 2012

4. CONCLUSIONS

The structure of phytoplankton and phytobenthos biocoenosis is dominated by bacillariophyceae group, which shows a permanent high load of silicon coming from discharge and favors the development of this group.

• The structure of phytoplankton and phytobenthos biocoenosis shows significant changes between stations upstream and downstream of Drăgăşani city. It indicates that changes in physical - chemical properties of the river waters negatively affect aquatic biocenosis.

• Although the number of species is higher downstream, they are in their majority, contaminated water indicator.

• Saprobic index in Voicesti station is consistently higher than that of Prundeni, highlighting once

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again the negative impact of wastewater discharge in Drăgăşani city.

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