

# 5.

## Assessment of water quality in the Prut River - tributary of the Danube River, according species indicators of phytoplankton

LUKYANOVA Victoria

*The State Hydrometeorological Service, Environment Quality Monitoring from Republic of Moldova,  
email: [andries65@mail.ru](mailto:andries65@mail.ru)*

**Abstract:** The Prut is a 953 km (592 mi) long river in Eastern Europe. In part of its course it forms Romania's border with Moldova and Ukraine. The Prut flows southeast eventually joining the Danube river near Reni, east of Galați. Quality of Prut river are influenced by antropicals and naturals factors. The Prut River quality monitoring system includes observation at 8 points. Phytoplankton is one of the most important elements in determining the quality of aquatic ecosystems. The basic indices upon which phytoplankton is examined are: species, quantity and biomass. Change in quality of water leads to the change in above mentioned indices. Samples of phytoplankton were collected in 250 ml. flasks were fixed in 4% of the alignment solution of formalin or Lugol's iodine solution, transported to the laboratory, where processed by settling. First, the samples stand for 3-4 weeks, then they thickened up to 30 ml. Then 0.1 ml. condensed sample was placed on a countable glass with glycerol and dried. After this sample was studied under a microscope to determine the species and varieties of algae, the counting numbers and biomass. The components of phytoplankton was made up of species that belong to: Cyanophyta, Bacillariophyta, Chlorophyta, Euglenophyta and Dinophyta, with predomination Bacillariophyta. To assess the water quality are used the method of indicators Pantle and Bukk in a change Sladecek. Quality of water depends by location points. The average values are calculated for the saprobic indices at the analyzed sections indicated that 5 sections of Prut river may be classified as Class II quality "good" and at 6 sections as a Class III (water is moderately polluted).

## INTRODUCTION

According to information sources, the Prut is a 953 km (592mi) long river in Eastern Europe. In part of its course it forms Romania's border with Moldova and Ukraine. The Prut flows southeast eventually joining the Danube river near Reni, east of Galați. The Prut river is the last main tributary of the Danube, being a "gate" to the Danube Delta Biosphere Reserve, with lakes (Pochina, Vlascuta, Belevu), meanders, networks of ponds and natural channels shaped by the river on its lower sector. The following rivers are tributaries to the river Prut: left: Racovăț, Ciuhur, Sarata, Lăpușna, Tlumachyk, Turka, Chornyava, Chirlena, Rynhach, Rekitnyanka, Larha. Right: Cheremosh, Herța, Poiana, Cornești, Isnovăț Rădăuți, Ghireni, Volovăț, Badu, Bașeu, Corogea, Berza Veche, Râioasa, Soloneț, Cerchezoaia, Jijia, Cozmesti, Bohotin, Moșna, Elan, Pruteț, Horincea, Oancea, Stoeneasa, Chineja, Rybnitsa, Pistynka. The following towns are situated along the river Prut, from source to mouth: Lanchin, Delatyn, Kolomyia, Sniatyn, Chernivtsi, Novoselytsia, Darabani, Lipcani, Ungheni, Leova, Cantemir and Cahul. Evaluation of water quality in rivers by State Hydrometeorological Service began in the 1970 years and continues up until present days.

## MATERIAL AND METHODS

Samples of phytoplankton were collected in 250-1000 ml. flasks were preserved with formalin or Lugol's iodine solution, transported to the laboratory, where processed by settling. First, the sample stand for 3-4 weeks, then they thickened up to 30 ml., Then 0.1 ml. condensed sample was placed on a countable glass with glycerol and dried. After this, samples was studied under a microscope to determine the species and varieties of algae, the counting numbers and biomass. To determine the diatom species a part of samples was treated by H<sub>2</sub>O<sub>2</sub>. Permanent preparations were prepared with Pleurax in Butanol. To assess the water quality are used the method of indicators Pantle and Bukk in a change Sladecek. Chlorophyll concentration is determined by spectrometric method according to SM SR ISO 260 : 2007.

In order to assess water quality during the summer of 2013 years and for a broader study of the ecological status of the river Prut an ecological expedition "Prut 2013" was organized. During this expedition, 11 samples of phytoplankton were collected and analyzed from 11 sections of river:

Șireuți, Bădragii Noi, Costești, Brănești, Sculeni, Ungheni, Valea-Mare, Leușeni, Leova, Cahul, Giurgiulești (Fig.1). In total in vegetative period were analyzed 28 samples of phytoplankton.

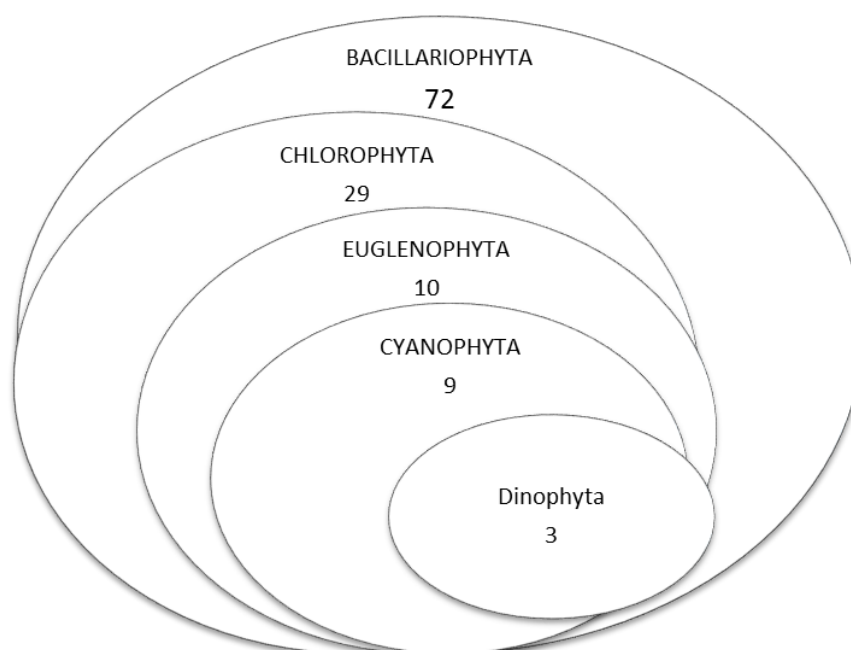


**Figure 1** Name and locations of sampling stations

## RESULT AND DISCUSSIONS

Quality of Prut river are influenced by antropolicals and naturals factors. The main sources of pollution are: torrential rain runoff from agricultural fields and pastures into small rivers, waters contaminated with point pollution coming from wastewater treatment plants whose inefficient performance has an immediate effect on water quality. In recent years, during the period of summer in Moldova there has been a reduction in amount of precipitation which consequently led reduction of chemicals that could affect the phytoplankton. Apart from water quality phytoplankton population can be affected by other competing species of phytoplankton. In the lower course of the river, the river bed has a loamy structure leading to the increase of suspended solids in water. As turbidity affects the light penetration and thus photosynthesis, it should also be considered as an important factor in regards to phytoplankton population.

In order to assess water quality during the summer of 2013 years and for a broader study of the ecological status of the river Prut an ecological expedition "Prut 2013" was organized. During this expedition, 11 samples of phytoplankton were collected and analyzed from 11 sections of river. In total in vegetative period were analyzed 28 samples of phytoplankton. The structure of studied sections was comprised of phytocenotic species belonging to the following taxonomic groups: Cyanophyta, Bacillariophyta, Chlorophyta, Dinophyta and Euglenophyta. The specific compositions of phytoplankton were identified in total 123 species of which respectively: diatoms - 72; chlorophyta - 29; euglenophyta - 10; cyanophyta - 9; dinophyta - 3 (Fig. 2).



**Figure 2** Biodiversity variation of phytoplankton species in Prut river during vegetative period of year 2013

The common cyanophytes algae species were: *Anabaena spiroides* - oligo beta mesosaprobe ; *Aphanizomenon flos-aquae*, *Merismopedia glauca* - beta mesosaprobes and alpha mesosaprobe species - *Oscillatoria tenuis*.

A broad spectrum of diatom algae water quality indicators were represented at the saprobic areas. Amongst which, following species were discovered:

**oligo-beta mesosaprobe:** *Asterionella formosa*, *Cymbella tumida*;

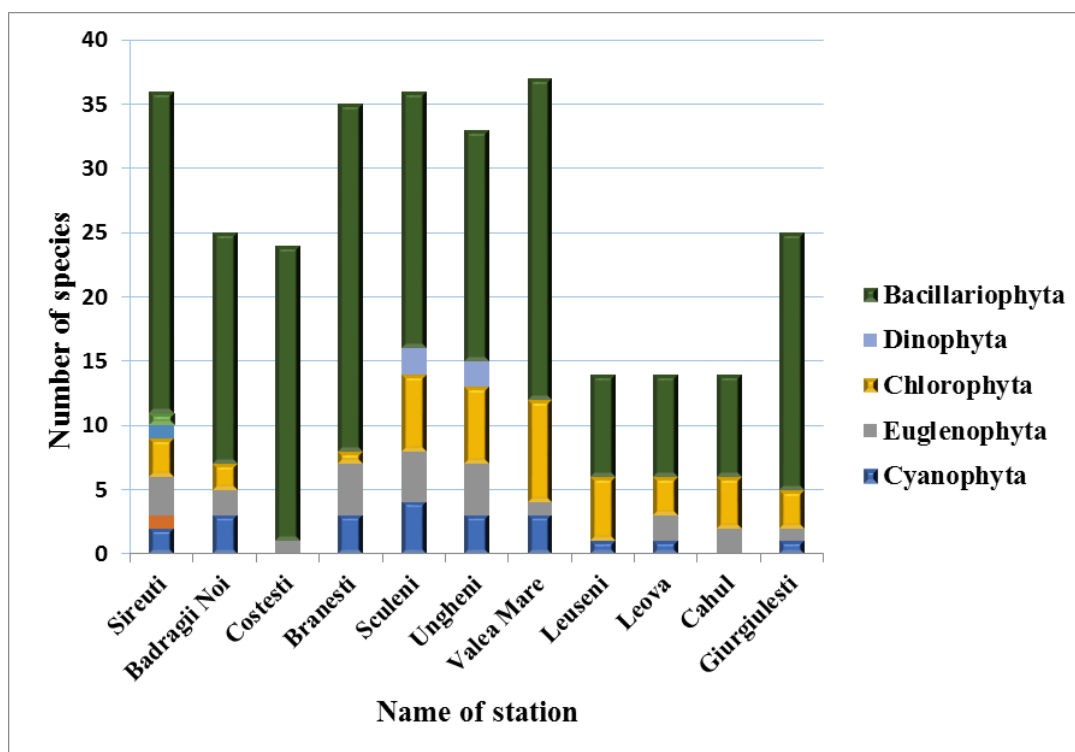
**beta mesosaprobe:** *Synedra* sp., *Melosira* sp., *Diatoma vulgare*, *Surirella ovata*, *Navicula lanceolata*, *N. capitatoradiata*, *N. gregaria*;

**beta-alpha mesosaprobe:** *Cyclotella meneghiniana*, *Cymatopleura solea*, *Caloneis amphysbaena*

**alpha mesosaprobe:** *Nitzschia acicularis*, *N. palea*.

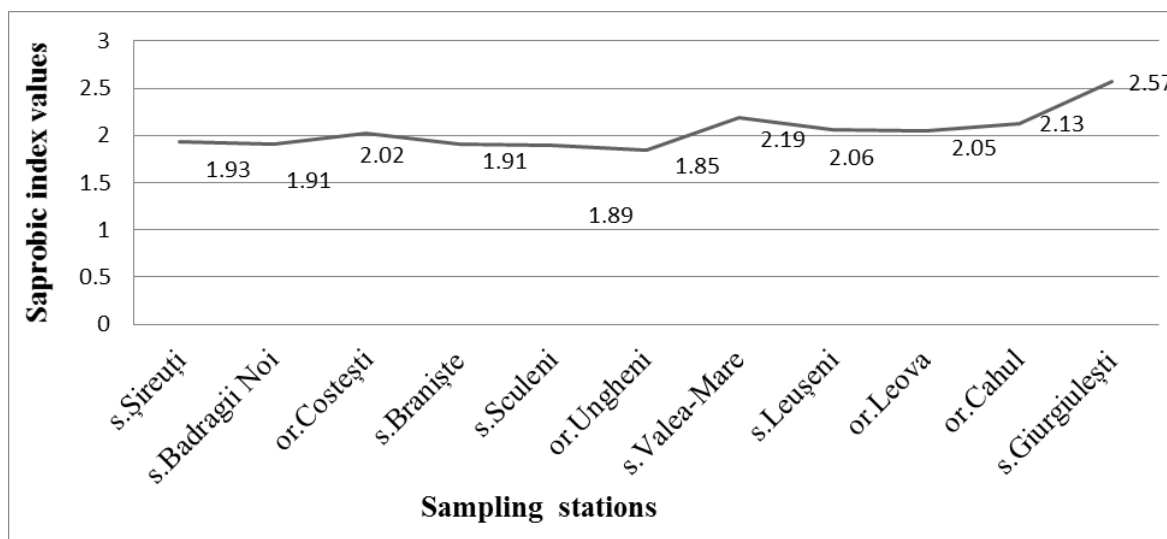
Euglenofite algal species were encountered mass beta mesosaprobes - *E. texta*, *Trachelomonas volvocina*, *T. verrucosa*, *T. rugulosa* and poli alpha mesosaprobe species such as *Euglena proxima*. Amongst green algae species as in the previous year prevailed: beta mesosaprobe eg. *Scenedesmus*, *Ankistrodesmus* and *Pediastrum* sp. Number of species determined in samples ranged widely, starting with two taxa peaks in summer at s.Braniște section and 30 species peak in the section near the s.Șireuți in the summer when the water level reached the minimum value (Fig. 3).

Maximum total number of phytoplankton (25 400 cells/ml) and the maximum total biomass (5.07 mg/L) were found in summer in the section of hydrometric station at s. Giurgiulești, when 99.41% of the total found species were chlorophyll polialfamezosaprobe species *Chlorella vulgaris*. This species indicate a high pollution of biodegradable organic substances and has high saprobic value 3.6, and also are highly resistant to pollution.



**Figure 3** Biodiversity variation of phytoplankton species in Prut river during vegetative period in 2013, depending on the location section

Evaluated saprobic index for all sections of the upper and lower course of the river varied between 1.77 and 3.6, reaching a peak in the summer at s.Giurgulești section (Class IV quality). The average values are calculated for the saprobic indices at the analyzed sections indicated that 5 sections of Prut river may be classified as Class II quality "good" and at 6 sections as a Class III (water is moderately polluted), (Fig. 4).



**Figure 4** The average values of saprobic index in Prut river, during vegetative period of 2013

The concentration of chlorophyll "a" ranged at 0.40 to 6.58 within µg/L. The minimum concentration of chlorophyll "a" was observed at the beginning of vegetation period near or.Costeşti and the maximum was set in April near s.Şirăuţi and in September near the town. Cahul. The cleanest sectors were near Ungheni and or.Leova, (mean 1.27 µg/L), the most polluted areas were near s.Şirăuţi and or.Leova (mean 3.51 µg/L).

Parallel of hydrobiology analysis, in State Hydrometeorological Service, is carried the hydrochemical analysis of waters to 53 hydrochemical indices. The results are assessed and included in the Yearbook of Surface Water Quality.

## CONCLUSION

The structure of studied sections was comprised of phytocenotic species belonging to the following taxonomic groups: Cyanophyta, Chlorophyta, Dinophyta and Euglenophyta in a greater number were found the Bacillariophyta species. Their saprobity was diverse, for example we found:oligo-beta-mesosaprobe,beta-mesosaprobe,beta-alpha-mesosaprobe and alpha-mesosaprobe species.

Evaluated saprobic index for all sections of the upper and lower course of the river varied between 1.77 and 3.6, reaching a peak in the summer at s.Giurgiuleşti section (Class IV quality).

The average values are calculated for the saprobic indices at the analyzed sections indicated that 5 sections of Prut river, may be classified as Class II quality "good" and at 6 sections as a Class III (water is moderately polluted).

Water quality of the river is getting worse in the lower course under the influence of the factors listed above. We must stop the penetration of harmful substances in water and unpurified waste water. In order to stop these pollution, we must install mini wastewater treatment plants for economical agents and to eliminate any waste on the bank of the river.

## REFERENCES

- Абакумов В.А.б Руководство по методам гидробиологического анализа поверхностных вод и донных отложений, 1983
- Krammer, K., Lange-Bertalot, H., 1986 – Bacillariophyceae – Naviculaceae. 2 (1): 1-875.
- Krammer K., Lange-Bertalot H., 1988 – Bacillariophyceae- Bacillariaceae, Epithemiaceae, Surirellaceae. 2(2): 1-596.
- Krammer, K., Lange-Bertalot, H., 1991a – Bacillariophyceae – Centrales, Fragilariaceae, Eunotiaceae. 2(3): 1-576.
- Krammer, K., Lange-Bertalot, H., 1991b – Bacillariophyceae – Achnanthaceae, Navicula, Gomphonema. 2(4): 1- 437.
- Lange-Bertalot, H., 1979, Simonsenia, a new genus with morphology intermediate between Nitzschia and Surirella, Bacillaria, 2, 127-137 (11) Braunschweig:
- Lange-Bertalot, H., Metzeltin D., Witkowski A., 1996, Hippodonta gen. nov., Umschreibung und Begründung einer neuen Gattung der Naviculaceae", Iconographia, Diatomologica, 4, 249-275 (12) Stuttgart
- Török, L., 2004, Methods used for diatoms' studies in the Danube Delta. – Part I", Analele Şt. INDD, 10: 62-70 Tulcea
- Годербах М.М. Определитель пресноводных водорослей СССР выпуск 1-11 1950-1982
- Киселев И.А. Определитель пресноводных водорослей выпуск 1-2 1956
- Коршиков О.А. Визначник прісноводних водорослей Української РСР підклас протококові видовн АН УРСР Київ 1953

Received 7 March 2017  
Revised 25 April 2017

