STUDY REGARDING THE IMPACT OF ANTHROPIC ACTIVITIES ON WATER QUALITY OF BEGA RIVER

Șmuleac Laura*, Ienciu Anișoara*, Horablaga Adina*, Șmuleac Adrian**

*Banat's University of Agricultural Sciences and Veterinary Medicine from Timisoara
**Politehnica University of Timisoara, Hydrotechnical Department Construction Engineering Faculty, George Enescu no. 1A, Timisoara, Romania, e-mail: adriansmuleac.as@gmail.com

Abstract

Under the current conditions, in which the drinking water crisis is beginning to feel increasingly acute, a proper assessment of water quality is required. Economic development, along with population growth, the development of urban settlements puts an increasing pressure on natural resources. Water occupies an important place in the development and maintenance of life so that pollution prevention measures must take precedence. In the present paper the quality of the Bega River is described in three control sections: Luncani, Balint and Amonte Timisoara. Water samples were taken in February, May, August and November for the year 2015 and February and May for the year 2016. The main quality indicators determined were: pH, dissolved oxygen content, biochemical oxygen demand, nitrogen and nitrogen content, ammonium, phosphates, conductivity, hardness, content in iron, manganese, cadmium, lead and nickel. In the three sections studied on the Bega River, there was registered water pollution with nutrients, due to the spillage of domestic and agricultural waters from the vegetal and zootechnical farms in the area, of the use of organic fertilizers and the storage of waste on the banks of the river.

Key words: Bega River, water quality, control sections, nutrients, heavy metals, pollution

INTRODUCTION

One of the major crises facing humanity in the near future is the water crisis, meaning the decrease of the amount of drinking water that can be made available to the population. Also, the negative effects of surface water pollution, effects that will be felt by the continuous and increasing environmental degradation and degradation of the general health status of the human population. In order to avoid these negative effects of water pollution, are needed a series of measures for waste water treatment and pollution avoidance in the future. When surface water is polluted it is necessary to know the provenience source of the pollutants. By this it is possible not only to determine the origin of the pollutant factor, but also to determine the initial concentrations, the duration and the cause of the pollution (Radulov et al., 2016; Nita et al.; Lato et al., 2013; Horablaga, 2014).

Pollution of surface waters, as well as underground waters, has serious effects on the biosphere, affecting aquatic life from microorganisms to insects, fish and birds, but also the health of terrestrial animals and plants. In addition, pollution affects people's ability to use water. Depending on nature and intensity of pollution, can be reduced or canceled the usability for

almost any purpose. Continuous monitoring of water quality is recommended (Șmuleac et al., 2012, 2014, 2016; Neacsu et al., 2011).

MATERIAL AND METHOD

The Bega River Basin is part of the BANAT hydrographic space. The total length of the course is 359 km, out of which 241,2 km on Romania's territory (from the spring to the exit from the country, at Balint). The Bega River is one of the main rivers of Timis County and the drinking water source for many localities where it passes. It springs from the Poiana Rusca Mountains, Pades peak, from the altitude of 1150 m and is formed by the union of two arms, Bega Luncanilor and Bega Poieni, near the locality Curtea. The main localities are: Margina, Faget, Balint, Recas, Timisoara and Otelec, after which it leave the country and enter in Serbia, where it drains to Tisza at Titel.

The study of Bega River water quality in the middle sector was carried out by sampling water samples in three control sections: Luncani, Balint and Amonte Timisoara.

Water samples were taken in February, May, August and November for 2015 and February and May for 2016. The main quality indicators determined were: pH, dissolved oxygen content, biochemical oxygen demand, nitrogen and nitrogen content, ammonium, phosphates, conductivity, hardness, content in iron, manganese, cadmium, lead and nickel.

RESULTS AND DISCUSSION

From the comparative analysis of the three sections taken in study, it is noted that the pH falls within normal limits (Fig. 1) from 6.8 pH units recorded in February at Luncani to the maximum value of 7.8 pH units recorded in August at Balint.

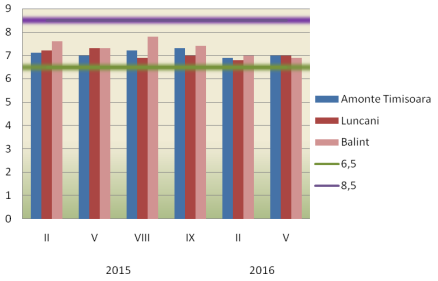

Fig. 1. Evolution of pH

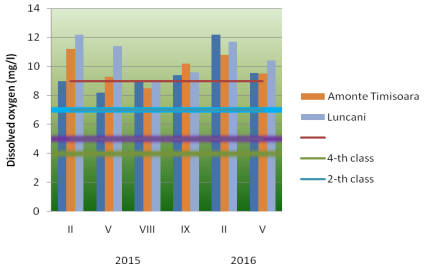

Fig. 2. The dissolved oxygen content

The dissolved oxygen content (Fig. 2) is high in all sections under study, except in August when the values fall below the limit of first quality

class limit for Amonte Timisoara section (8.5 mg/l) and Luncani (8.9 mg/l), the minimum being recorded at the Balint section in May 2015 (8.2 mg/l).

Biochemical oxygen consumption in 5 days is an indicator that allows us to predict the degree of water pollution. From Figure 3 we can see that the CBO5 values are below the first grade for the Amonte Timisoara and Luncani sections, a slight exceeding being recorded only in February 2016 for the Balint section.

Regarding the nutrient regime, it is observed that at the ammonium indicator (Fig. 4) values are very good, keeping below the limit of first quality class for Amonte Timisoara section and the Luncani section, only the value of 0.46 mg/l recorded in November 2015 being above the limit of first quality class for the Balint section.

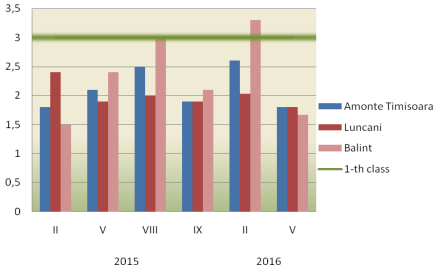

Fig. 3. Biochemical oxygen consumption

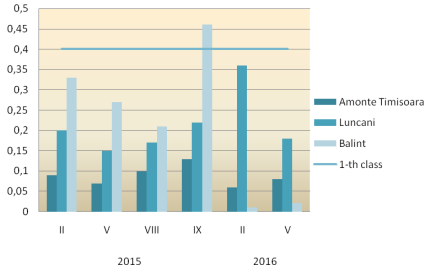

Fig. 4. Ammonium content

The nitrogen content (Fig. 5) in water at Amonte Timisoara section, in February 2016 and August 2015 puts the water in the second quality class, while in the rest of the months taken under study the water quality decreased to the third class; at Luncani the water is in the second class of quality, except in May 2016, when the water is in the third class, and at the Balint section the water was of the third quality, decreasing in May, August and November 2015 at the four grade quality.

The nitrate content is moderate, and in all three sections studied the water is of the second quality (Fig. 6).

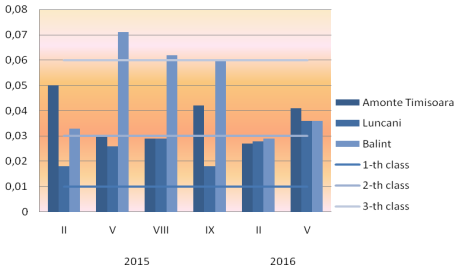

Fig. 5. The nitrogen content

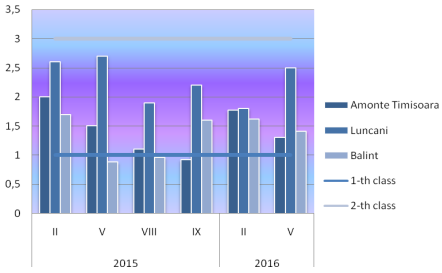

Fig. 6. The nitrate content

If at the sections Amonte Timisoara and Balint the content in phosphates is low, with values that allow water description as being of first

quality, in the Luncani section, are reported overflows in all months under study, only the value of 0.13 mg/l from May 2016 being below first quality class.

The hardness of the water (Fig. 7) is expressed in mg/l of CaCO3, and the values obtained at all three sections taken in the study indicate water with a low hardness.

The iron content (Fig. 8) is reduced with values below the limits of first quality Class.

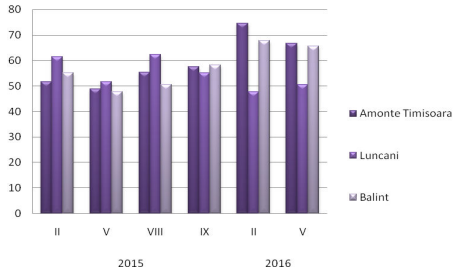

Fig. 7. The hardness

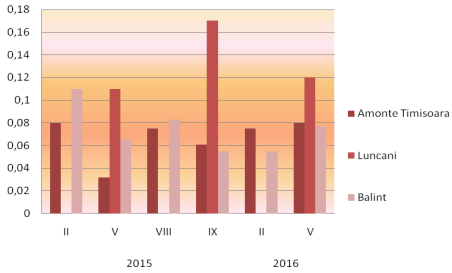

Fig. 8. The iron content

The manganese (Fig. 9) determines water classification from the Amonte Timisoara section in the second quality class in 2015; at Luncani section are seen exceeds of first quality class in May 2015 and May 2016, and in November 2015 the value of 0.14 mg/l being of third class of quality and at Balint the manganese is below first quality class only in February 2016, in the remaining months of study having values of second quality class.

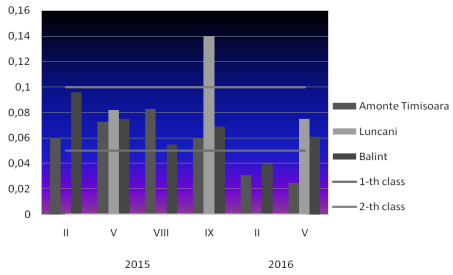

Fig. 9. The manganese

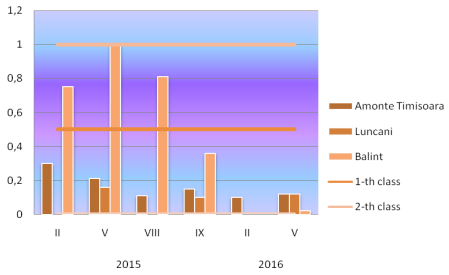

Fig. 10. Cadmium concentrations

At the heavy metals regime, it is noted that are not signaled exceeding at cadmium concentrations (Fig. 10) at the sections Amonte Timisoara and Luncani, instead at Balint, in the first half of the year 2015, values exceeding the first quality class are recorded. Concerning the lead concentration (Fig. 11), are determined values which classify water in the 2nd quality class in May, August and November of the year 2015 for Amonte Timisoara, at Luncani the lead from water exceeds the limit of first quality class only in May 2015, and at Balint are reported exceeding of first

quality class from 6.1 µg/l in May 2015 and 2016 up to 7.17 µg/l in February 2016.

The nickel content (Fig. 12) is reduced in all the months under study at all the three control sections.

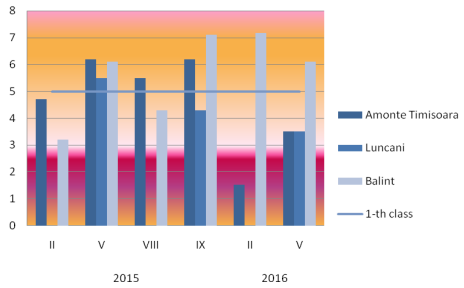

Fig. 11. The lead concentration

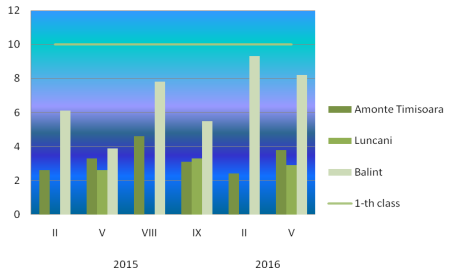

Fig. 12. The nickel content

CONCLUSIONS

- The study of Bega River water quality in the middle sector was carried out by sampling water samples in February, May, August and November for the year 2015 and February and May for the year 2016 in the three control sections: Amonte Timisoara, Luncani and Balint. The following have resulted:
- The pH ranges in normal limits to all three sections.
- Dissolved oxygen content is high in all sections studied, except in August when values fall below the limit of first quality class.
- Regarding the nutrient regime, it is noted that the ammonium indicator the values are very good, the content of nitrite in the water is in the second quality class, and decreases in some months to the level of the third class of quality, and at the Balint section decreased in May, August and November 2015 at the fourth class, the content of nitrates is moderate, in all three sections studied, water being of second quality. The content of phosphates is low.
- Water hardness is low.
- Iron content is reduced with values below the limit of first quality class, but manganese determines that water quality to be classified in the second and third quality class.
- At the heavy metals regime, it is observed that are not signaled exceeding to cadmium concentration at the sections Amonte Timisoara and Luncani, in change at Balint in the first half of 2015 are registered values exceeding the first quality class. As regards the lead concentration, are determined values that classifies water in second quality class and the nickel content is reduced in all the months under study from the three control sections.

In the three sections studied on the Bega River there was water pollution with nutrients due to the spillage of domestic and agricultural waters from the vegetal and zootechnich farms from the area, from the use of organic fertilizers and from the storage of waste on the river banks.

Acknowledgments

This research work was carried out with the support of GEOMATICS RESEARCH LABORATORY infrastructure, https://erris.gov.ro/LABORATORCERCETARE GEOMATICA from BUASMV "King Michael I of Romania" Timisoara - Faculty of Agriculture.

REFERENCES

1. Horablaga A., Horablaga N.M., Osman A., Banatean-Dunea I., 2014, The Impact Of Economic Activities Within The Naturalprotected Areas In The West Region. Rjas, ISSN 2066-1843, Vol. 46
2. Lato A., Neacsu A., Crista F., Lato K., Radulov I., Berbecea A., Niţă L., Corches M., 2013, Chemical Properties And Soils Fertility In The Timis County Wetlands. Journal Of Environmental Protection And Ecology, Volume: 14, Issue: 4, ISSN: 1311-5065, pp.1551-1558
3. Neacşu A., G.G. Arsene, I. Borza, C. Stroia, F. Crista, 2011, Preliminary Data On The Ecological Status Of Humid Areas In Banat. Research Journal Of Agricultural Science, 43 (2), pp.204-210, ISSN 2066-1843
4. Niţă L., I Rusu, V. Ştefan, - Anthropic Activity Effect On Cambic Chernozem Density In Timişoara. LucrăI Ştiinţifice-Agricultură, Universitatea de Ştiinţe Agricole şi Medicină Veterinară A Banatului Timişoara, Vol.32(1), pp.181-188
5. Radulov I., Lato A., Berbecea A., I. Lato, F. Crista, 2016, Nitrate Pollution Of Water In Romania Serbia Cross – Border Area As A Consequece Of Agricultural Practices. 16th International Multidisciplinary Scientific Geoconference Sgem 2016, Sgem Vienna Green Extended Scientific Sessions, www.Sgemviennagreen.Org, Sgem2016 Conference Proceedings, Isbn 978-619-7105-81-0 / Issn 1314-2704, 2 - 5 November, 2016, Book 3, Vol. 3, 6, pp.205-212, Doi: 170.5593/Sgem2016/Hb33/S02.0286
6. Şmuleac L., Oncia S., 2012, Resurse De Apă Şi Protecţia Lor. Ed. Agroprint, Timişoara
7. Şmuleac L., S. Oncia, A. Ienciu, R. Bertici, A. Şmuleac, V. Mihăiesc, 2014, Influence Of Anthropic Activities On Ground Water In Boldur, Timis County, Romania. Research Journal Of Agricultural Science, Vol. 46, No. 1, Ed. Agroprint, Timişoara Issn:2066-1843
8. Şmuleac L., Niţă S., Ienciu A., Şmuleac A., Dicu D., 2016, Topographic Survey For The Monitoring Of The Impact Of The Brua/Rohuat Pipe On Water Flow In The Irrigation System At Fântânele, Arad County, Romania. Sgem2016 Conference Proceedings, Isbn 978-619-7105-81-0 / Issn 1314-2704, 2 - 5 November, 2016, Book 3, Vol. 3, pp.333-340
9. Vădineanu A., Vădineanu R.S., Cristofor S., Adamescu M.C., Cazacu C., Postoloache C., Rîşnoveanu G., Ignat G., 2009, The 6th Symposium For European Freshwater Sciences - Sinaia – "Scientific Arguments For Identification Of The Lower Danube River System (Ldrs) As "Heavily Modified Water Body" (Hmwb)
10. ***, 2006, Official Journal of Romania, Part I, No. 511/June 13th