Water Quality of the Black Sea

Anton Sotirov

Assist. Prof. Dr. Eng.
Institute of Agriculture, Agricultural Academy, 2500, Kyustendil, Bulgaria
Department Agrotechnology, Plant Protection and Economy
Direction Earth Sciences and Ecology

Abstract- **Aim of the study is to be investigated the Black Sea water from Varna Bay, East Bulgaria and to be determined the reason for possible pollution – natural or human activities. The study was initiated by the fishermen and aqua-cultural persons from City of Varna. As a result of the study there was not observed any pollution or visible contamination of the water. Quality of the water is excellent for fishery, cultivating of aqua-cultures, tourism, swimming and developing of the eco-systems.**

Key words: **water, contamination, radiation, heavy metals, Black Sea.**

I. Introduction:

Aim of the study is to be investigated the Black Sea water from Varna Bay, East Bulgaria and to be determined the reason for possible pollution – natural or human activities. The study was initiated by the fishermen and aqua-cultural persons from City of Varna (Fig. 1).

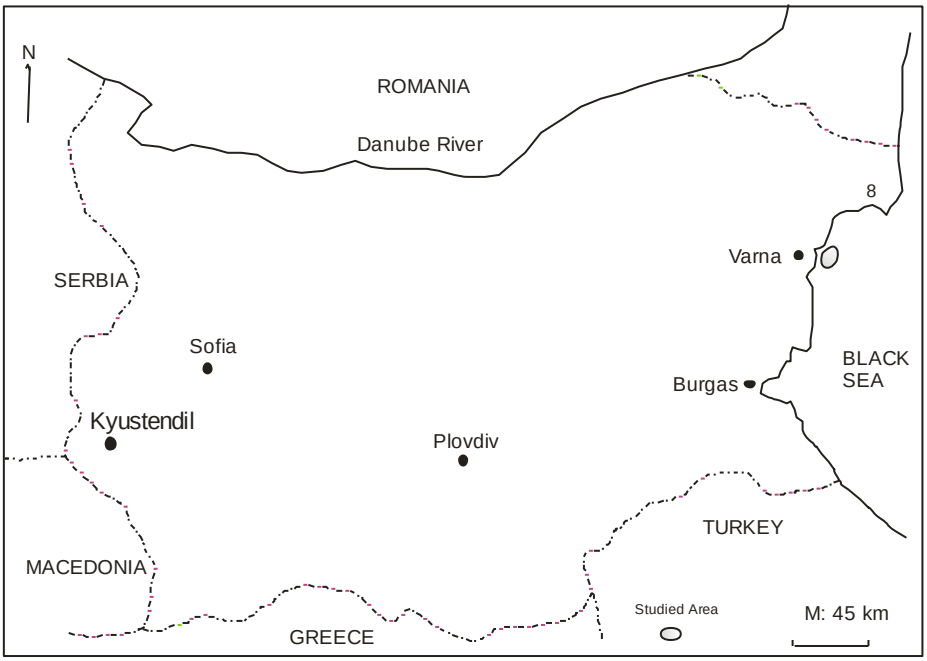

Fig. 1 Location of the studied area

II. Material and Methods:

Samples were taken at place “Trakata” on 04 August 2023 from the upper 30 cm layer of the water at depth of the bottom 1 m. The distance between the samples is 10 m. Number of samples 10. All samples have almost equal chemical characteristics. Radiation of the water and the common radiation background were measured with a Geiger counter "Radex"RD1503. Physics-chemical measurements were performed with instruments "SensoDirect 150" and "Hanna"HI9813-6. Spectrophotometer “Lovibond MD 600” was used for chemical study. Nitrate and nitrite content in the water were measured by using of test strips with a range of 0-10-25-50-100-250-500 mg/l. Arsenic content in the water is measured by the usage of test strips with a range of 0.005-0.0010-0.0025-0.05-0.1-0.25-0.5 mg/l. Zink content in the water is measured by the usage of test strips with a range of 0-4-10-20-50 mg/l. Lead content in the water is measured by the usage of test strips with a range of 20-40-100-200-500 mg/l. Manganese content in the water is measured by the usage of test strips with a range of 2-5-20-50-100 mg/l. Sulfate and sulfite content in the water are measured by using test strips with a range of 200-400-800-1200-1600 mg/l for SO4 and 10-40-80-180-400 mg/l for SO3.Ascorbic acid in the water was measured through test strips with range 0-25-50-100-200-400 mg/l. Bromine is

determined through test strips with range 0-0.5-1-2-6-10-20, Fluoride 0-25-50100-200, and Iodine 0-0.02-0.04-0.08-0.10-0.15. Also, a microbiological survey for coliforms in some of the rivers is performed under Bulgarian State Gazette BDS EN ISO/IEC 17025: 2006. The applied method of measurement is "on spot" ("in-situ"), on terrain, throughout direct sampling ("grab samples"), because of its accuracy.

III. Results and Discussion:

Acidity of the water was 7.0, total alkalinity (CaCO3) is high >200 mg/l, EC, TDS and Salt have low values for marine water, radiation of the water and sediment is normal as vary between 0,16 and 0,20 µSv/h . Generally, we could not find human pollution and contamination in the water as a result of this study, but [1,2] and other non-scientific subjects published data for high microbial contamination of the water from several beaches along the south Bulgarian Black Sea Coast. [3] Published data for no contamination of the Black Sea water. Some presence of ascorbic acid was established. We believe that the ascorbic acid is a part of the amin acids, which are part of the creation of the life. According to [4] the values of the gamma measurements were common but between 0.13 to 0.16 µSv/h. They were not different from the normal gamma background for the Varna region, which is 0.10µSv/h. Information about possible sources of radioactive contamination, influence of the common radiation background, the radioactivity of soils, waters and air are presented by [5,6] and [7].

Table 1 Measured parameters of the Black Sea Water, Varna Bay, Bulgaria

Measured parameter	Acidity pH	Electrocon ductivity EC, ms/cm	Total Dissolved Solids TDS, ppt	Salt, ppt	Temperature t,°C air	Temper ature t,°C water	Nitrite NO3, mg/l	Nitrate NO2, mg/l
Value	6,57	2,81	14.00	16.4 0 (1.64%)	28.50	27.50	<0,05	<0,10

Free Cl, mg/l	Total Cl, mg/l	Combined Cl, mg/l	Cyanuric acid CYS mg/l	Bromine, mg/l	Total alkalinity CaCO3, mg/l	Free Cu, mg/l	Total Cu, mg/l	Combined Cu, mg/l	Iron Fe, mg/l
<0,05	<0,05	<0,05	7,00	<0,05	>200	0,14	0.13	0,00	0.05

Microbiol ogy coliforms, CFU/g	Dissolve d oxygen O2, %	Arsenic As, mg/l	Lead Pb, mg/l	Iodine, mg/l	Mang anese Mn, mg/l	Zinc Zn, mg/l	Sulphate SO4, mg/l	Sulfite SO22-mg/l	Fluoride, mg/l
0-100	11,00 (4.2 mg/l)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Radiation background µSv/h	Radiatio n water, µSv/h	Radiation of sediment, µSv/h	Anthropoge nic micro-detritus and micro-plastics, %	Hardn ess, mg/l	Eh, mV	Ascorbic acid mg/l	Special Gravity, S.G.	Aroma, taste, color, turbidity
0,16-0,20	0,20	0,12-0,20	0,00	30,00	161,00	0,25	1,009	Normal, typical for sea water

IV. Conclusion:

As a result of the study there was not observed any pollution or visible contamination of the water. Quality of the water is excellent for fishery, cultivating of aqua-cultures, tourism, swimming and developing of the eco-systems.

REFERENCES:

[1]https://www.novinite.com/articles/221176/Feces+in+the+Sea%3A+Up+to+41+times+above+the+norm+is+the+Pollution+on+the+Bulgarian+Black+Sea+Coast

[2] Officials, experts seek to calm Georgians' Black Sea safety fears | Eurasianet

[3] BTA :: No Pollution Detected in Bulgaria Black Sea Area
[4] M. Vankova, I. Ivanov. Beta radioactivity measurement results of seawater at the Bulgarian seacoast, Varna Medical Forum, Medical University Varna, 2020. Vol. 9, appx. 1, 19-22.
[5] N. Dolchinkov. Sources of natural background radiation, Security and Defence Quarterly 3 (2017)(2017:3 (18)), 2017, 40-51.
[6] N. Dolchinkov. Radiation Background of the Atmosphere, Soil and Water in Bulgaria and Its Monitoring in the Contemporary Political Conditions. Conference: "Technics, technologies, education, safety" 2017, Veliko Tarnovo, Bulgaria, 2017, Vol. 1., 48-51.
[7] A. Sotirov, A., D. Malwood, N. Pistalov. Factors, influencing on the common radiation background. Proceedings Annual University Scientific Conference, Veliko Turnovo, Bulgaria, July 2014, 35-39.