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Interreg-IPA Cross-border Cooperation Programme Romania-Serbia

Academic Environmental Protection Studies on surface water quality in significant cross-border nature reservations Djerdap / Iron Gate national park and Carska Bara special nature reserve, with population awareness raising workshops

= RORS-462 =

PA2.OI3 Studies in the field of environmental protection and emergency management.

STUDY ON SURFACE WATER QUALITY OF CARSKA-BARA SPECIAL NATURE RESERVE AND DELTA (BALTA) NERA NATURE RESERVATION – Part.2

AEPS
common history, common future

www.aeps.upt.ro

5th – 6th February 2021, Timisoara, Romania

8th – 9th February, Bor, Serbia

Nature reserve “Balta Nera”, the newest Delta in Europe

The reservation is part of the European Biogeographical Region, according to European norms and is classified as nature reserve class IV-IUCN, with specific wetlands protected habitats.

The area covered by Ramsar protection is 10 hectares. The reservation is located on the administrative territory of Socol commune, Caras-Severin County, being an integral part of the Iron Gates Natural Park.

It was declared Nature reserve in 1994 by Decision of Caras-Severin County Council, reconfirmed by law 5/2000 - regarding the approval of the National Territory Planning Plan - Section III - protected areas.

Aerial photo from cniptmoldovanoua.ro

Balta Nera

Balta Nera reserve is relatively difficult to access, in her vicinity one can drive on DN57 from East or DJ57A from north, by the junction of Nera and Danube Rivers.

Balta Nera

The flora is represented by hydrophilic and hygrophilous species.
As expected, ichthyofaunal is very well represented.

The fauna is very rich, from insects to mammals. The most well-known faunal elements in the area are waterfowl (swans, geese and ducks), the reserve meeting the bioecological conditions necessary for them for food, reproduction and nesting.

Balta Nera

The avifauna is represented by species that benefit from the protection status offered by the community legislation - Birds Directive, ratified by GEO 57/2007 by the Government of Romania. Among these species we mention: Phalacrocorax pygmaeus (small cormorant), Botaurus stellaris (marsh owl), Ixobrychus minutus (dwarf heron), Egretta garzetta (small egret), Egretta alba (large egret), Alcedo atthis but also species of predators, such as Tyto alba and Circus aeruginosus.

Limit values of pollutants in surface waters, Romania

Parameter	Unit	Limit values				
		I class	II class	III class	IV class	V class
pH	-	6.5 – 8.5				
Conductivity	µS/cm	-				
Dissolved oxygen (DO)	mgO_2/l	9	7	5	4	< 4
Biochemical oxygen demand (BOD – CBO5)	mgO_2/l	3	5	7	20	> 20
Chemical oxygen demand (COD – CCO-Cr)	mgO_2/l	10	25	50	125	> 125
Ammonia (NH_4^-)	mg/l	0.01	0.3	0.06	0.3	> 0.3
Nitrates (NO_3^-)	mg/l	1	3	5.6	11.2	> 11.2
Nitrites (NO_2^-)	mg/l	0,01	0,03	0,12	0,3	>0,3
Total Nitrogen (TN)	mg/l	1.5	7	12	16	> 16
Orto phosphate ($P\text{-}PO_4^{3-}$)	mg/l	0.1	0.2	0.4	0.9	> 0.9
Sulphates (SO_4^{2-})	mg/l	60	120	250	300	>300
Chloride (Cl^-)	mg/l	25	50	250	300	> 300
Sodium (Na+)	mg/l	25	50	100	200	> 200
Calcium (Ca2+)	mg/l	50	100	200	300	> 300
Mercury (Hg)	µg/l	0.1	0.3	0.5	1	> 1
Arsenic (As_3^+)	µg/l	10	20	50	100	> 100
Lead (Pb)	µg/l	5	10	25	50	> 50
Zinc (Zn_2^+)	µg/l	100	200	500	1000	> 1000
Cadmium (Cd)	µg/l	0.5	1	2	5	> 5
Manganese (Mn - total)	mg/l	0.05	0.1	0.3	1	> 1
Iron (Fe – total)	mg/l	0.3	0.5	1.0	2	> 2

In-situ and laboratory analysis, Balta Nera

The surface water samples were taken in 5 spots from Balta Nera nature reserve, in 5th august 2020 and 23rd September 2020. The in-situ analysis (for pH, temp, chlorides, total hardness, chromate and dissolved oxygen) were performed on site. All samples were preserved in-situ for laboratory analysis with acids: HNO_3 (nitric acid) for metal concentration analysis, H_3PO_4 (phosphoric acid) for TOC/TN analysis and H_2SO_4 (sulfuric acid) for COD, ammonia, phosphor, nitrite, nitrate, phosphate, a.o


Romania
Serbia
Balta Nera
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2
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Danube
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Physical-chemical parameters of Balta Nera surface water

Methods for parameter analysis in samples of Balta Nera

Parameters	Measurement methods
pH	Electrode - electric potential difference
Conductivity	Electrolytic probe
Dissolved oxygen (DO)	Galvanic probe
Biochemical oxygen demand (BOD – CBO5)	Specord 250Plus – photometric method
Chemical oxygen demand (COD – CCO-Cr)	
Ammonia (NH_4^-)	
Nitrates (NO_3^-)	
Nitrites (NO_2^-)	
Total Nitrogen (TN)	Multi N/C 3100. Corrosion-free Focus-Radiation NDIR detection and furnace technology of combustion.
Orto phosphate ($P\text{-}PO_4^{3-}$)	Specord 250Plus – photometric method
Sulphates (SO_4^{2-})	
Chloride (Cl^-)	
Sodium (Na+)	
Calcium (Ca2+)	
Mercury (Hg)	ZEEnit 700 P Compact Tandem Spectrometer. Atomic Absorption Spectrometry – equipped with flame, hydride and graphite furnace, with Zeeman magnetic field control and Deuterium and Zeeman background correction.
Arsenic (As_3^+)	
Lead (Pb)	
Zinc (Zn_2^+)	
Cadmium (Cd)	
Manganese (Mn - total)	
Iron (Fe – total)	

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Results obtained for parameter analysis in samples of Balta Nera, on 5th august 2020

Parameter	Unit	Measured values - 5th august 2020					
		BN1	BN2	BN3	BN4	BN5	ecological state
pH	-	7.94	7.88	8.05	7.92	7.98	-
Conductivity	µS/cm	293	302	296	299	308	-
Dissolved oxygen (DO)	mgO_2/l	10.4	9.9	10.1	9.7	10.9	Ist
Biochemical oxygen demand (BOD – CBO5)	mgO_2/l	2.9	2.8	3.1	3.1	2.9	Ist-IInd
Chemical oxygen demand (COD – CCO-Cr)	mgO_2/l	9.7	10.2	10.1	9.7	10.2	Ist-IInd
Ammonia (NH_4^-)	mg/l	0.38	0.41	0.35	0.39	0.40	IVth
Nitrates (NO_3^-)	mg/l	0.53	0.61	0.56	0.55	0.54	Ist
Nitrites (NO_2^-)	mg/l	0.041	0.053	0.048	0.045	0.044	IInd
Total Nitrogen (TN)	mg/l	1.12	1.14	1.12	1.16	1.14	Ist
Orto phosphate ($P\text{-}PO_4^{3-}$)	mg/l	0.16	0.17	0.16	0.15	0.16	IInd
Sulphates (SO_4^{2-})	mg/l	15.6	14.3	15.1	14.7	14.9	Ist
Chloride (Cl^-)	mg/l	0.4	0.4	0.4	0.4	0.4	Ist
Sodium (Na+)	mg/l	3.6	3.2	3.2	3.5	3.4	Ist
Calcium (Ca2+)	mg/l	8.6	8.7	8.7	8.5	8.6	Ist
Mercury (Hg)	µg/l	0.021	0.017	0.018	0.011	0.015	Ist
Arsenic (As_3^+)	µg/l	0.33	0.14	0.21	0.17	0.11	Ist
Lead (Pb)	µg/l	0.088	0.094	0.091	0.081	0.085	Ist
Zinc (Zn_2^+)	µg/l	12.7	14.1	13.7	12.9	13.5	Ist
Cadmium (Cd)	µg/l	0.007	0.007	0.010	0.008	0.007	Ist
Manganese (Mn - total)	mg/l	0.022	0.021	0.025	0.024	0.025	Ist
Iron (Fe – total)	mg/l	0.893	0.955	1.021	0.912	0.897	IIIrd

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Results obtained for parameter analysis in samples of Balta Nera, on 23rd September 2020

Parameter	Unit	Measured values - 5th august 2020					
		BN1	BN2	BN3	BN4	BN5	ecological state
pH	-	7.45	7.44	7.51	7.52	7.49	-
Conductivity	µS/cm	441	455	447	453	450	-
Dissolved oxygen (DO)	mgO_2/l	8.5	8.4	8.4	8.3	8.3	IInd
Biochemical oxygen demand (BOD – CBO5)	mgO_2/l	4.2	4.4	4.3	4.2	4.2	IInd
Chemical oxygen demand (COD – CCO-Cr)	mgO_2/l	14.4	14.8	14.5	14.7	14.5	IInd
Ammonia (NH_4^-)	mg/l	0.45	0.48	0.43	0.46	0.48	IVth
Nitrates (NO_3^-)	mg/l	0.68	0.66	0.65	0.66	0.67	Ist
Nitrites (NO_2^-)	mg/l	0.055	0.052	0.056	0.058	0.055	IIIrd
Total Nitrogen (TN)	mg/l	1.33	1.28	1.30	1.29	1.28	Ist
Orto phosphate ($P\text{-}PO_4^{3-}$)	mg/l	0.22	0.24	0.24	0.23	0.22	IIIrd
Sulphates (SO_4^{2-})	mg/l	20.1	21.1	20.5	20.6	20.3	Ist
Chloride (Cl^-)	mg/l	0.3	0.4	0.5	0.3	0.4	Ist
Sodium (Na+)	mg/l	3.3	3.4	3.5	3.4	3.4	Ist
Calcium (Ca2+)	mg/l	6.8	6.9	6.8	6.8	6.9	Ist
Mercury (Hg)	µg/l	0.013	0.011	0.010	0.011	0.009	Ist
Arsenic (As_3^+)	µg/l	0.15	0.16	0.17	0.17	0.18	Ist
Lead (Pb)	µg/l	0.071	0.077	0.079	0.080	0.076	Ist
Zinc (Zn_2^+)	µg/l	14.9	14.7	15.1	14.7	14.9	Ist
Cadmium (Cd)	µg/l	0.006	0.006	0.008	0.008	0.007	Ist
Manganese (Mn - total)	mg/l	0.031	0.033	0.031	0.032	0.033	Ist
Iron (Fe – total)	mg/l	1.118	1.083	1.103	1.094	1.107	IVth

From the measurements made in 5th August 2020 it can be determined that the heavy metals were located in the 1st category (the best), while the Iron and Ammonia determinations showed high levels of contamination (class 3 and 4).

The measurements made in 23 th September 2020 indicated high levels of contaminants in terms of Ammonia, Nitrates and Ortho Phosphates (class 3 and 4), with potential negative impact over the local environment. Heavy metal contamination remained in class 1 ecological state.

Continuous measurements from multiple points are required to be further investigated in order to determine potential areas with high or low grade of contamination and remedial actions can be further proposed to be taken as a result of repetitive laboratory and in situ determinations.