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Project:
Resources pilot centre for cross-border preservation of the aquatic biodiversity of Prut River MIS ETC 1150

THE THIRD REPORT, MAY 2012 – APRIL 2013

Partner - Institute of Zoology, Academy of Sciences of Moldova

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GA4: PRUT RIVER INVESTIGATION

D1. Site hydrobiological study (including fish sampling) performed across and alongside Prut River from the entry into the Romanian territory to the confluence with Danube River

Investigations were carried out in the Institute of Zoology of the Academy of Sciences of Moldova.

The water and biological samples were collected in June, August, October and December of 2012 and in February, March and April of 2013. A range of samples collected in April of 2013 are currently under processing, because of this the corresponding results will be presented in the next report. The sampling was performed in Costesti-Stinca reservoir (lower sector, straight next to the dam), the Prut River (Braniste, Sculeni, Leuseni, Leova, Cahul, Cislita-Prut, Giurgiulesti), excepting the field expedition in December of 2012, when the samples were picked up only in Costesti-Stinca reservoir (middle and lower sectors).

Investigations were directed both to the assessment of diversity, quantitative structure and production peculiarities of bacterio-, phyto- and zooplankton, zoobenthos, ichthyofauna and hydrochemical state of the Prut River. According to obtained results, the trophic statute and water quality of the Prut River were identified.

D.1.1 The monitoring of the structural and functional characteristics of the main aquatic organisms communities inhabiting the River Prut

Bacterioplankton. The results of investigations proved that the diversity of functional bacterioplankton is rich in the Costesti-Stinca reservoir and Prut River. The following groups of bacteria were identified: nitrogen fixing bacteria (aerobic and anaerobic), ammonifying, nitrifying, denitrifying, phosphate mineralizing, amylolytic, cellulosolytic, phenolytic and petrolytic bacteria (Table 1).

Table 1 The density of main physiological groups of microorganisms in the Prut River and Costesti-Stinca reservoir, June 2012 – April 2013, thousand cells/ml

Station	Ammonifying bacteria	Denitrifying bacteria	Nitrifying bacteria	Phosphate-mineralizing bacteria	Amylolytic bacteria	Cellulosolytic bacteria	Phenolytic bacteria	Petrolytic bacteria
June 2012								
Costesti-Stinca	0.20	0.050	0.003	0.250	0.150	0.002	0.59	0.60
Braniste	0.64	0.080	0.005	0.350	1.600	0.006	1.00	1.50
Leova	0.390	0.070	0.008	0.200	0.600	0.003	0.700	1.800
Cahul	0.40	0.100	0.002	0.110	0.550	0.002	0.610	1.500
Cislita-Prut	1.10	1.50	0.004	0.40	4.0	0.004	1.20	2.0
August 2012								
Costesti-Stinca	3.20	0.50	0.01	0.070	0.980	0.025	0.600	1.90
Braniste	3.00	0.30	0.009	0.020	0.900	0.02	1.000	1.30
Sculeni	0.20	1.00	0.002	0.090	0.600	0.015	0.808	1.000
Leuseni	2.160	0.300	0.003	0.080	0.360	0.01	0.700	0.960
Leova	2.200	0.400	0.001	0.300	1.000	0.018	0.500	1.100
Cahul	1.800	0.450	0.007	0.200	2.480	0.027	1.000	2.500
Cislita-Prut	1.200	0.380	0.006	0.095	0.900	0.018	0.900	2.00
Giurgiuleşti	1.00	0.390	0.005	0.097	0.950	0.019	0.800	1.800
October 2012								
Costesti-Stinca	3	0.005	0.015	0.02	1.2	0.014	0.79	7
Braniste	6	0.01	0.013	0.05	2.5	0.013	1.2	6.5
Sculeni	0.2	0.032	0.003	0.009	0.05	0.002	0.9	1

Leuseni	1.5	0.002	0.01	0.1	1.5	0.01	0.8	3
Leova	8	0.019	0.012	0.25	1.8	0.008	0.6	3.8
Cahul	0.6	0.01	0.008	0.05	1.3	0.009	1.3	3.5
Cislita-Prut	2.2	0.03	0.009	0.14	2	0.01	1.1	4.2
Giurgiuleşti	0.7	0.02	0.005	0.03	0.5	0.004	1	5
December 2012								
Costesti-Stinca, middle sector	1	0.004	0.0002	0.075	2.5	0.001	0.05	0.5
Costesti-Stinca, lower sector	0.5	0.002	0.0002	0.05	0.8	0.001	0.02	0.2
February 2013								
Costesti-Stinca, lower sector	0.06	0.032	0.0002	0.025	0.065	-	0.005	0.013
Braniste	0.035	0.01	0.0003	0.005	0.05	-	0.003	0
Sculeni	0.22	0.07	0.0005	0.058	0.24	-	0.004	0.15
Cahul	0.64	0.56	0.005	0.005	0.32	-	0.06	0.01
Cislita-Prut	0.32	0.28	0.003	0.03	0.3	-	0.055	0.002
Giurgiuleşti	0.36	0.16	0.004	0.02	0.45	-	0.078	0.005
March 2013								
Costesti-Stinca, lower sector	0.015	0.007	0.0003	0.028	0.01	-	-	0.003
Braniste	0.08	0.045	0.0005	0.04	0.02	0.001	0.01	0.045
Sculeni	0.45	0.12	0.001	0.08	0.1	0.003	0.013	0.015
Leuseni	0.7	0.18	0.005	0.504	1.76	0.004	0.041	0.8
Leova	0.8	0.16	0.004	0.18	0.65	0.007	0.05	0.08
Cahul	0.5	0.18	0.004	0.24	0.24	0.008	0.09	0.1
Cislita-Prut	0.2	0.005	0.003	0.12	0.1	0.006	0.018	0.05
Giurgiuleşti	0.3	0.24	0.005	0.16	0.08	0.005	0.019	0.055
April 2013								
Costesti-Stinca, lower sector	0.3	0.136	0.0003	0.16	0.56	0.0005	0.1	0.45
Braniste	0.31	0.11	0.0004	0.15	0.44	0.0005	0.2	0.4
Sculeni	0.5	0.15	0.0005	0.28	0.5	0.001	0.4	0.48
Leuseni	4	0.56	0.0006	0.36	0.88	0.002	0.8	0.35
Leova	0.56	0.2	0.0007	0.165	0.6	0.0006	0.15	0.72
Cahul	0.64	0.36	0.0009	0.34	0.64	0.0005	0.25	1.65
Cislita-Prut	0.32	0.44	0.0008	0.5	1.3	0.0004	0.5	0.4
Giurgiuleşti	0.4	0.3	0.0005	0.28	0.5	0.0007	0.7	0.5

The results on the density of total bacterioplankton varied in the wide limits- from 0.6 to 22.3 million cells/ml (Fig.1). It is worth to mention that, from the microbiological point of view, the most loaded was Leuseni station (17.5 million cells/ml) in August of 2012 and Sculeni (22.3 million cells/ml) in April of 2013.

Bacterioplankton production oscillated in large diapason- from 0.01 cal/l in 24 hours (Leuseni) to 5.39 cal/l in 24 hours (Braniste, June 2012).

Saprophytic bacteria are a group of heterotrophic bacteria, actively participating to the destruction of easily degradable organic substances. As rule, their number has increased during the summer. Regarding on the quantitative development of saprophytic bacteria in the Prut River, it was revealed that their number is extremely variable, reaching values between 0.036 and 12.80 thousand cells/ml. The highest quantities were registered next to the Costesti dam and at Braniste station in August and October of 2012, at Leova station in October of 2012, at Leuseni station and on the Cislita-Prut – Giurgiulesti sector in April of 2013 (Fig.2).

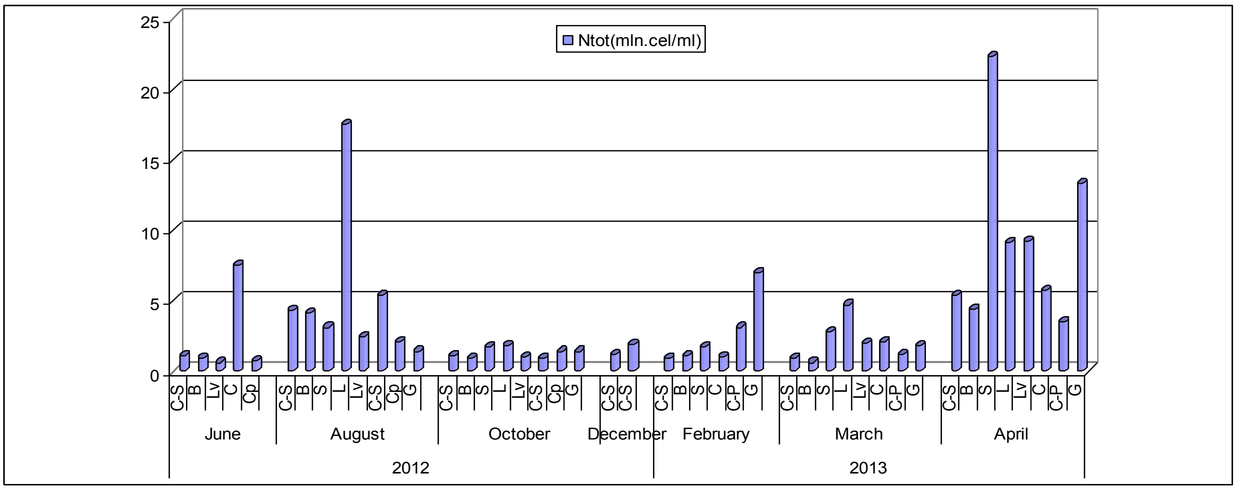


Fig.1 Dynamics of bacteria density (million cells/ml) in the waters of Costesti-Stinca reservoir and the Prut River, June of 2012 – April of 2013 (C-S –Costesti-Stinca; Prut River: B-Braniste, S- Sculeni, L-Leuseni, Lv- Leova, C-Cahul, C-P – Cislita-Prut, G – Giurgiulesti)

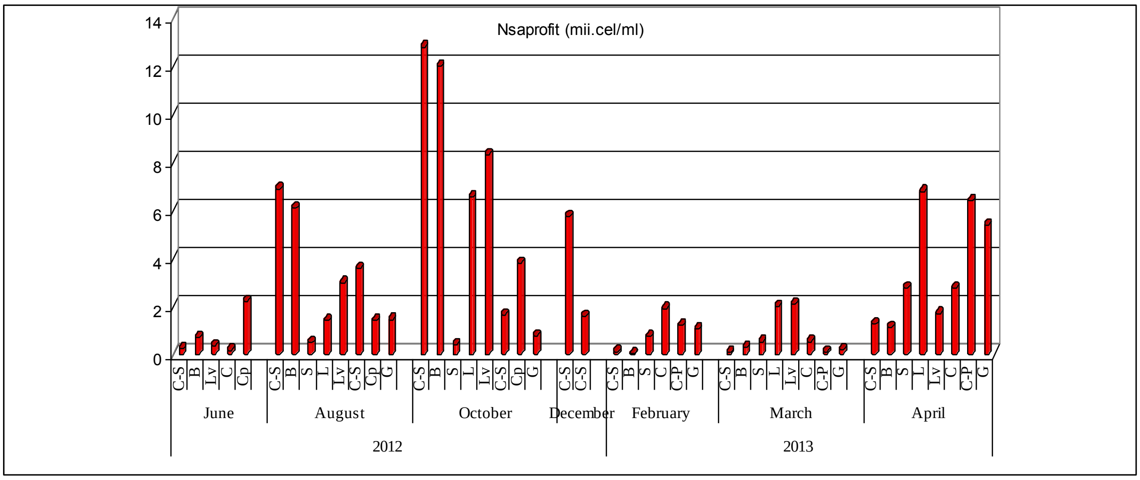


Fig.2 Dynamics of saprophytic bacteria (thousand cells/ml) in the waters of Costesti-Stinca reservoir and the Prut River, June of 2012- April of 2013 (C-S –Costesti-Stinca; Prut River: B-Braniste, S- Sculeni, L-Leuseni, Lv- Leova, C-Cahul, C-p – Cislita-Prut, G – Giurgiulesti)

The self-cleaning potential of the Prut River water is high, this fact being demonstrated by density of ammonifying bacteria increased up to 8.0 thousand cells/ml, amylolytic bacteria- up to 4.0 thousand cells/ml and denitrifying bacteria- up to 1.5 thousand cells/ml (Table 1).

Investigation of microorganisms participating to the degradation of toxic compounds (phenols) and heavy biodegradable compounds (petroleum products) allowed stating that these groups of bacteria are well quantitatively represented. The density of phenolytic bacteria varied from 0.003 thousand cells/ml to 1.3 thousand cells/ml and the density of petrolytic bacteria - from 0 to 7.0 thousand cells/ml (Table 1). These figures indirectly denote that studied aquatic ecosystems are polluted by phenols and especially, by petroleum products.

According to the results of bacterioplankton investigation, the water quality varied within limits "low- polluted" - "very polluted".

Phytoplankton. In summer time of 2012, in the phytoplankton composition were identified 56 species and intraspecific taxa of planktonic algae, which refer to 6 phyla: *Cyanophyta* – 6, *Chrysophyta* -1, *Dinophyta* – 1, *Bacillariophyta* – 24, *Euglenophyta* – 4, *Chlorophyta* – 20. The most frequent were the following species: *Merismopedia tenuissima*, *Monoraphidium contortum*, *Monoraphidium komarkovae*, *Scenedesmus quadricauda*, *Trachelomonas hispida*, *Chlamydomonas globosa*, *Navicula cryptocephala*, *Cocconeis placentula*, *Nitzschia acicularis*, and *Cyclotella kuetzingiana*. Dinophyte algae, mainly represented by the species *Ceratium hirundinella,* were indentified only in the lower sector of the Costesti-Stinca reservoir, revealing a biomass of 4.37 g/m^3. High values of phytoplankton density in the lower sector of river are due to intense development of cyanophyte algae at the stations Leova (22.4 million cells/l) and Cahul (21.6 million cells/l)(Fig.3).

Investigations of autumn of 2012 revealed 49 species and intraspecific taxa of planktonic algae, which refer to 5 phyla (*Cyanophyta* – 7, *Bacillariophyta* – 20, Xanthophyta-1, *Euglenophyta* – 2, *Chlorophyta* – 19) in the composition of the Prut River phytoplankton. The list of the most frequent registered species is comprised by *Synechocystis aquatilis* Sanv., *Merismopedia tenuissima* Lemm., *Oscillatoria lacustris (*Kleb.) Geitl., *Oscillatoria planctonica* Wolosz., *Scenedesmus quadricauda* Turp. *var. quadricauda, Diatoma vulgare* Bory *var.vulgare.*

In the middle sector of the Prut River, in autumn period, the phytoplankton was represented basically by *Cyanophyta* and *Bacillariophyta* algae; the density ranged 2.16-9.23 million cells/l, and the biomass- 1.15-1.24 g/m^3. At the Braniste station the phytoplankton was more abundant, being significantly influenced by the penetration of species (*Synechocystis aquatilis* Sanv., *Oscillatoria lacustris* (Kleb.) Geitl.) from the lower sector of the Costesti-Stinca reservoir. In the lower sector of the Prut River the density values ranged between 2.43-24.96 million cells/l and of biomass- between 1.30-5.34 g/m^3. The values of quantitative parameters of phytoplankton were relatively higher in the sector Leuseni-Cahul (12.06-24.96 million cells/l, 3.29-5.34 g/m^3), being dominated by species *Synechocystis aquatilis* Sanv., *Merismopedia tenuissima* Lemm., *Oscillatoria lacustris (*Kleb.) Geitl., *Oscillatoria planctonica* Wolosz., *Scenedesmus quadricauda* Turp. *var. quadricauda*, and considerably decreased in the sector Cislita-Prut- Giurgiulesti (2.43-2.79 million cells/l, 1.30-2.12 g/m^3).

Phytoplankton of lower sector of Costesti-Stinca reservoir was represented by 11 species of cyanophyte, bacillariophyte and chlorophyte algae in autumn time, and among them the most abundant were *Synechocystis aquatilis* Sanv., *Aphanizomenon flos-aquae* (L.) Ralfs *f. flos-aquae*, *Oscillatoria lacustris* (Kleb.) Geitl. and *Diatoma vulgare* Bory *var.vulgare*. The values of phytoplankton density (8.1 million cells/l) and biomass (2.1 g/m^3) were quite low.

In winter time (December of 2012 – February of 2013) the phytoplankton of reservoir was composed by 9 species of bacillariophyte, cyanophyte and chlorophyte algae and showed an insignificant development, with a density of 1.67-2.43 million cells/l and a biomass of 1.14-1,91 g/m^3. In the Prut River the winter phytoplankton was represented by a total number of 30 species and intraspecific taxa, most of them referring to bacillariophyte algae. The phytoplankton density in the Prut River in winter time ranged from 1.13 to 9.93 million cells/l, with the highest values at Braniste and Giurgiulesti stations, and biomass – from 2.35 to 3.58, with the highest values at Sculeni and Giurgiulesti stations.

During the entire period of investigations (June of 2012 – March of 2013) 131 species and intraspecific taxa have been identified in the structure of the Prut River phytoplankton, which refer to 7 phyla: *Cyanophyta* – 7, *Chrysophyta* – 1, *Bacillariophyta* – 50, *Xanthophyta* -2, *Dinophyta* – 4, *Euglenophyta* – 12, *Chlorophyta* – 48 (Table 2). In Costesti-Stinca reservoir 42 species and intraspecific taxa have been registered, most of them pertaining to the *Bacillariophyta* (15) and *Chlorophyta* (16) groups. The highest input in the formation of phytoplankton density it is made by cyanophyte algae, and of phytoplankton biomass – by bacillariophyte and chlorophyte algae.

The phytoplankton density has varied during the June of 2012 – March of 2013 between 1.13-29.58 million cells/l in the Prut River and 1.46-31.29 million cells/l in Costesti-Stinca reservoir (Fig.3), and phytoplankton biomass - in diapason of 1.15-17.19 g/m^3 in the Prut River and of 1.14-30.26 g/m^3 in Costesti-Stinca reservoir (Fig. 4).

Table 2 List of species of planktonic algae identified in the Prut River and Costesti-Stinca reservoir in June of 2012 – March of 2013

Taxoni	S	r. Prut	Lacul Costeşti-Stînca
Cyanophyta			
Merismopedia tenuissima Lemm.	β- α	+	-
Synechocystis aquatilis Sanv.		+	+
Microcystis aeruginosa Kutz. f.aeruginosa	β	+	-
Microcystis pulverea (Wood.) Forti f. pulverea	o –β	+	-
Gloeocapsa turgida (Kutz.) Hollerb. f.turgida	o	+	+
Anabaena spiroides Kleb. f.spiroides	o –β	+	+
Anabaena flos-aquae (Lyngb.) Breb. f. flos-aquae	β	+	-
Aphanizomenon flos-aquae (L.)Ralfs f.flos-aquae	β	+	+
Oscillatoria lauterbornii Schmidle	ρ	+	-
Oscillatoria subtilissima Kutz.	α	+	-
Oscillatoria kisselevii Anissim		+	-
Oscillatoria lacustris (Kleb.) Geitl.		+	+
Oscillatoria planctonica Wolosz.		+	+
Romeria leopoliensis (Racib.) Koczw	0- β	+	-
Total		**14**	**6**
Chrysophyta			
Dinobryon sertularia Ehr.var.sertularia	o	+	+
Total		**1**	**1**
Bacillariophyta			
Melosira granulata (Ehr.) Ralfs var.granulata	β	+	+
Melosira italica (Ehr.) Kutz. var. italica	0- β	+	
Cyclotella ocellata Pant.		+	+
Cyclotella Kuetzingiana Thw.	β	+	+
Cyclotella meneghiniana Kutz var.meneghiniana	α-β	+	
Cyclotella comta (Ehr.) Kutz. var.comta	o	+	
Diatoma vulgare Bory var.vulgare	β	+	+
Diatoma vulgare var. lineare Grun.		+	+
Fragillaria virescens Ralfs var. virescens	x	+	
Synedra ulna (Nitzsch.) Ehr. var.ulna	β	+	+
Synedra acus Kutz. var.acus	β	+	
Asterionella formosa Hass	0- β	+	+
Cocconeis placentula Ehr. var.placentula	β	+	+
Rhoicosphenia curvata (Kutz.) Grun. var. curvata	β	+	
Stauroneis anceps Ehr.var.anceps	β	+	
Navicula lacustris Greg.		+	
Navicula cryptocephala Kutz. var.cryptocephala	α	+	+
Navicula cryptocephala var.intermedia Grun.	β	+	
Navicula hungarica Grun.	β	+	
Navicula hungarica var.capitata Cl.	β- α	+	
Navicula cincta (Ehr.) Kutz. var.cincta	β-α	+	
Navicula grasilis Ehr.	β-o	+	

Navicula peregrina (Ehr.) Kutz. var.peregrina		+	
Navicula exigua (Greg.) O.Mul. var.exigua	β	+	
Navicula pusilla W.Sm.var.pusilla		+	
Navicula pygmaea Kutz.	α	+	
Pinnularia viridis (Nitzsch.) Ehr.	β	+	
Gyrosigma distortum (W.Sm.) Cl. var.distortum		+	
Gyrosigma acuminatum (Kutz.) Rabenh. var. acuminatum	α	+	
Gyrosigma fasciola Ehr.		+	
Amphora ovalis Kutz. var.ovalis	o-β	+	
Amphora venata Kutz. var. venata		+	
Cymbella turgida (Greg.) Cl.		+	+
Cymbella ventricosa Kutz. var. ventricosa	β	+	
Cymbella lanceolata (Ehr.) V.H. var.lanceolata	β	+	+
Cymbella tumida (Breb.) V.H. var.tumida		+	+
Gomphonema olivaceum (Lyngb.) Kutz. var.olivaceum	β	+	+
Hantzschia amphioxys Grun. var.amphioxys	α	+	
Nitzschia palea (Kutz.) W.Sm. var.palea	α	+	
Nitzschia kuetzingiana Hilse		+	
Nitzschia sigmoidea (Ehr.) W.Sm. var.sigmoidea	β	+	+
Nitzschia acicularis W.Sm. var. acicularis	α	+	+
Nitzschia longissima var.reversa (Breb.) Ralfs.W.Sm.		+	
Cymatopleura solea (Breb.) W.Sm.var.solea	β- α	+	
Cymatopleura eliptica (Breb.) W.Sm. var. eliptica	β	+	
Surirella robusta Ehr. var.robusta		+	
Surirella robusta var. splendida Ehr.	β	+	
Surirella ovata Kutz. var.ovata	β	+	
Navicula sp.		+	
Nitzschia sp.		+	
Total		**50**	**15**
Xanthophyta			
Centritractus belanophorus Lemm.	o-β	+	
Ophiocytium lagerheimii Lemm.		+	
Total		**2**	**0**
Dinophyta			
Glenodinium quadridens (Stein.) Schiller.		+	
Glenodinium gymnodinium Penard.		+	+
Peridinium cinctum (O.F.M.) Ehr. var. cinctum		+	
Ceratium hirundinella (O. F.M.) Bergh.	o	+	+
Total		**4**	**2**
Euglenophyta			
Trachelomonas verrucosa Stokes var.verrucosa		+	
Trachelomonas intermedia Dang. f.intermedia		+	+
Trachelomonas oblonga Lemm. var.oblonga	β	+	
Trachelomonas hispida (Perty) Stein. var. hispida	β	+	+
Strombomonas fluviatilis (Lemm.) Defl. var. fluviatilis	β	+	
Euglena viridis Ehr. var. viridis	ρ-α	+	

Euglena polymorpha Dang.	α	+	
Euglena acus Ehr. var. acus	β	+	
Euglena oxyuris Schmarda var. oxyuris	β- α	+	
Lepocinclis fusiformis (Carter) Lemm var. fusiformis	β	+	
Phacus pleuronectes (Ehr.) Duj. var. pleuronectes	β	+	
Monomorphina nordstedtii (Lemm.) Popova		+	
Total		**12**	**2**
Volvocophyceae			
Chlamydomonas globosa Snow.		+	+
Carteria globosa Korsch.		+	
Carteria pallida Korsch.		+	+
Eudorina elegans Ehr.	β	+	
Pandorina morum (Mull.)Bory	β	+	
Total		**5**	**2**
Chlorococcophyceae			
Golenkinia radiata Chod.		+	+
Treubaria triapendiculata Bern.		+	
Pediastrum simplex Meyen		+	+
Pediastrum tetras (Ehr.) Ralfs var. tetras	β	+	
Pediastrum boryanum (Turp.) Menegh. var.boryanum	β	+	
Pediastrum borianum var. longicorne Reinsch.		+	
Pediastrum duplex Meyen. var. duplex	β	+	+
Chlorella vulgaris Beier.	ρ-α	+	
Tetraedron triangulare Korsch.		+	
Tetraedron caudatum (Corda) Hansg. var. caudatum	β	+	
Tetraedron minimum (A.Br.) Hansg. var. minimum	β	+	
Lagerheimia wratislaviensis Schroed. var. wratislaviensis	β	+	
Lagerheimia genevensis Chod. var. genevensis	β	+	
Lagerheimia ciliata (Laegerh.)Chod.		+	
Oocystis borgei Chnow. var. borgei		+	
Oocystis lacustris Chod.	β-o	+	+
Oocystis parva W.et W.		+	
Monoraphidium komarkovae Nygaard		+	+
Monoraphidium griffithii (Berk.)		+	
Monoraphidium arcuatum (Korsch.)		+	
Monoraphidium minutum (Nag.)		+	+
Monoraphidium contortum Thur.		+	+
Dictyosphaerium pulchellum Wood.		+	
Coelastrum microporum Nageli	β	+	+
Crucigenia tetrapedia (Kirchn.) W.et G.S.West	o-β	+	+
Tetrastrum triangulare Chod.		+	
Tetrastrum elegans Playfair.		+	
Tetrastrum triacanthum Korschik.		+	
Actinastrum hantzschii Lagerh. var.hantzschii	β	+	
Scenedesmus acutus Meyen		+	
Scenedesmus falcatus Chodat.		+	

Scenedesmus acutiformis Schroed.		+	
Scenedesmus elipticus Corda		+	
Scenedesmus obtusus Meyen		+	
Scenedesmus intermedius Chodat var.intermedius		+	
Scenedesmus intermedius var. balatonicus Hortobagyi		+	
Scenedesmus bicaudatus Dedussenko		+	
Scenedesmus spinosus Chodat		+	+
Scenedesmus quadricauda Turp. var. quadricauda	β	+	+
Micractinium bornhemiense (Conr.)Korsch.		+	+
Total		**40**	**12**
Desmidiales			
Closterium gracile Breb. f.gracile		+	+
Cosmarium phaseolus Breb.		+	
Staurastrum tetracerum Ralfs.		+	+
Total		**3**	**2**
Total	**74**	**131**	**42**

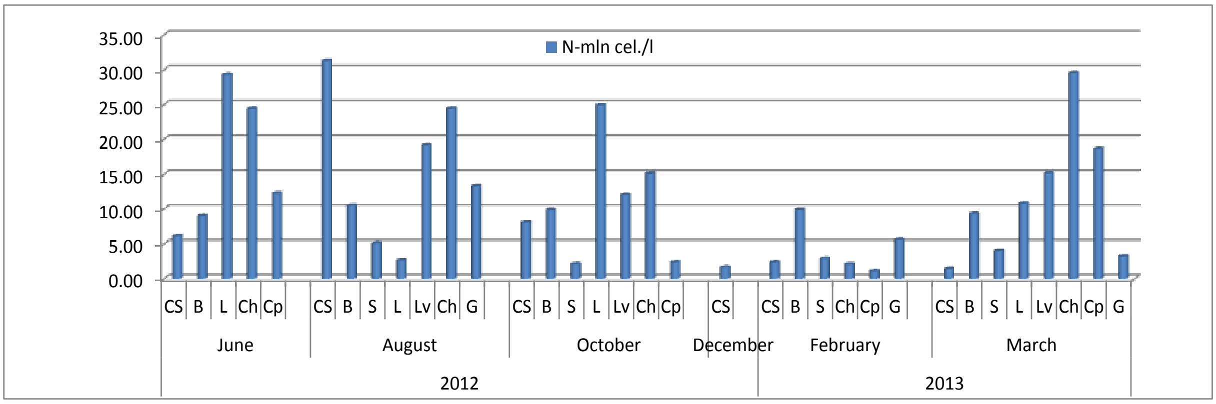


Fig. 3 Phytoplankton density (N-million cells/l) in the lower sector of Costesti-Stinca reservoir (C-S) and Prut River (B-Braniste, L-Leuseni, C-Cahul, Cp-Cislita-Prut, G-Giurgiulesti) in 2012-2013

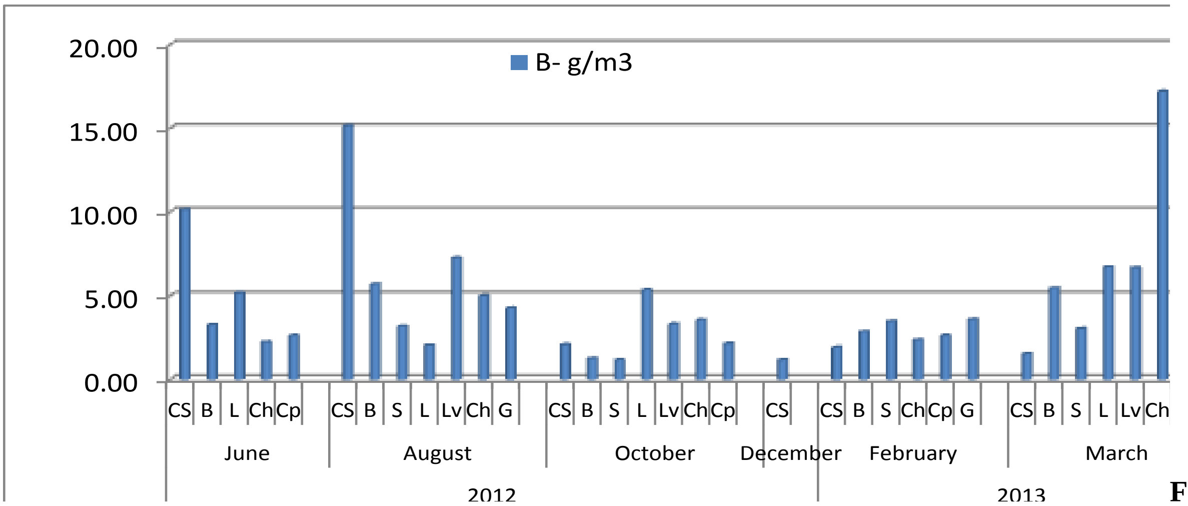


Fig.4 Phytoplankton biomass (B-g/m^3) in the lower sector of Costesti-Stinca reservoir* (C-S) and Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, Cp-Cislita-Prut, G-Giurgiulesti) in 2012-2013

Note: * - in the figure the August biomass was diminished twice.

Of the total of 131 identified species, 74 are indicators of the degree of water saprobity. Among them 58% are β-mesosaprobic species, 9,5%- α-mesosaprobic species, and 13,5% are β-o and o-β saprobic species (Fig.5).

Values of saprobic index, accordingly to the indicatives species from the phytoplankton composition, ranged from 1.44 to 3.17, the water quality being better in the middle sector and worse- in the lower sector of the river. A better quality had the water in the lower sector of Costesti-Stinca reservoir (1.72-1.78).

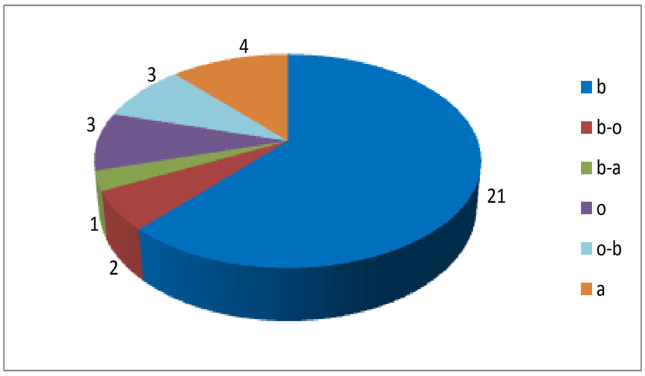


Fig. 5 Distribution of indicative species of phytoplankton from the Prut River accordingly to saprobity zone

There were established considerable differences between the values of phytoplankton primary production and destruction of organic matter in different sectors of the Prut River. In June of 2012 the highest intensity of production processes was registered in the lower sector of the Costesti-Stinca reservoir (5.51 gO_2/m^{-2} 24h) and in the middle sector of the river, at the stations Braniste and Leuseni, where the values of primary production were situated in the range 2.25-4.28 gO_2/m^{-2} 24h (Fig. 6).

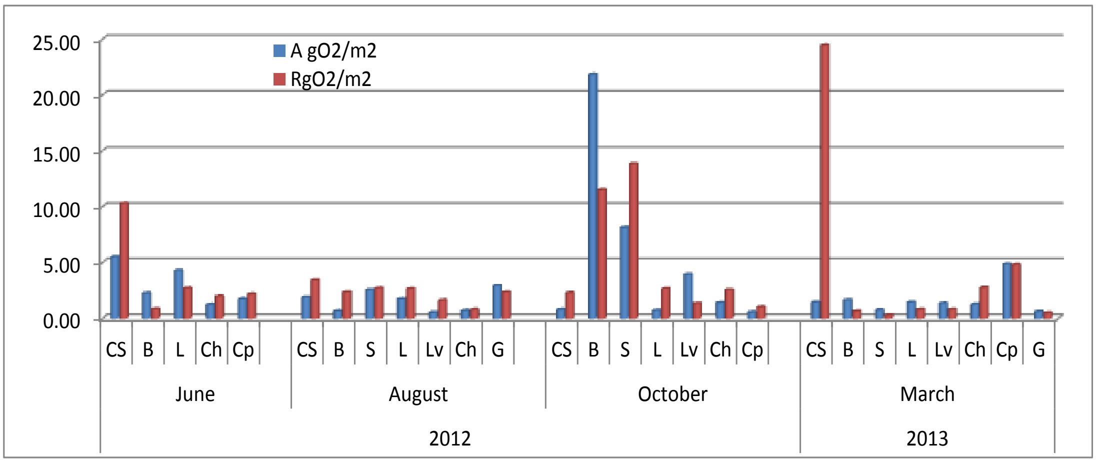


Fig. 6 Dynamics of phytoplankton primary production (A- gO_2/m^{-2} 24h) and destruction of organic matter (R- gO_2/m^{-2} 24h) in Costesti-Stinca reservoir, next to the dam (CS) and the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, Ch-Cahul, Cp-Cislita-Prut, G-Giurgiulesti) in 2012-2013

Note: the values of destruction of organic matter were diminished by four times.

In August of 2012 the higher values of primary production were recorded in the lower sector of the Costesti-Stinca reservoir (1.88 gO_2/m^{-2} 24h), at the stations Sculeni (2.53 gO_2/m^{-2} 24h) and Leuseni (1.73 gO_2/m^{-2} 24h) from the middle sector of the Prut River and at the Cislita-Prut station (2.93 gO_2/m^{-2} 24h) from its lower part. Spatial fluctuations of primary production values in the river are accompanied by the fluctuations of phytoplankton biomass, successions of the plankton algae communities, modifications of nutrient concentrations and oscillations of water transparency, determined by the content of suspended substances.

The values of destruction of organic matter evidently exceeded the values of phytoplankton primary production both in lower sector of Costesti-Stinca reservoir and in all three river sectors. Thus, in June, the values of destruction of organic matter varied in the range from 2.46 to 8.56 gO_2/m^{-2} 24h in the Prut River, the highest figure being registered at Leuseni station (Fig.6).

In August of 2012 the values of destruction of organic matter oscillated from 0.97 to 5.86 gO_2/m^{-2} 24h, the highest figure being encountered at Cislita-Prut station. This parameter had much higher values in the lower sector of Costesti-Stinca reservoir both in June (13.73 gO_2/m^{-2} 24h) and August (41.18 gO_2/m^{-2} 24h), showing a direct correlation with values of phytoplankton primary production and biomass.

The A/R ratio less than 1 reflects the negative balance of formation of organic substances in the river and proves a high content of allochthonous substances.

In the lower part of the Costesti-Stinca reservoir, concomitant with the diminishing of water transparency, in autumn time the values of phytoplankton primary production decreased evidently in comparison with the values recorded in summer time, being equal to 0.77 gO_2/m^{-2} 24h. Also, the values of destruction of organic matter were lower – 9.14 gO_2/m^{-2} 24h.

The water transparency in the middle sector of the Prut River was of 150-200 cm, being much higher than in the lower sector of river, where it not exceeded 20 cm. The values of phytoplankton primary production and destruction of organic matter in the Prut River in autumn season were higher than in summer one. As in summer period, there were recorded important differences between the values of phytoplankton primary production and destruction of organic matter in autumn in different sectors of the Prut River. The highest intensity of production processes in autumn season was registered in the middle sector of Prut River, its values ranging from 8.13 to 21.8 g O_2/m^{-2} 24h. The values of destruction of organic matter were within 46.01-55.32 gO_2/m^{-2} 24h (Fig. 6).

In the lower sector of the Prut River the values of phytoplankton primary production were mush lower – from 0.55 to 3.93 gO_2/m^{-2} 24h, the highest value being recorded at Leova station. The values of destruction of organic matter exceeded much more the values of phytoplankton production and were ranged between 4.01-10.63 gO_2/m^{-2} 24h, the highest figures being recorded at Leuseni and Cahul stations (Fig.6).

In the spring of 2013 the values of phytoplankton primary production in the Prut River were lower, being placed in the diapason 0.6-4.85 gO_2/m^{-2} 24h, the highest value being registered at Cislita-Prut, and the lowest – at Giurgiulesti stations. The values of destruction of organic matter exceeded evidently those of phytoplankton production, being equal to 1.13 – 19.2 gO_2/m^{-2} 24h, the highest value being observed at Cahul and Cislita-Prut, and the lowest – at Sculeni and Giurgiulesti stations (Fig.6). In Costesti-Stinca reservoir the production processes developed an intensity of 1.45 gO_2/m^{-2} 24h, but the destruction processes- of 97.81 g O_2/m^{-2} 24h.

The A/R ratio less than 1 was characteristic for all investigated stations on the Prut River and Costesti-Stinca reservoir, this fact reflecting the negative balance of formation of organic compounds in the river and a high content of alochtonic substances.

Zooplankton. There were identified 74 species and varieties from 3 taxonomic groups (*Rotatoria, Copepoda, Cladocera*), of which most species (67% of total zooplankton) belongs to *Rotatoria* (*Brachionus calyciflorus, Brachionus angularis, Brachionus leydijii Filinia longiseta, Keratella quadrata, Notholca squamula, Lecane luna, Notholca squamula, Ascomorpha sp., Polyathra euryptera etc.*); 29.7% refers to *Copepoda* (*Eudiaptomus gracilis, Mesocyclops leuckarti, Mesocyclops crassus, Macrocyclops albidus, Eucyclops sp., Paracamptus sp., etc.)* and 10.8% - to *Cladocera (Bosmina longirostris, Daphnia longispina, Scaridium sp., Moina sp., Alona affinis, etc.).* Despite of taxonomic domination of *Rotatoria*, only 2 species (*Keratella quadrata, Brachionus angularis*) were registered in each investigated sample.

From quantitative point of view, zooplankton of the Prut River was scarce during investigation period. Its biomass and density were higher at Braniste and Giurgiulesti stations (Table 3).

Table 3 Density (N) and biomass (B) of main groups of zooplankton in the Prut River, June 2012 – April 2013

Station	*Rotatoria*		*Copepoda*		*Cladocera*		Total	
	N, ind/m^3	B, mg/m^3	N, ind/m^3	B, mg/m^3	N, ind/m^3	B, mg/m^3	N, ind/m^3	B, mg/m^3
May 2012								
Braniste	0	0.000	1000	10.600	0	0.000	1000	10.600
Sculeni	0	0.000	700	6.450	0	0.000	700	6.450
Leuseni	200	0.160	800	4.600	0	0.000	1000	4.760
Cahul	500	0.340	200	0.400	0	0.000	700	0.740
Cislita	600	0.300	200	0.400	0	0.000	800	0.700
Giurgiulesti	200	0.400	400	6.800	600	3.000	1200	10.200
	August 2012							
Costeşti-Stinca	2400	0.480	5800	31.800	0	0.000	820	32.28
Braniste	300	0.060	400	2.300	100	3.000	800	5.360
Sculeni	200	0.040	300	4.250	0	0.000	500	4.290
Leuseni	200	0.080	200	2.700	100	0.500	500	3.280
Leova	100	0.200	600	7.300	0	0.000	700	7.500
Cahul	100	0.04	300	2.100	0	0.000	400	2.140
Cislita	200	0.040	100	0.200	100	3.000	400	3.240
Giurgiulesti	2000	4.000	2500	67.400	6500	195.00	11000	266.400
October 2012								
Costeşti-Stinca	500	0.100	600	1.200	200	3.400	1300	4.700
Braniste	200	0.080	500	1.000	100	10.00	800	11.080
Sculeni	0	0.000	200	3.400	100	1.700	300	5.100
Leuseni	300	0.120	400	2.900	0	0.000	700	3.020
Leova	0	0.000	100	1.700	200	3.400	300	5.100
Cahul	100	0.04	400	3.100	100	2.500	600	5.640
Cislita	0	0.000	400	2.400	200	6.000	600	8.400
Giurgiulesti	200	0.08	100	0.200	400	6.800	700	7.080
February 2013								
Costeşti-Stinca	0	0.000	0	0.000	0	0.000	0	0.000
Braniste	0	0.000	50	3.100	0	0.000	50	3.100
Sculeni	50	0.010	100	0.200	0	0.000	150	0.210
Cahul	100	0.140	0	0.000	0	0.000	100	0.140
Cislita	200	0.320	0	0.000	0	0.000	200	0.320
Giurgiulesti	1300	2.510	0	0.000	0	0.000	1300	2.510
March 2013								
Costeşti-Stinca	250	1.710	200	0.400	0	0.000	450	2.110
Braniste	6500	21.510	1100	32.200	300	6.750	7900	60.460
Sculeni	1800	5.350	550	7.100	0	0.000	2350	12.450

Leuseni	300	0.890	300	8.400	100	1.700	700	10.990
Leova	600	0.140	900	2.700	0	0.000	1500	2.840
Cahul	600	0.370	600	3.900	0	0.000	1200	4.270
Cislita	2000	2.260	1200	18.050	300	5.100	3500	25.410
Giurgiulesti	700	0.330	1100	6.050	0	0.000	1800	6.380
April 2013								
Costeşti-Stinca	1800	0.800	100	0.200	0	0	1900	1.000
Braniste	1200	2.790	1100	18.100	0	0	2300	20.890
Sculeni	600	0.210	600	4.800	0	0	1200	5.010
Leuseni	100	0.040	1800	12.750	0	0	1900	12.790
Leova	100	0.030	900	3.850	0	0	1000	3.880
Cahul	500	1.110	200	2.000	0	0	700	3.110
Cislita	500	0.640	200	4.500	0	0	700	5.140
Giurgiulesti	3900	8.120	11200	80.050	0	0	15100	88.170

In the Costesti-Stinca reservoir the taxonomic composition of zooplankton in winter period differs from those of vegetation period. For instance, among *Rotatoria* are dominant *Asplanchna sp.* and *Filinia longiseta,* among *Copepoda - Nauplii Calanoida, Copepodit Calanoida, Metadiaptomus asiaticus,* and *Acanthocyclops gigas,* among *Cladocera* - *Bosmina longirostris* and *Daphnia cucullata.*

The indicative species of saprobity zone make up to 95% of total number of species identified in the Prut River. Their majority (38%) belongs to the group of species characteristic for β-saprobic zone. As average for investigated stations, the saprobity index varied in a narrow diapason -1.50 – 2.50, which correspond to the β-mesosaprobic zone.

Benthic macroinvertebrates. Monitoring of freshwater ecosystems mandatory includes macrozoobenthic animals as object of study; this group of animals meets several requirements for indicator organisms: wide distribution, enough high density, relatively large size of the body, combination of populating certain biotopes and a certain degree of mobility.

Benthic invertebrates were sampled using standardized methods with the Petersen grab, area of capture - 250 cm^2 or 1/40 m^2. For qualitative samples it has been used a dredge for different substrates including macrophytes. For the preservation of the samples it has been used 4% formaldehyde and 70% alcohol.

The large *Bivalvia* molluscs were identified in the field, weighted and left in the found ecosystem according to the recommendations of the AQEM. All the other organisms were sorted as much as possible by groups or species afterwards in the laboratory and identified with using of identification keys (Jadin, 1952; Mordukhai-Boltovsky, 1968, 1969, 1972; Kutikova, Starobogatov, 1977; Tsalolikhin, 1994, 1995, 1997, 2000, 2001, 2004).

The identification of species is carried out by use of stereomicroscope МБС-9 and upright microscope *Jenaval* (Zeiss). Last months, the stereomicroscope SteREO *Discovery.V8 (*Zeiss*)* and upright microscope *Axio Imager A.2 (*Zeiss), which were purchased in the frame of this project, are used.

The biomass of benthic organisms was determined via their weighting, being previously dried up on a paper filter till the disappearance of wet spots. The analytical balance ABS 80-4 Kern, with the readout of 0.1 mg was used. The density and biomass of organisms were recalculated to ind./m^2 and, correspondingly, to g/m^2.

During May 2012-March 2013, using different sampling methods, e.g. dredge and Petersen grab, it has been collected and identified 107 invertebrate taxa (Table 4).

The number of species at each sampling site differed significantly. This difference may occur because of various ecological conditions: hydromorphological, hydrochemical, type of substrate, and level of anthropogenic load.

According to the average values, the diversity of benthic invertebrates revealed an evident diminution alongside the Prut River (Fig.7

Table 4 List of benthic invertebrate taxa from the Prut River, 2012-2013

	Taxonomic group	Station						
		Braniste	Sculeni	Leuseni	Leova	Cahul	Cislita-Prut	Giurgiulesti
	Nematomorpha							
●	*Gordius sp.*	+						
●	*Nematoda*	+	+		+	+		+
	Gastropoda							
●	*Lymnaea ovata*	+	+		+			
●	*Lymnaea stagnalis*	+						
●	*Galba truncatula*	r						
●	*Physa fontinalis*	+						
●	*Physa acuta*	+					r	
●	*Acroloxus lacustris*	+						
●	*Theodoxus danubialis*					+		
●	*Theodoxus fluviatilis*	r	+		+		+	
●	*Viviparus viviparus*						+	
●	*Viviparus contectus*				r	r		
●	*Valvata piscinalis*	+						
●	*Bithynia tentaculata*	+						
●	*Lithoglyphus naticoides*	+	+		+	+		r
●	*Fagotia esperi*	+						
●	*Fagotia acicularis*	+	+	+				
	Bivalvia							
●	*Anodonta piscinalis*					+		
●	*Sinanodonta woodiana*					+	+	
●	*Unio tumidus*					+	+	
●	*Unio longirostris*					+		
●	*Crassiana crassa*			+		+		
●	*Pisidium amnicum*	+	+					
●	*Pisidium casertanum*	+						
●	*Pisidium moitesserianum*	+						
●	*Dreissena polymorpha*	r	r		r	+		
●	*Dreissena bugensis*	+						
●	*Corbicula fluminea*						+	
	Oligochaeta							
●	*Branchiura sowerbyi*	+				+		+
●	*Lumbriculidae Gen sp*					+		
●	*Lumbriculus variegatus*	+						+
●	*Nais spec. none*	+	+		+			
●	*Stylaria lacustris*	+	+					
●	*Ophidonais serpentina*	+		+	+			
●	*Tubifex sp.div*	+	+	+	+	+	+	+
●	*Tubifex tubifex*		+					
	Crustacea							
	Mysidacea							

●	*Limnomysis benedeni*	+		+	+	+	+	
●	*Paramysis lacustris*	+	+	+	+	+	+	
	Amphipoda							
●	*Dikerogammarus haemobaphes*	+	+	+	+		+	
●	*Dikerogammarus villosus*		+		+			
●	*Gammarus sp*	+						
●	*Chaetogammarus warpachowskyi*	+	+	+	+			
●	*Chaetogammarus ischnus*	+	+	+	+			
●	*Chaetogammarus sp*						+	
●	*Gmelina sp*		+					
●	*Iphigenella andrussowi*	+	+					
●	*Iphigenella acanthopoda*		+					
●	*Corophium curvispinum*				+	+		
●	*Corophium nobile*			+	+		+	
●	*Corophium robustrum*			+			+	
●	*Corophium sp*				+			
●	*Corophium chelicorne*			+				
	Ephemeroptera							
●	*Caenis sp.*	+						
●	*Caenis horaria*	+						
●	*Cloeon dipterum*	+						
●	*Palingenia longicauda*	+	+	+	+			
●	*Heptagenia coerulans*		+		+		+	
●	*Heptagenia flava*				+			
●	*Potamanthus luteus*	+						
●	*Baetis sp*	+	+	+	+			
●	*Baetis rhodani*	+					+	
	Odonata							
●	*Coenagrionidae (Erythromma sp.)*	+						
●	*Platycnemis pennipes*		+					
●	*Agrion splendes Harris*	+	+	+				
●	*Agrion virgo*	+						
●	*Gomphus vulgatisimus*		+					
●	*Gomphus (Stylurus) flavipes*		+				+	
	Heteroptera							
●	*Plea minutissima*	+				+	+	
●	*Mesovelia sp*	+						
●	*Nepa cinerea*	+						
●	*Aphelocheirus aestivalis*	+						
●	*Sigara falleni*						+	
	Coleoptera							
●	*Haliplidae*	+						
●	*Dytiscidae*	+						
●	***Colembolla***		+			+	+	
	Trichoptera							
●	*Triaenodes bicolor*				+			
●	*Hidroptila sp.*	+				+		
●	*Hydroptila tineoides*	+	+					

●	*Ecnomus tenellus*	+	+				+	
●	*Polycentropidae*	+	+					
●	*Hydropsyche ornatula*	+		+	+		+	
●	*Limnephilidae*	+						
●	*Leptoceridae*	+						
●	*Mystacides sp.*	+						
●	*Agraylea multipunctata*	+						
	Diptera							
	Chironomidae							
●	*Chironomus plumosus*	+				+		+
●	*Chironomus gr. tummi*				+			
●	*Chironomus silvestris*	+						
●	*Chironomus sp.div none*	+	+		+	+	+	
●	*Chironomini Gen. sp.*		+	+				
●	*Orthocladius sp.*	+	+	+	+	+	+	+
●	*Diamesa insignipes*	+						
●	*Diamesa sp*				+			
●	*Prodiamesa sp*	+						
●	*Tanypus vilipennis*	+	+	+			+	
●	*Ablabesmyia gr. monilis*		+					
●	*Ablabesmyia gr. lentiginosa*		+					
●	***Ceratopogonidae***	+					+	
●	*Bezzia sp*		+					
●	***Culicidae***		+	+		+		
●	*Culicoides setosinervis*		+					
●	***Simuliidae***	+		+	+			
●	***Tabanidae***	+	+		+			
●	*Tipulidae*					+		
●	*Dolichopodidae*					+		
●	***Lepidoptera***							
●	***Ptychoptera***		+					
●	Megaloptera(Sialidae)	+						
	Total	**65**	**40**	**21**	**28**	**24**	**24**	**6**

*r – shells

The density is most rich at Braniste station – there were registered 21limnophylic species (33%), 26 limnophylic and reophylic species (41%) and only 16 reophylic species (25%). This phenomenon demonstrates the influence of hydrological conditions and flow from Costesti-Stinca reservoir on the diversity of benthic organisms at the given station. The density and biomass of benthic organisms have the lowest values at Giurgiulesti station (Fig.7).

It is important to mention that at Braniste station are registered species, which are characteristic for clean zones of aquatic ecosystems – 7 species of *Ephemeroptera* and 9 species of *Trichoptera.* Also, at this station for the first time was registered a very rare species – bivalve mollusc *Pisidium moitesserianum.*

With reference to the samples, which were collected with the Petersen grab, the total biomass varied from 0.006 g/m^2 to 2971.764g/ m^2, the biomass without molluscs – from 0.006 g/m^2 to 58.2995 g/m^2, and the density of total zoobenthos – from 6 ind./m^2 to 39000 ind./m^2 (Table 5).

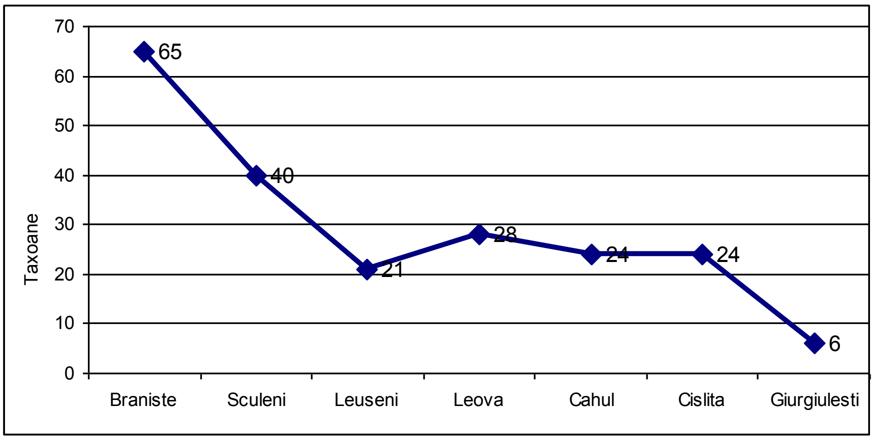


Fig.7 Taxonomic diversity of benthic invertebrates in the Prut River, 2012-2013

Table 5 Density (ind./m^2) and biomass (g/m^2) of zoobenthos from the Prut River, 2012-2013

Station	Zoobenthos without molluscs, ind./m^2	Zoobenthos without molluscs, g/m^2	Total zoobenthos, ind./m^2	Total zoobenthos, g/m^2
June 2012				
Braniste	15922	19.379	16562	44.819
Leova	884	0.216	1364	1.056
Cahul	346	0.2637	346	0.2627
	August 2012			
Braniste	17080	6.404	17720	66.724
Sculeni	6360	4.204	6400	4.244
	October 2012			
Braniste	18775	15.2973	19895	85.1053
Sculeni	16174	58.2995	17854	240.9915
Leuseni	8528	12.4305	8568	1247.711
Leova	9723	7.748	9723	7.748
Cahul	23226	19.0748	23226	19.0748
Cislita-Prut	1137	14.476	1337	2971.844
Giurgiulesti	4080	4.008	4080	4.008
	February 2013			
Braniste	38760	34	39000	89.12
Sculeni	8179	22.631	10073	594.541
Cahul	1480	0.16	1480	0.16
Cislita-Prut	137	0.4865	137	0.4865
Giurgiulesti	40	0.04	40	0.04
	March 2013			
Braniste	22648	13.811	23048	44.291
Sculeni	5604	5.638	6244	68.998
Leuseni	10482	11.163	10522	578.135
Leova	7792	2.347	7872	13.587
Cahul	4402	1.791	4402	1.791
Cislita-Prut	6	0.006	6	0.006

There are a range of methods for determination of water quality, or of assessment of aquaric ecosystem state in dependence of state and density of benthic invertebrates. Thus, in line with the oligochaete index of Goodnight & Whitley (1961), the water of Prut River is characterized as polluted, but according to the Biological Monitoring Working Party index (BMWP) - from moderately polluted to critically polluted.

The saprobity zones calculated based on macrozoobenthos from the lower sector of the Prut River varied within β-mesosaprobic and α- -mesosaprobic and the water quality class - within the moderately polluted and critically polluted.

D.1.2 Qualitative and quantitative characterization of fish populations, aiming at preserving their biodiversity

The ichthyologic materials were collected in summer-autumn of 2012 in the bed of Prut River and in autumn-winter- in the Costesti-Stinca reservoir, using stationary nets (the mesh size used in the nets varied from 15 mm x 15 mm to 80 mm x 80 mm, in dependence of collection aim) and trammel for juvenile (lenght of trammel is 6 m, the mesh size is 5 mm) (Fig. 8).

Fig. 8 Collection of fish samples, 2012

The majority of captured individuals were returned alive to the water. A small number was fixed in 4% formalin solution for laboratory study. Ichthyologic material analysis was performed by using classical ecological and ichthyologic methods (Banarescu, 1964; Kottelat, Freyhof, 2007; Navodaru et al., 2008).

As result of ichthyologic investigations carried out in 2012 in the Prut River ecosystem, it was established the presence of an ichthyologic assemblage, composed by 39 species of fish, which were assigned to 9 families and 6 orders: order *Clupeiformes*, family *Clupeidae* (1 species); order *Esociformes*, family *Esocidae* (1 species); order *Cypriniformes,* family *Cyprinidae* (22 species), family *Cobitidae* (2 species); order *Siluriformes,* family *Siluridae* (1 species), order *Gasterosteiformes*, family *Gasterosteidae* (2 species) order *Perciformes,* family *Percidae* (4 species), family *Gobiidae* (4 species), family *Centrarchidae* (1 species).

To highlight the comparative aspect of the Prut River ichthyofauna and ichthyofaunictic successions in last decades, it was made the analysis of existing literature in the field, starting with data of such scientists as Grimaliskii V. (1970), Popa L. (1976; 1977), Popa L., Frunza M., and Panas E. (1985), Dolghii V. (1993), Usatii M. (2004), Davideanu Gr. (2008) and recent data (Table 6).

In Prut riverbed the following species registered the highest values of relative abundance: Alburnus alburnus (Linnaeus, 1758) -14.5%, *Blicca bjoerkna* (Linnaeus, 1758) – 6.38%, *Silurus glanis* (Linnaeus,1758) – 4.42%, *Aspius aspius* (Linnaeus, 1758) – 6.14%, *Hypophthalmichthys molitrix* (Valenciennes, 1844) – 4.67%, *Neogobius fluviatilis* (Pallas, 1814) – 6.88%, *Rhodeus amarus* (Bloch, 1782) – 5.16%, *Gymnocephalus cernuus* (Linnaeus, 1758) – 5.16% etc. It was reported a semnificative abundence of *Alosa tanaica* (Grimm, 1901) – 3.44%, *Leuciscus idus* (Linnaeus, 1758) – 2.21% and *Pelecus cultratus* (Linnaeus, 1758) – 2.21%, which are enough rare in other natural aquatic ecosystems on the territory of Moldova.

The population density of some ichthyophague fish species of the Prut River as *Aspius aspius*, *Silurus glanis* and *Sander lucioperca* (Linnaeus, 1758) reached a satisfactory level (as response to prey abundance - especially fish with short life cycle), but young groups dominate the age structure, which shows a significant illegal fishing pressing.

Table 6 Ichthyofauna diversity in the Prut River in 2012 and its quantitative indices

No	Fish species	Prut River bed 2012		Costesti-Stinca lake 2012		Beleu and Manta lakes 2012		Prut River basin Popa L.*	Prut River basin Usatîi M.	Prut River Davidea-nu et.al.
		Numeric abundance	Relative abundance %	Numeric abundance	Relative abundance %	Numeric abundance	Relative abundance %	Species diversity 1960-1963 1968-1974	Species diversity 1996-1997	Species diversity 2008
Ord. Petromizontiformes Fam. Petromyzontidae										
1	***Eudontomyzon mariae*** (Berg, 1931) Ukrainian brook lamprey	-	-	-	-	-	-	+	-	-
Ord. Acipenseriformes Fam. Acipenseridae										
2	***Acipenser ruthenus*** Linnaeus,1758, Sterlet	-	-	-	-	-	-	+	-	-
3	***Acipenser nudiventris*** Lovetsky, 1828 Ship sturgeon	-	-	-	-	-	-	+	-	-
Ord. Clupeiformes Fam. Clupeidae										
4	***Alosa tanaica*** (Grimm,1901) Azov shad	14	3.44	-	-	45	10.92	-	+	-
Ord. Salmoniformes Fam. Salmonidae										
5	***Hucho hucho*** (Linnaeus,1758) Huchen	-	-	-	-	-	-	+	-	-
6	***Salmo trutta fario*** Linnaeus, 1758 Brown trout	-	-	-	-	-	-	+	-	-
7	***Oncorhynchus mykiss*** (Walbaum,1792) Rainbow trout	-	-	-	-	-	-	+	-	-
Ord. Esociformes Fam. Esocidae										
8	***Esox lucius*** Linnaeus,1758 Northern pike	-	-	-	-	1	0.24	+	+	+
Fam. Umbridae										
9	***Umbra krameri*** Walbaum,1792 Mudminnow	-	-	-	-	-	-	+	-	-
Ord. Cypriniformes Fam. Cyprinidae										
10	***Cyprinus carpio carpio*** Linnaeus, 1758 Common carp	7	1.72	3	1.41	13	3.16	+	+	+
11	***Carassius carassius*** (Linnaeus, 1758) Crucian carp	-	-	-	-	-	-	+	-	-
12	***Carassius gibelio*** (Bloch, 1782) Prussian carp	24	5.9	5	2.35	57	13.83	+	+	+
13	***Barbus barbus*** (Linnaeus,1758) Barbel	1	0.25	-	-	-	-	+	-	+
14	***Barbus borysthenicus*** Dybowski, 1862 = ***Barbus barbus*** (Linnaeus,1758) Barbel	-	-	-	-	-	-	+	-	-
15	***Barbus petenyi*** Heckel, 1852 Romanian barbel	-	-	-	-	-	-	+	-	-
16	***Tinca tinca*** (Linnaeus, 1758) Tench	-	-	-	-	-	-	+	-	-
17	***Chondrostoma nasus*** (Linnaeus, 1758) Common nase	2	0.49	-	-	-	-	+	-	+
18	***Gobio gobio*** (Linnaeus, 1758) Gudgeon	-	-	-	-	-	-	+	-	+
19	***Romanogobio vladykovi*** (Fang, 1943) Danube whitefin gudgeon	3	0.74	-	-	2	0.49	+	-	+
20	***Romanogobio kesslerii*** (Dybowski, 1862) Kessler's gudgeon	-	-	-	-	5	1.21	+	-	+
21	***Pseudorasbora parva*** (Temminck & Schlegel, 1846) Stone moroko	4	0.98	2	0.94	12	2.91	-	+	+
22	***Abramis brama*** (Linnaeus, 1758) Freshwater bream	12	2.95	19	8.92	6	1.46	+	+	+
23	***Ballerus sapa*** (Pallas, 1814) White-eye bream	15	3.69	7	3.29	4	0.97	+	+	+
24	***Blicca bjoerkna*** (Linnaeus, 1758) White bream	26	6.38	4	1.88	15	3.64	+	+	+
25	***Vimba vimba*** (Linnaeus, 1758) Vimba bream	2	0.49	9	4.23	1	0.24	+	-	+
26	***Rutilus rutilus*** (Linnaeus, 1758) Roach	7	1.72	15	7.04	19	4.61	+	+	+
27	***Rhodeus amarus*** (Bloch, 1782) Bitterling	21	5.16	3	1.41	14	3.4	+	+	+
28	***Aspius aspius*** (Linnaeus, 1758) Asp	25	6.14	6	2.82	8	1.94	+	+	+
29	***Pelecus cultratus*** (Linnaeus, 1758) Sichel	9	2.21	-	-	4	0.97	+	-	+
30	***Squalius cephalus*** (Linnaeus, 1758) Chub	2	0.49	-	-	1	0.24	+	+	+
31	***Leuciscus idus*** (Linnaeus, 1758) Orfe	9	2.21	-	-	3	0.73	+	+	+
32	***Phoxinus phoxinus*** (Linnaeus, 1758) Eurasian minnow	-	-	-	-	-	-	+	-	-
33	***Leuciscus leuciscus*** (Linnaeus, 1758) Common dace	-	-	-	-	-	-	-	-	-
34	***Scardinius erythrophthalmus*** (Linnaeus, 1758) Rudd	4	0.98	2	0.94	5	1.21	+	+	+

35	***Hypophthalmichthys molitrix*** (Valenciennes, 1844) Silver carp	19	4.67	11	5.16	16	3.88	+	+	-
36	***Hypophthalmichthys nobilis*** (Richardson, 1845) Bighead carp	2	0.49	8	3.76	2	0.49	-	-	-
37	***Ctenopharyngodon idella*** (Valenciennes, 1844) Grass carp	4	0.98	9	4.23	3	0.73	-	-	-
38	***Leucaspius delineatus*** (Heckel,1843) Belica	7	1.72	-		12	2.91	+	+	+
39	***Alburnus alburnus*** (Linnaeus, 1758) Bleak	59	14.5	42	19.72	37	8.98	+	+	+
40	***Alburnoides bipunctatus*** (Bloch, 1782) Schneider	-	-	-	-	-	-	+	-	+
	Fam. Balitoridae									
41	***Barbatula barbatula***(Linnaeus, 1758) Stone loach	-	-	-	-	-	-	+	-	-
	Fam. Cobitidae									
42	***Cobitis taenia*** Linnaeus,1758 Spined loach	2	0.49	9	4.23	5	1.21	+	-	+
43	***Cobitis elongatoides*** Bacescu et Maier, 1969 Danubian spined loach	7	1.72	-	-	1	0.24	-	-	+
44	***Sabanejewia aurata aurata*** (De Filippi, 1863) Golden spined loach	-	-	-	-	-	-	+	-	+
45	***Misgurnus fossilis*** (Linnaeus,1758) Weatherfish	-	-	-	-	-	-	+	-	+
	Ord. Siluriformes Fam. Siluridae									
46	***Silurus glanis*** Linnaeus,1758 Wels catfish	18	4.42	2	0.94	17	4.13	+	+	+
	Ord. Gadiformes Fam. Lotidae									
47	***Lota lota*** (Linnaeus,1758) Burbot	-	-	-	-	-	-	+	-	+
	Ord. Gasterosteiformes Fam. Gasterosteidae									
48	***Pungitius platygaster*** (Kessler,1859) Southern ninespine stickleback	-	-	3	1.41	-	-	+	-	-
49	***Gasterosteus aculeatus aculeatus*** Linnaeus,1758 Three-spined stickleback	-	-	-	-	3	0.73	-	-	-
	Ord. Sygnathiformes Fam. Sygnathidae									
50	***Syngnathus abaster*** Risso, 1827 Black-striped pipefish	-	-	-	-	-	-	+	-	-
	Ord. Perciformes Fam. Percidae									
51	***Perca fluviatilis*** Linnaeus,1758 European perch	2	0.49	16	7.51	4	0.97	+	+	+
52	***Sander lucioperca*** (Linnaeus, 1758) Pike-perch	15	3.69	12	5.63	9	2.18	+	+	+
53	***Gymnocephalus cernuus*** (Linnaeus, 1758) Ruffe	21	5.16	5	2.35	21	5.1	+	+	+
54	***Gymnocephalus schraetser*** (Linnaeus, 1758) Yellow pope	-	-	-	-	-	-	+	-	+
55	***Gymnocephalus baloni*** Holcík & Hensel, 1974 Danube ruffe	15	3.69	-	-	48	11.65	-	-	-
56	***Zingel streber*** (Siebold, 1863) Streber	-	-	-	-	-	-	+	-	+
57	***Zingel zingel*** (Linnaeus, 1766) Zingel	-	-	-	-	-	-	+	-	-
	Fam. Gobiidae									
58	***Neogobius kessleri*** (Guenther, 1861) Bighead goby	5	1.23	-	-	4	0.97	-	-	+
59	***Neogobius gymnotrachelus*** (Kessler, 1857) Racer goby	6	1.47	-	-	2	0.49	-	-	+
60	***Neogobius melanostomus*** (Pallas, 1814) Round goby	-	-	-	-	-	-	-	-	+
61	***Proterorhinus semilunaris*** (Heckel, 1837) Western tubenose goby	8	1.97	-	-	-	-	+	+	+
62	***Neogobius fluviatilis*** (Pallas, 1814) Monkey goby	28	6.88	21	-	9	2.18	+	-	+
	Fam. Centrarchidae									
63	***Lepomis gibbosus*** (Linnaeus, 1758) Pumpkinseed	2	0.49	-	-	4	0.97	+	+	+
	Fam. Odontobutidae									
64	***Perccottus glenii*** Dybowski, 1877 Chinese sleeper	-	-	-	-	-	-	-	-	+
	Ord. Scorpaeniformes Fam. Cottidae									
65	***Cottus gobio*** Linnaeus, 1758 Bullhead	-	-	-	-	-	-	+	-	-
66	***Cottus poecilopus*** Heckel, 1837 Alpine bullhead	-	-	-	-	-	-	+	-	-
	Total (specii)	**35**		**22**		**35**		**54**	**23**	**41**

* Some species names, which were described in 1974, were conformed to the new nomenclature.

The species structure of ichthyocenoses of the Lake Beleu and Lake Manta largely depends on the hydrological regime, temperature and solved gas gradients, and may change significantly during the year. In 2012, due to prolonged drought, the ichthyocenose structure became dominated by such species as *Carassius gibelio* (Bloch, 1782) -13.83%, *Alburnus alburnus* -

8.98%, and *Gymnocephalus baloni* (Holcík & Hensel, 1974) – 11.65%. In the spring of 2012 there were significant reproductive migrations of *Alosa tanaica*, which influenced the relative abundance values (10.92%).

Also, there has occurred a significant increase of the share of economically valuable native species (*Hypophthalmichthys molitrix* (Valenciennes, 1844), *Hypophthalmichthys nobilis* (Richardson, 1845), *Ctenopharyngodon idella* (Valenciennes, 1844)) in the Prut ecosystems as result of major natural disasters in the summer of 2010.

Despite emphatic anthropogenic pressing on fish resources in the lower sector of the Prut River, their quantitative values are maintained due to fish active migration from the Danube River, accidental penetration or intentional stocking by culture species.

In 2012, there were established an ichthyofauna diversity of 23 species in the Costesti-Stinca reservoir. A favorable growing rate was put in evidence at all species, this fact indicating the existence of optimal nutrition conditions.

The analysis of mathematic model of length and weight growing of *Ctenopharyngodon idella* (Valenciennes, 1844) in the Costesti-Stinca reservoir is presented in Table 7.

Table 7 Empirical metric and gravimetric values and growing parameters of grass carp *(Ctenopharyngodon idella* (Valenciennes, 1844)) in the Costesti-Stinca reservoir

t (x)	$\bar{l}(t)$	-ln(1-$\bar{l}(t)$/l∞) (y)	$\overline{w}(t)$	-ln(1-$\overline{w}(t)$/W∞) (y)	lg$\overline{w}(t)$=a+blg$\bar{l}(t)$	
					lg$\bar{l}(t)$, (x)	lg$\overline{w}(t)$, (y)
1	14.0	0.097	70	0.001	1.146	1.845
2	36.5	0.278	940	0.021	1.562	2.973
3	43.5	0.342	1900	0.043	1.638	3.278
4	56.0	0.467	3280	0.075	1.748	3.515
5	62.0	0.533	4700	0.110	1.79	3.672
6	71.0	0.641	6380	0.152	1.851	3.804
S_x=21 S_{xx}=91 S_y=2.361 S_{yy}=1.11 S_{xy}=10.06		a=0.033±0.028 b=0.102±0.007 t_0=-0.321 k=0.102±0.007 l∞=150	S_x=21 S_{xx}=91 S_y=0.404 S_{yy}=0.043 S_{xy}=1.944	a=-0.038±0.008 b=0.030±0.002 t_0=-0.321 k=0.030±0.002 W∞=45000	S_x=9.738 S_{xx}=16.135 S_y=19.089 S_{yy}=63.316 S_{xy}=31.903	a=-1.367±0.095 b=2.802±0.156

Two years old grass carp reaches in the Costesti-Stinca reservoir a mean length of 36.5 cm and a mean weight of 940 g, three year old- 43.5 cm and 1900 g, correspondingly, four years old- 56.0 cm and 3280 g, five years old- 62.0 cm and 4700 g, and six years old – 71.0 cm and 6380 g.

The analysis of relationship between length and weight gave a value of *b* equal to 2.802, indicating a negative alometry and demonstrating a stagnation of weight growth in comparison with length growth. It is worth to mention that this is common for species with oblong body (Fig.9).

The application of Bertalanffy model in assessment of growing parameters of grass carp revealed an accelerated and uniform character of the weight growing rate, which denotes a high potential of weight gain (Fig.10). The type of length growing is more changeable, but fast, which is common for species with long life cycle and big body size.

For bighead carp from the Costesti-Stinca reservoir the empirical data and Bertalanffy mathematic model of growing is presented in Table 8.

At the age of 2 years the bighead carp reaches an average length of 42.0 cm and an average weight of 136 g, of 3 years 51.5 cm and 2680 g, correspondingly, of 4 years- 58.5 cm and 4050 g, of 5 years – 67.0 cm and 5830 g, and of 6 years – 79.5 cm and 9090 g.

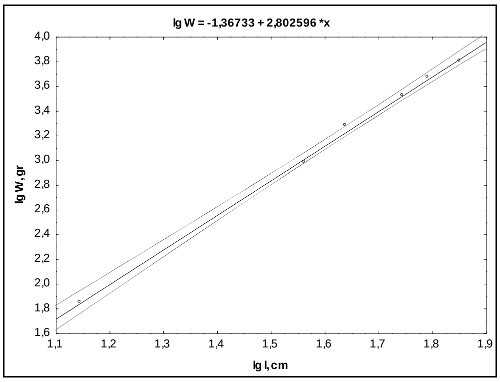


Fig. 9. Relationship between body weight W (g) and body length l (cm) at the crass carp from the Costesti-Stinca reservoir lgW= (-1,367±0,095)+(2,802±0,156)l

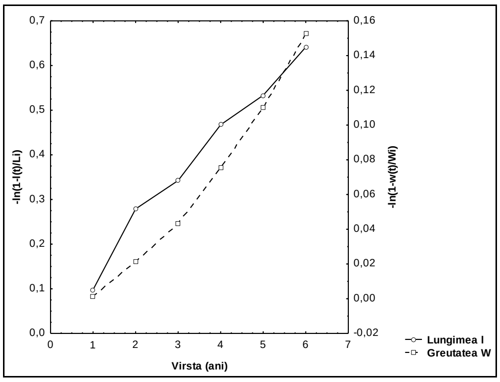


Fig. 10 Assessment of growing parameters of grass carp from the Costesti-Stinca reservoir by Bertalanffy method

Table 8 Empirical metric and gravimetric values and growing parameters of bighead carp *(Hypophthalmichthys nobilis* (Richardson, 1845)) in the Costesti-Stinca reservoir

t (x)	$\overline{l}(t)$	-ln(1- $\overline{l}(t)$/l∞) (y)	$\overline{w}(t)$	-ln(1- $\overline{w}(t)$/W∞) (y)	lg$\overline{w}(t)$=a+blg$\overline{l}(t)$	
					lg$\overline{l}(t)$, (x)	lg$\overline{w}(t)$, (y)
1	16.0	0.112	75	0.002	1.204	1.875
2	42.0	0.328	1360	0.039	1.623	3.133
3	51.5	0.420	2680	0.079	1.711	3.428
4	58.5	0.494	4050	0.122	1.767	3.607
5	67.0	0.591	5830	0.182	1.826	3.76669
6	79.5	0.755	9090	0.300	1.900	3.958
S_x=21 S_{xx}=91 S_y=4.12 S_{yy}=3.53 S_{xy}=17.87	a=0.043±0.030 b=0.116±0.010 t_0=-0.369 k=0.116±0.010 l∞=150		S_x=21 S_{xx}=91 S_y=0.55 S_{yy}=0.08 S_{xy}=2.67	a=-0.055±0.010 b=0.042±0.004 t_0=-0.369 k=0.042±0.004 W∞=35000	S_x=10.032 S_{xx}=17.083 S_y=19.768 S_{yy}=15.670 S_{xy}=33.986	a=-1.764±0.054 b=3.025±0.092

The application of mathematic model of length and weight growing at bighead carp from Costesti-Stinca reservoir demonstrated that the *k* value for length is equal to 0.116, and for weight- to 0.042, being quite high and revealing the tendency of fast growing of this species towards the highest physiologic sizes: l∞=150cm and W∞=35000 g.

The analysis of length-weight correlation in logarithmic form demonstrated a b═3.025, which indicated an isometric growing, the speed of length growing being equivalent to those of weight, and revealed the fact that nutrition and growing conditions are excellent in this ecosystem (Fig.11).

The application of Bertalanffy model for appreciation of growing parameters of bighead carp (Fig.12) put in evidence the exponential character of length growing, which denotes a high growing potential of higher age groups (up to a certain limit).

It is important to note that in the frame of control fishing, which was carried out in October-December of 2012 (the results were not included in the Table 5) by stationary net (mesh size – 20 mm, net length- 50 m), 10 individuals of barbell (*Barbus barbus*) with an average weight of 70.1 g were caught. Probably, the Costesti-Stinca reservoir became a recipient of juveniles of this typical reophile species after the harsh floods in 2010. Moreover, after the 2010 floods it was observed the significant increase of Vimba bream (*Vimba vimba*) density.

Therefore, the natural hazards in lotic ecosystems may provoke potamodrome migrations (active or passive) of fish, inducing the interpenetration of fishery zones characteristic for a river.

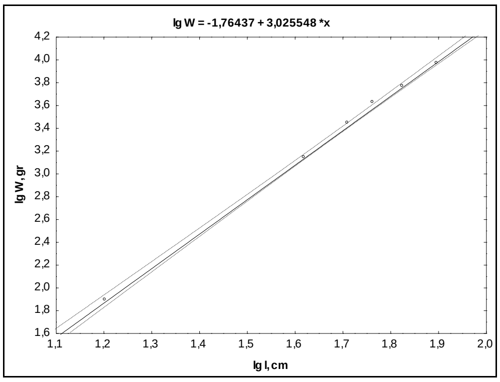


Fig.11 Relationship between body weight W (g) and body length l (cm) at the bighead carp from the Costesti-Stinca reservoir lgW=(-1,764±0,054)+(3,025±0,092)lgl

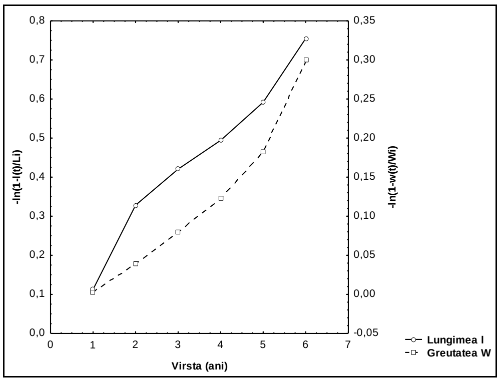


Fig. 12 Assessment of growing parameters of bighead carp from the Costesti-Stinca reservoir by Bertalanffy method

Four field expeditions were made in the spring of 2013. It was found a high level of water, caused by snow melt in the Prut River catchment area and the advancement of water from Danube (for the lower sector of Prut River). This period proved to be favourable to the reproduction of majority of phytophylic and litophylic fish species.

Fig. 13 Lake Beleu during the 2013 spring floods

Fig.14 The high level of water in Costesti-Stinca reservoir in spring of 2013

The relative abundance of the fish species caught in Lake Beleu in April 2013 with stationary nets with mesh size of 20 mm, 30 mm and 40 mm it is presented in Table 9.

Table 9 The relative abundance of the fish captured in Lake Beleu with stationary nets with mesh size of 20 mm, 30 mm and 40 mm (exposure time - 24 hours), April of 2013

Species		Ø 20 mm, l=50 m and h=2 m		Ø 30 mm, l=50 m and h=3 m		Ø 40 mm, l=100 m and h=3 m	
		An(ex)	Ar(%)	An(ex)	Ar(%)	An(ex)	Ar(%)
1.	***Rutilus rutilus*** (Linnaeus, 1758)	27	42.86	3	8.82		-
2.	***Blicca bjoerkna*** (Linnaeus, 1758)	8	12.70	15	44.12	3	18.75
3.	***Alburnus alburnus*** (Linnaeus, 1758)	15	23.81		-		-
4.	***Carassius gibelio*** (Bloch, 1782)	1	1.59	11	32.35	7	43.75
5.	***Hypophthalmichthys molitrix*** (Valenciennes, 1844)	1	1.59		-		-
6.	***Gymnocephalus cernuus*** (Linnaeus, 1758)	1	1.59		-		-
7.	***Gymnocephalus baloni*** Holcík & Hensel, 1974	8	12.70		-		-
8.	***Perca fluviatilis*** Linnaeus,1758	1	1.59		-		-
9.	***Ballerus sapa*** (Pallas, 1814)		-	2	5.88	3	18.75
10.	***Chondrostoma nasus*** (Linnaeus, 1758)		-	1	2.94		-
11.	***Vimba vimba*** (Linnaeus, 1758)		-	1	2.94		-
12.	***Cyprinus carpio carpio*** Linnaeus, 1758		-		-	1	6.25
13.	***Leuciscus idus*** (Linnaeus, 1758)		-		-	1	6.25
14.	***Pelecus cultratus*** (Linnaeus, 1758)		-	1	2.94		-
15.	***Sander lucioperca*** (Linnaeus, 1758)		-		-	1	6.25
16.	***Aspius aspius*** (Linnaeus, 1758)	1	1.59		-		-

Ecosystem of the Lake Beleu and those of the Lake Manta in the spring time turns into a spawning area of a primary importance for the reproduction of phytophylic and litophylic fish species from the lower sector of the Danube and Prut River, which, consequently, requires a more effective protection of this area during prohibition period.

The metric and gravimetric analysis of catchments of *Rutilus rutilus* put in evidence six individuals with an average length of 13.6 cm and an average body mass of 25.0 g, which ovaries were at the IV-V stages of maturation.

It was found that for the Lake Manta also are characteristic individuals of *Rutilus rutilus* with a slow rhythm of growth and early maturation (2 years). Presumably, in the particular habitat conditions of the Lake Beleu and Lake Manta (temperature high alternations, unstable hydrological regime, etc.), some species of euribiontic fishes, e.g. *Carassius gibelio* and *Rutilus rutilus*, have developed some idioadaptive features, which allowed them to build some ecotipic local populations, characterized by early maturation and slow growing rhythm.

The relative abundance of the fish species caught in Costesti-Stinca reservoir in April 2013 with stationary nets with mesh size of 20 mm, 30 mm and 40 mm it is presented in Table 10.

Spring of 2013 debuted by low temperatures followed by a sharp warming since mid April, because of this breeding period of most fish species with early reproduction (*Aspius aspius, Perca fluviatilis*) and relatively early reproduction (*Sander lucioperca, Abramis brama, Rutilus rutilus*) has occurred about 2 weeks later as usual.

Thus, if on 27-29 March the water temperature in the lower sector of lake was only 2.5°C, then on 25-28 April it increased up to 12.3°C. Fish were concentrated in the littoral zone, *Rutilus rutilus* was in the middle of reproduction process, the majority of adults having ovaries in the stage V of development.

Starting with the end of May of 2013, it is planed the use of trammel for juvenile ((l=5 m) for the investigation of the Prut River ichthyofauna, which will allow supplementing the list with diverse species with short life cycle (*Gobiidae, Cobitidae, Gasterosteida, etc.*).

Table 10 The relative abundance of the fish captured in Costesti-Stinca reservoir with stationary nets with mesh size of 20 mm, 30 mm and 40 mm (exposure time - 24 hours), April of 2013

Species		Ø 20 mm, l=50 m and h=2 m		Ø 30 mm, l=50 m and h=3 m		Ø 40 mm, l=100 m and h=3 m	
		An(ex)	Ar(%)	An(ex)	Ar(%)	An(ex)	Ar(%)
1.	***Rutilus rutilus*** (Linnaeus, 1758)	49	85.96	79	87.78	15	48.39
2.	***Blicca bjoerkna*** (Linnaeus, 1758)		-		-		-
3.	***Alburnus alburnus*** (Linnaeus, 1758)	4	7.02		-		-
4.	***Carassius gibelio*** (Bloch, 1782)		-		-	3	9.68
5.	***Hypophthalmichthys molitrix*** (Valenciennes, 1844)		-		-		-
6.	***Gymnocephalus cernuus*** (Linnaeus, 1758)		-		-		-
7.	***Gymnocephalus baloni*** Holcík & Hensel, 1974		-		-		-
8.	***Perca fluviatilis*** Linnaeus,1758		-	1	1.11		-
9.	***Ballerus sapa*** (Pallas, 1814)		-		-		-
10.	***Chondrostoma nasus*** (Linnaeus, 1758)		-		-		-
11.	***Vimba vimba*** (Linnaeus, 1758)	2	3.51		-	1	3.23
12.	***Cyprinus carpio carpio*** Linnaeus, 1758		-		-	2	6.45
13.	***Leuciscus idus*** (Linnaeus, 1758)		-		-		-
14.	***Pelecus cultratus*** (Linnaeus, 1758)		-		-		-
15.	***Sander lucioperca*** (Linnaeus, 1758)		-	4	4.44	2	6.45
16.	***Aspius aspius*** (Linnaeus, 1758)		-		-	1	3.23
17.	***Squalius cephalus*** (Linnaeus, 1758)	1	1.75		-		-
18.	***Abramis brama*** (Linnaeus, 1758)	1	1.75	6	6.67	7	22.58

D.1.3 River Prut hydrochemical characteristics investigation

Field samples collection and their chemical analyses were performed according to established methods in hydrochemistry and hydrobiology (Abakumov, 1983; Semenov, 1977). Dissolved oxygen was determined by iodometric method, which was adapted to ISO 5813:1993; this method includes the fixation of samples directly in the field.

Content of hydrocarbonate (HCO3$^-$) and carbonate (CO3^{2-}) ions or alkalinity was determined by titration classical method, which also corresponds to ISO 9963-1:1994 and 9963-2:1994. Chlorides were investigated by silvermetric titration method in accordance with ISO 9297:1989. Sulphate ion concentration (SO_4^{2-}) was determined by gravimetric method using barium chloride according to ISO 9280:1990. Determination of calcium and magnesium total content or water hardness, as well as of calcium ions was carried out by complexometric EDTA-titrimetric method (ISO 6059:1989 and 6058:1984). Content of magnesium ions (Mg^{2+}) was calculated as the difference between hardness values and content of calcium ions. In the case of sodium and potassium ions, the method of Semenov (1977) was used, but some samples were analysed by atomic absorption method - ISO 9964-2:1993.

Nutrients (N-NH_4^+, N-NO_2^- , N-NO_3^-, mineral P) were investigated by using classical spectrometric methods, which complies to a range of standards: ISO 7150-1:1984, ISO 6777:1984, ISO 7890-3:1988, ISO 6878:2004.

Chemical composition. Investigations have shown that in summer of 2012 the dissolved oxygen content was relatively satisfactory for hydrobiont development, its concentration ranging within 7.86 and 8.86 mg/l, or 90.4 to 101% of saturation at a water temperature of 21.2- 25.8°C; in autumn of 2012 - winter of 2013, at water temperatures of 5-16.4°C, the water saturation with oxygen varied between 77-98.5%, in spring of 2013 - between 90.7- 113.9%, these values being favourable for hydrobiont development (Table 11).

Table 11 Dynamics of dissolved oxygen, mg/l and % of saturation, in the waters of the Prut River and Costesti-Stinca reservoir (next to the dam), June 2012- April 2013

Station	t,°C	O_2	
		mg/l	% saturation
June 2012			
Costesti-Stinca reservoir, next to the dam	23.5	8.82	100.3
Braniste	24.0	8.86	101.1
Sculeni	21.5	8.95	97.9
Leova	25.0	8.38	97.2
Cahul	25.8	7.93	93.2
Cislita	25.6	7.86	92.0
Giurgiulesti	25.6	7.85	91.8
August 2012			
Costesti-Stinca	22.3	8.57	95.5
Braniste	22.6	8.31	93.1
Sculeni	22.6	8.07	90.4
Leuseni	21.2	8.66	94.7
Leova	22.4	8.47	94.6
Cahul	23.4	8.19	93.0
Cislita	23.0	8.26	93.2
Giurgiulesti	23.2	8.00	90.5
October 2012			
Costesti-Stinca reservoir, next to the dam	16.4	9.47	94.7
Braniste	16.2	9.89	98.5
Sculeni	16.2	9.86	98.2
Leuseni	15.0	9.99	97.2
Leova	13.4	9.94	93.7
Cahul	15.0	9.58	93.2
Cislita	15.6	9.16	90.2
Giurgiulesti	16.2	9.07	90.4
December 2012			
Costesti-Stinca reservoir, middle sector	5.0	9.87	77.0
Costesti-Stinca reservoir, lower sector	5.0	9.93	77.5
February 2013			
Costesti-Stinca reservoir, lower sector	2.0	14.58	105.3
Braniste	2.4	14.1	102.9
Sculeni	1.8	14.09	101.2
Cahul	0.8	12.75	89.2
Cislita	1.2	13.28	93.9
Giurgiulesti	1.2	13.38	94.5
March 2013			
Costesti-Stinca reservoir, lower sector	4.2	13.28	101.6
Braniste	5.0	13.46	105.0
Sculeni	6.0	12.94	103.4

Leovo	7.4	11.78	97.3
Leuseni	7.8	11.94	99.5
Cahul	9.0	11.14	95.5
Cislita	9.6	11.46	99.6
Giurgiulesti	10.0	10.35	90.7
April 2013			
Costesti-Stinca reservoir, lower sector	13.8	11.75	111.6
Braniste	10.6	11.71	103.9
Sculeni	11.0	11.14	99.8
Leuseni	12.6	10.16	94.2
Leova	12.5	10.04	92.9
Cahul	14.4	9.76	93.8
Cislita	17.0	11.25	113.9
Giurgiulesti	16.4	9.55	95.5

Suspensions have an important role in the functioning of aquatic ecosystems, especially in their self-cleaning processes. Namely to suspensions belongs the role to adsorb a range of dissolved substances, including pollutant ones, and to store them in bottom sediments. The high contents of suspensions diminish the intensity of photosynthesis process, influence the processes of production and destruction of organic matter and have a negative impact on planktonic organisms (Zubcov et al., 2009; Zubcov, Ungureanu, Munjiu, 2005).

The quantity of suspensions in the Prut River varied in a quite large diapason- from 2 mg/l to 190 mg/l. The dynamics of suspensions in the Prut River is highly dependent on its right tributary – Bahlui River, which provokes the increase of their content by ten times in the Prut River on the Leuseni- Cislita-Prut sector. At Giurgiulesti station, in the zone of small water speed, the most of suspensions are stored in silts (Table 12).

Table 12 Dynamics of mineral (S_{min}), organic (S_{org}) and total (S_{total}) suspensions in Costesti-Stinca reservoir and the Prut River, June of 2012-April of 2013, mg/l

Station	S_{min}	S_{org}	S_{total}
June 2012			
Costesti-Stinca reservoir, next to the dam	0.4	2.4	2.8
Braniste	1.2	0.6	1.8
Leova	48.8	20	68.8
Cahul	67.2	8.6	75.8
Cislita	152	27	179
Giurgiulesti	47.2	6.8	54
August 2012			
Costesti-Stinca reservoir	2.8	0.8	3.6
Braniste	0.4	0.4	0.8
Sculeni	2	0.4	2.4
Leuseni	66	8	74
Leova	73.2	13.2	86.4
Cahul	88.8	67.6	156.4
Cislita	118.8	10.4	129.2
Giurgiulesti	77.2	8.4	85.6

October 2012			
Costesti-Stinca reservoir, next to the dam	0.8	0.4	1.2
Braniste	0.4	0.4	0.8
Sculeni	2	1.2	3.2
Leuseni	46	1.6	47.6
Leova	49.2	9.2	58.4
Cahul	62.5	1.5	64
Cislita	58	12	70
Giurgiulesti	40	3.2	43.2
December 2012			
Costesti-Stinca reservoir, middle sector	0.4	0.4	0.8
Costesti-Stinca reservoir, lower sector	0.4	0.4	0.8
February 2013			
Costesti-Stinca reservoir, lower sector	0.8	0.4	1.2
Braniste	0.4	0.01	0.41
Sculeni	4.4	0.03	4.43
Cahul	42.4	0.01	42.41
Cislita	16.8	4.8	21.6
Giurgiulesti	5.8	4.6	10.4
March 2013			
Costesti-Stinca reservoir, lower sector	0.4	2	2.4
Braniste	2.8	1	3.8
Sculeni	1.6	0.8	2.4
Leova	100.4	4.8	105.2
Leuseni	26.8	1.2	28
Cahul	7.0	1.4	8.4
Cislita	1.2	0.4	1.6
Giurgiulesti	2.4	1.6	4
April 2013			
Costesti-Stinca reservoir, lower sector	2.8	0.4	3.2
Braniste	2.4	0.4	2.8
Sculeni	46.4	1.6	48
Leuseni	130.8	12.8	143.6
Leova	194.8	24	218.8
Cahul	228.2	21.4	249.6
Cislita	3.6	0.8	4.4
Giurgiulesti	10.4	0.8	11.2

Mineralization, as well as the content of main ion, are conservative indices and depend mostly by natural factors. It is known that water mineralization has decreasing during floods and has increasing during low flows. In 2012 it was observed a light increase of mineralization and major ions content, but not so pronounced and their values were within those multiannuals. In 2013 it was observed an evident increase of concentration of sulfates, sodium and potassium ions at Cahul station in February and on the sector Leuseni-Cahul in March (Table 13).

Table 13 Dynamics of hydrogen carbonate, sulfate, chloride, calcium, magnesium, sodium and potassium ions and mineralization in the waters of Prut River and Costesti-Stinca reservoir, June of 2012-April of 2013, mg/l

Station	**SO_4^{2--}**	**HCO_3^-**	**Cl^-**	**Ca^{++}**	**Mg^{++}**	**Na^++K^+**	**Mineralization**
June 2012							
Braniste	55.1	158.7	21.7	52.1	10.3	22.8	320.7
Sculeni	63.4	164.8	21.3	54.1	10.3	26.8	340.7
Leova	64.2	180.0	24.5	57.1	12.1	28.5	366.4
Cahul	66.7	180.0	24.5	56.1	13.4	28.3	369.0
Cislita	71.2	180.0	26.6	55.1	13.9	10.8	357.6
Giurgiulesti	72.4	181.5	26.6	53.1	15.8	32.3	381.7
August 2012							
Costesti-Stinca	44.4	143.4	26.2	46.1	10.9	20.3	291.3
Braniste	55.9	143.4	24.6	50.1	10.3	21.3	305.6
Sculeni	49.4	152.6	26.2	57.1	9.1	16.8	311.2
Leuseni	45.3	164.8	26.6	59.1	10.3	14.8	320.9
Leova	71.6	161.7	26.6	50.1	14.6	29.8	354.4
Cahul	69.9	161.7	26.6	56.1	10.3	32.8	357.4
Cislita	72.4	164.8	26.6	55.1	10.3	34	363.2
Giurgiulesti	60.1	170.9	26.9	51.5	19.5	16.5	345.4
October 2012							
Costesti-Stinca, next to the dam	67.5	158.7	26.6	56.1	9.1	30.0	348.0
Braniste	65.8	155.6	26.9	56.1	9.7	27.0	341.1
Sculeni	59.3	161.7	26.9	58.1	12.8	17.3	336.1
Leuseni	83.9	186.1	31.8	56.1	15.8	39.8	413.5
Leova	71.6	192.2	33.3	55.1	17.6	34.5	404.3
Cahul	78.2	201.4	31.8	55.1	15.8	44.3	426.6
Cislita	79.0	207.5	32.9	55.1	17.6	44.3	436.4
Giurgiulesti	71.6	205.9	32.9	53.1	16.4	45.0	424.9
December 2012							
Costesti-Stinca, middle sector	92.2	175.4	32.2	62.1	10.3	44.0	416.2
Costesti-Stinca, lower sector	92.2	175.4	32.2	63.1	10.3	42.8	416.0
February 2013							
Costesti-Stinca, lower sector	170.9	78.19	32.9	61.1	11.6	34.0	388.7
Braniste	207.5	83.95	40.1	73.2	13.9	37.0	455.7
Sculeni	219.7	100.41	40.5	78.2	15.8	43.0	497.6
Cahul	233.4	174.48	53.9	72.1	21.3	90.8	645.9
Cislita	234.9	139.09	49.2	71.1	20.7	72.0	586.9
Giurgiulesti	224.3	136.62	46.1	68.1	21.9	65.3	562.3
March 2013							

Costesti-Stinca, middle sector	184.6	88.4	35.3	68.1	10.3	38.3	425.0
Costesti-Stinca, lower sector	198.3	88.9	38.4	66.1	14.6	42.0	448.3
Braniste	193.7	106.2	39.2	68.1	13.4	50.0	470.6
Sculeni	234.9	176.1	43.1	76.2	23.1	68.3	621.7
Leuseni	265.4	209.9	45.4	79.2	31	87.5	718.4
Leovo	277.6	238.7	45.4	77.2	34.7	102.3	775.9
Cahul	271.5	238.7	50.5	77.2	33.4	106	777.3
Cislita	265.4	124.3	50.5	75.2	32.8	47.8	596.0
Giurgiulesti	215.1	122.2	37.6	66.1	23.1	100.3	564.4
April 2013							
Costesti-Stinca, lower sector	161.7	76.5	21.9	56.1	12.8	25.3	354.3
Braniste	170.9	79.8	25.2	56.1	15.8	26.8	374.6
Sculeni	176.9	84.8	26.9	60.1	13.4	33.0	395.1
Leuseni	187.9	109.5	29.1	58.1	18.8	43.3	446.7
Leova	189.2	113.6	29.1	58.1	18.8	45.8	454.6
Cahul	192.2	118.5	29.4	62.1	18.2	46.3	466.7
Cislita	206.3	152.3	34.4	64.1	21.9	63.0	542.0
Giurgiulesti	213.6	145.7	35.1	67.1	23.1	56.8	541.4

It was preserved the classical trend of mineralization growth along the river. In most cases, the water of the Prut River referred to the hydrogen carbonate class, group of calcium, type II, accordingly to classification of Alekin (Fig.15, 16).

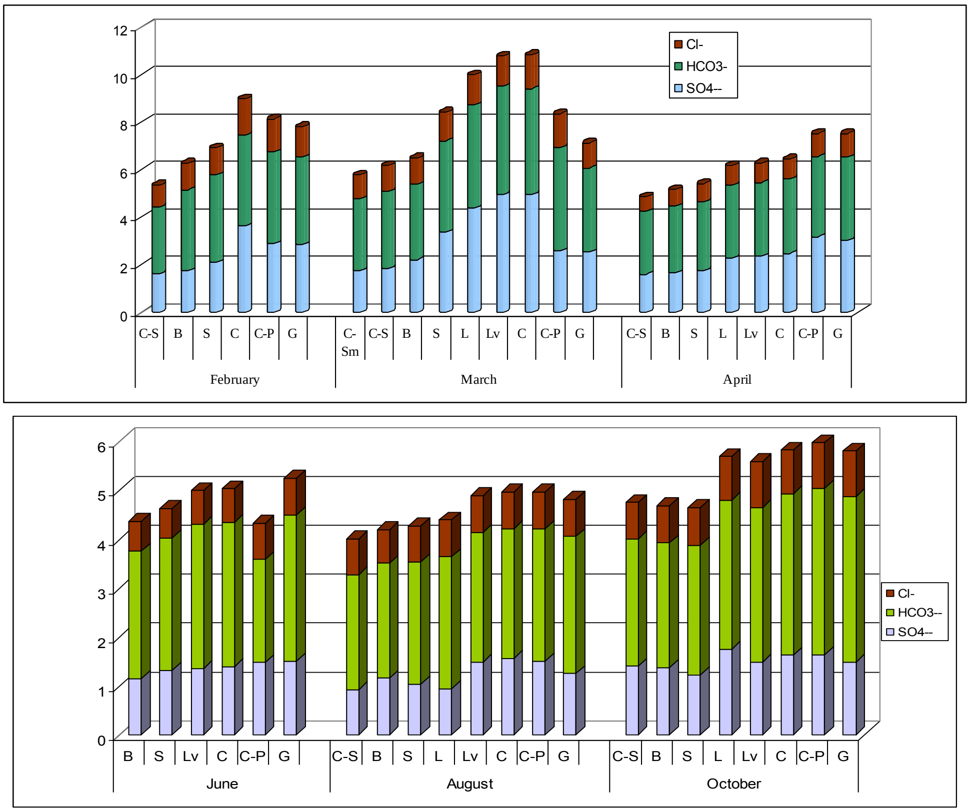


Fig.15 Dynamics of hydrogen carbonate, sulfate and chloride ions in Costesti-Stinca reservoir, middle sector (C-Sm), next to the dam (C-S), and in the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, C-P-Cislita-Prut, G-Giurgiulesti), June-October of 2012 and February-April of 2013, mg-ecv/l

It is known that the correlation between cations and anions is a basic indicator in the determining of surface water stability. The modification of water class reveals the existence of pollution or the water metamorphosis under the influence of some major factors. Accordingly to the Figures 15-16, in February and March of 2013 the increase of content of sulfate, sodium and potassium ions occurred. As result, in February of 2013 the waters of the Prut River referred to the hydrogen carbonate-sulfate class, group of sodium-calcium, type II (Cahul) and to the sulfate class, group of sodium in March of 2013 (on the Leuseni-Cahul sector). Obviously, water mineralization also reached much higher values (Table 13), which, in fact, were three times higher compared to those from Costesti-Stinca reservoir, next to the dam.

The Prut waters, taking in account the composition of main ions, corresponded to the requirements on quality, which must be met by drinking water, and waters used in pisciculture and aquaculture.

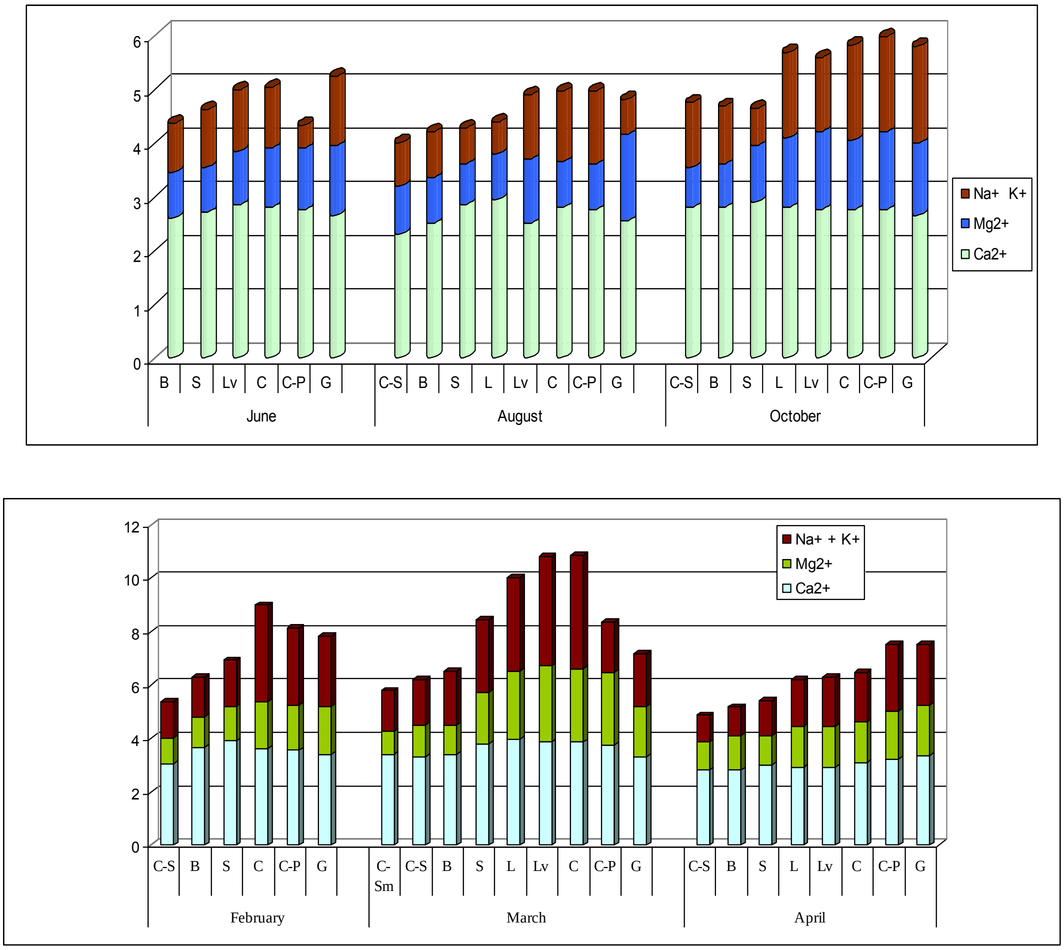


Fig.16 Dynamics of calcium, magnesium, sodium and potassium ions in Costesti-Stinca reservoir, middle sector (C-Sm), next to the dam (C-S), and in the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, C-P-Cislita-Prut, G-Giurgiulesti), June-October of 2012 and February-April of 2013, mg-ecv/l

The content of nutrients is one of the most important indicators of water quality, which determines both the development of several aquatic organisms, as well as trophicity level, intensity of production-destruction processes of aquatic ecosystems. The share of nitrates in the sum of forms of mineral nitrogen is 54-90%, of ammonium nitrogen – 8.5 – 43%, and of nitrites – 1.1-6.0% (Table 14).

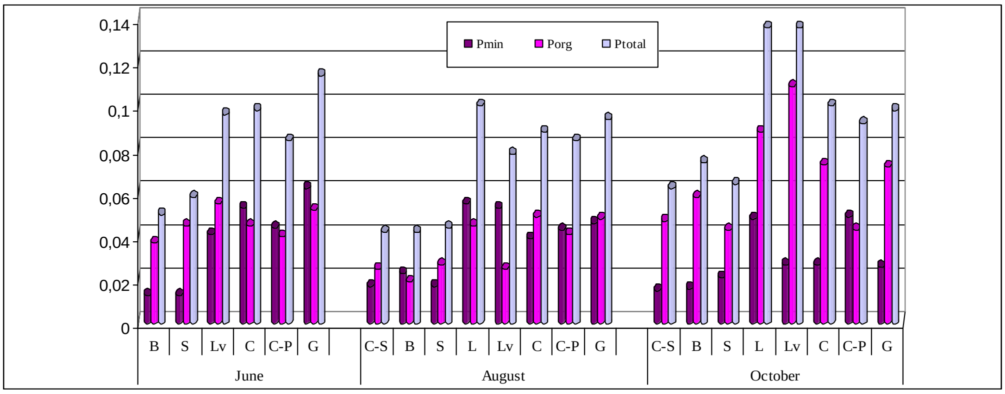
As rule, in aquatic ecosystems the content of mineral nitrogen exceeds those of organic nitrogen. In 2012 in 25% of samples the share of mineral nitrogen in total nitrogen was equal to 25-44%, but in 2013 already in 30% of samples it varried between 6-38%. Thus, it is evident the tendency of increase of the organic nitrogen concentration (Table 14). The ratio between mineral and organic nitrogen is an integrated index that reflects not only nitrogen flow processes, but also the intensity of self-cleaning processes, secondary pollution and trophicity level of aquatic ecosystems.

Table 14 Dynamics of concentrations of ammonium (N-NH_4), nitrite (N-NO_2) and nitrate nitrogen (N-NO_3), of mineral (Nmin), organic (Norg) and total (Ntot) nitrogen in the waters of the Prut River and Costesti-Stinca reservoir, June of 2012-April of 2013, mg/l

Station	**N-NH_4**	**N-NO_2**	**N-NO_3**	**Nmin**	**Norg**	**Ntot**
June 2012						
Braniste	0.224	0.055	0.784	1.063	1.5	2.563
Sculeni	0.228	0.039	0.741	1.008	0.324	1.332
Leova	0.198	0.034	1.004	1.236	0.284	1.52
Cahul	0.331	0.032	0.73	1.093	0.151	1.244
Cislita	0.242	0.03	0.639	0.911	0.295	1.206
Giurgiulesti	0.402	0.03	0.676	1.108	0.425	1.533
August 2012						
Costesti-Stinca	0.176	0.032	0.327	0.535	0.251	0.786
Braniste	0.146	0.029	0.338	0.513	0.239	0.752
Sculeni	0.116	0.023	0.338	0.477	0.482	0.959
Leușeni	0.317	0.017	0.596	0.93	0.495	1.425
Leovo	0.346	0.023	0.601	0.97	0.181	1.151
Cahul	0.246	0.037	0.736	1.019	0.637	1.656
Cislita	0.25	0.031	0.725	1.006	0.633	1.639
Giurgiulesti	0.205	0.032	0.719	0.956	0.892	1.848
October 2012						
Costesti-Stinca, next to the dam	0.202	0.041	0.467	0.710	2.098	2.808
Braniste	0.265	0.028	0.413	0.706	0.344	1.050
Sculeni	0.190	0.028	0.424	0.642	0.622	1.264
Leuseni	0.343	0.031	0.908	1.282	1.619	2.901
Leova	0.380	0.030	1.091	1.501	1.852	3.353
Cahul	0.383	0.026	0.859	1.268	2.390	3.658
Cislita	0.536	0.027	0.924	1.487	1.020	2.507
Giurgiulesti	0.432	0.025	0.811	1.268	3.559	4.827
December 2012						
Costesti-Stinca, middle sector	0.461	0.034	0.832	1.327	0.357	1.684
Costesti-Stinca, lower sector	0.606	0.037	0.762	1.405	0.071	1.476
February 2013						
Costesti-Stinca, lower sector	0.235	0.033	0.601	0.869	0.583	1.452
Braniste	0.424	0.026	0.671	1.121	0.805	1.926
Sculeni	0.435	0.036	1.091	1.562	0.863	2.425
Cahul	0.517	0.044	2.188	2.749	2.078	4.827
Cislita	0.502	0.052	2.086	2.64	2.511	5.151
Giurgiulesti	0.573	0.054	2.096	2.723	2.569	5.292
March 2013						
Costesti-Stinca, middle	0.487	0.03	1.16	1.677	0.039	1.716

sector						
Costesti-Stinca, lower sector	0.629	0.033	0.956	1.618	1.145	2.763
Braniste	0.621	0.033	0.978	1.632	25.129	26.761
Sculeni	0.758	0.044	1.505	2.307	1.081	3.388
Leova	0.603	0.043	2.36	3.006	4.719	7.725
Leuseni	0.536	0.041	2.312	2.889	0.844	3.733
Cahul	0.231	0.031	2.435	2.697	14.419	17.116
Cislita	0.242	0.025	2.032	2.299	2.977	5.276
Giurgiulesti	0.302	0.024	1.93	2.256	6.596	8.852
April 2013						
Costesti-Stinca, lower sector	0.476	0.052	1.817	2.345	3.69	6.035
Braniste	0.502	0.042	1.564	2.108	0.44	2.548
Sculeni	0.506	0.038	1.623	2.167	6.08	8.247
Leova	0.428	0.049	1.801	2.278	3.81	6.088
Leuseni	0.383	0.048	1.822	2.253	0.41	2.663
Cahul	0.532	0.067	1.774	2.373	1.27	3.643
Cislita	0.313	0.052	1.203	1.568	5.33	6.898
Giurgiulesti	0.614	0.051	1.37	2.035	2.87	4.905

The dynamics of mineral, organic and total phosphorus is presented in the Figure 17.



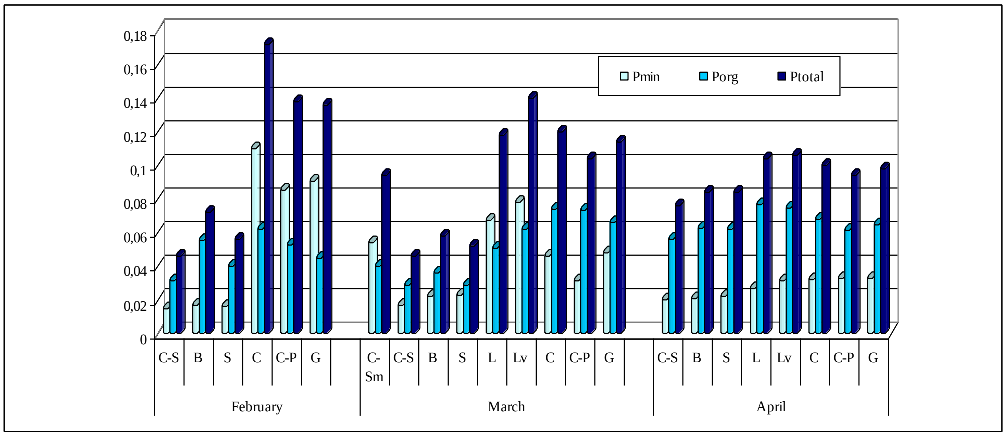


Fig.17 Dynamics of mineral (Pmin), organic (Porg), and total (Ptotal) phosphorus in the Costesti-Stinca reservoir, middle sector (C-Sm), next to the dam (C-S), and in the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, C-P-Cislita-Prut, G-Giurgiulesti), June-October of 2012 and February-April of 2013, mg/l

It is worth to mention that in summer of 2012 the concentrations of mineral phosphorus, in most of cases, were higher than those of organic phosphorus, and in autumn of 2012- opposite. It was obvious the increase of phosphorus concentrations along the river.

It was evident the increase of content of organic substances, both easily degradable and poorly degradable, along the Prut River (Fig.18) with few exceptions, when the highest values were registered at Leuseni and Cahul, being provoked by discharge of insufficient purified wastewaters.

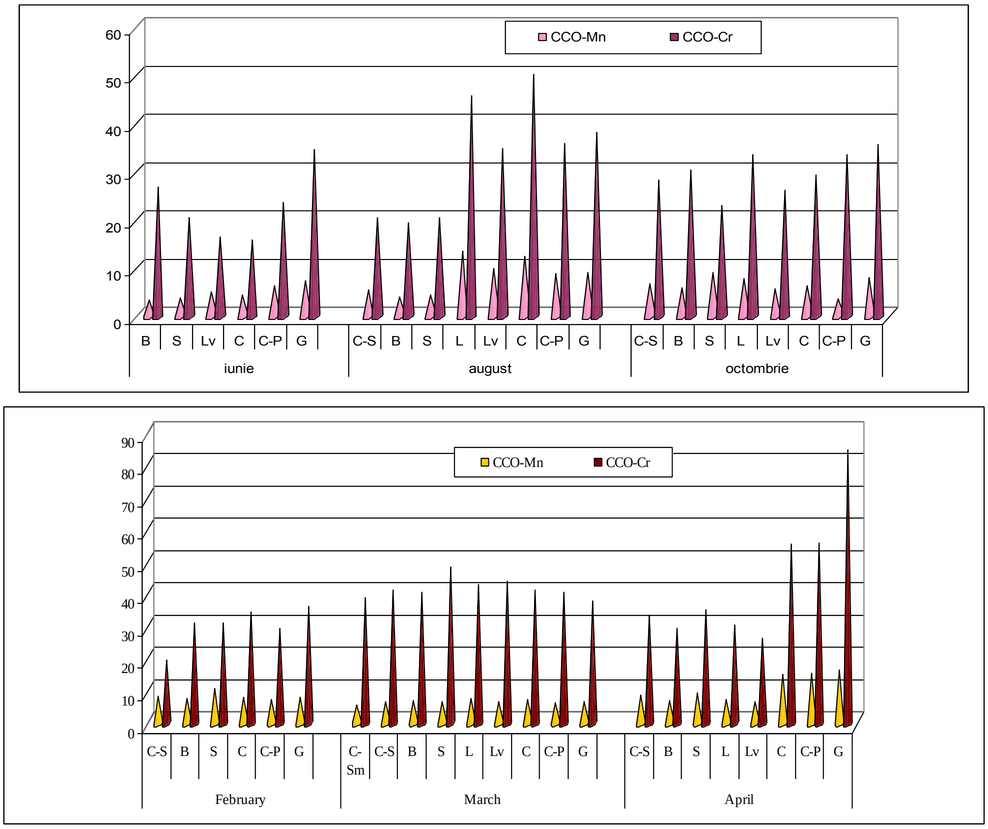


Fig. 18 Dynamics of permanganate (CCO-Mn) and dichromate (CCO-Cr) oxidability in Costesti-Stinca reservoir, middle sector (C-Sm), next to the dam (C-S), and in the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, C-P-Cislita-Prut, G-Giurgiulesti), June-October of 2012 and February-April of 2013, mgO/l

On the base of determination of chemical (CCO_{Cr}) and biochemical (CBO_5) consumption of oxygen, it was calculated the self-cleaning capacity of the Prut River: in 2012 its value not exceeded 0.162 (Braniste, August of 2012), and in 2013 it not exceeded 0.1 (Fig.19). It is worth to be mention that no obvious correlation was observed between the values of CBO_5 and $CCO_{Cr.}$

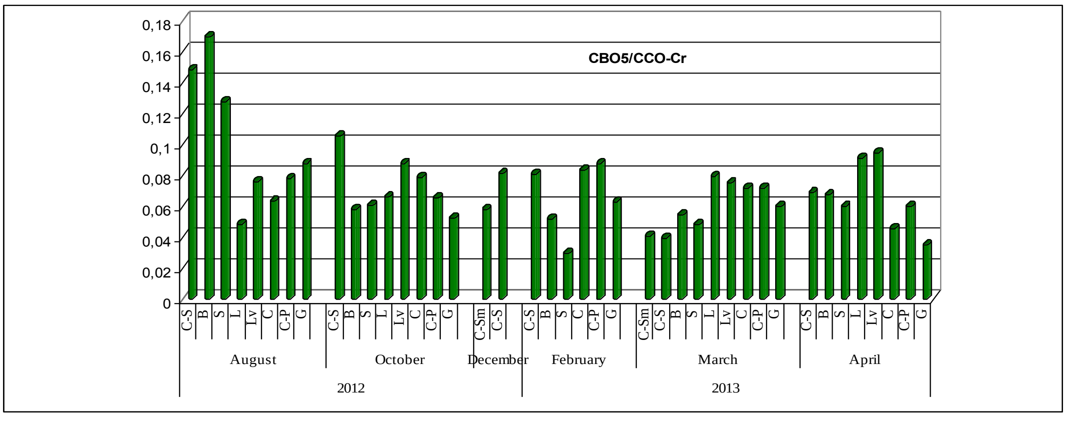


Fig. 19 Self-cleaning capacity of waters of the Prut River and Costesti-Stinca reservoir, August-December of 2012, February-April of 2013

D.1.4 Abiotic factors' influence upon aquatic organisms communities. Evaluation of the natural and anthropogenic threats upon the fish reproduction capability

The main role in the development of bacterioplankton, phytoplankton and zooplankton belongs to nutritive elements, especially nitrogen and phosphorus compounds. Dynamics and ratio between the ammonifying, nitrifying and denitrifying bacteria is directly dependent on the content of ammonium ions, nitrates and nitrites in the waters of aquatic ecosystems. The role of phosphorus in the development of planktonic bacteria and alga consists of in its contribution to the energy accumulation and transformation inside cells. Quantitative assessment of intensity of planktonic bacteria and alga response to the modifications of phosphorus concentrations in water is one of relevant methods used for elaboration of prognostic on aquatic ecosystem troficity (Zubcov et al., 2009; Zubcov, Ungureanu, Munjiu, 2005).

The dynamics of dissolved organic substances in the waters of Prut River reflects destruction processes, because organic matter is the main nutrition source for many groups of bacteria, especially amylolytic and cellulosolytic ones. It was proved that when the temperature of Prut River water is favorable for these groups of microorganisms, the relationship between the concentration of organic substances in the water and density of these bacteria is almost linear. From other hand, it was evident a positive correlation between the concentration of organic substances and density of planktonic bacteria (Fig. 20).

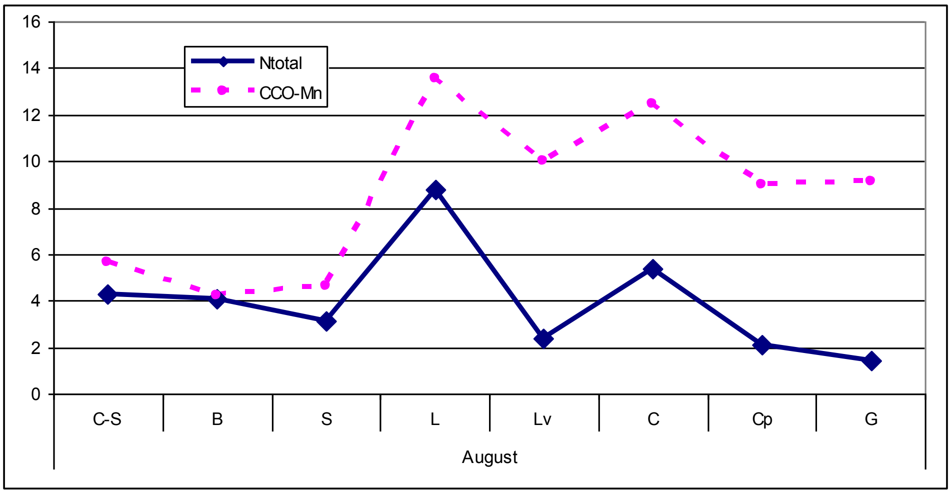


Fig. 20 Correlation between the concentration of easily biodegradable organic compounds (CCO-Mn, mgO/l) and the density of total bacterioplankton (Ntotal, million cells/ml) in the Costesti-Stinca reservoir, next to the dam, and in the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, Cp-Cislita-Prut, G-Giurgiulesti), August of 2012

The synthesis of phytoplankton primary production depends on a range of factors, especially on solar radiation and water transparency. The carried out investigations revealed a negative correlation between the suspensions content in the waters of Prut River and Costesti-Stinca reservoir and the values of primary production (Fig.21).

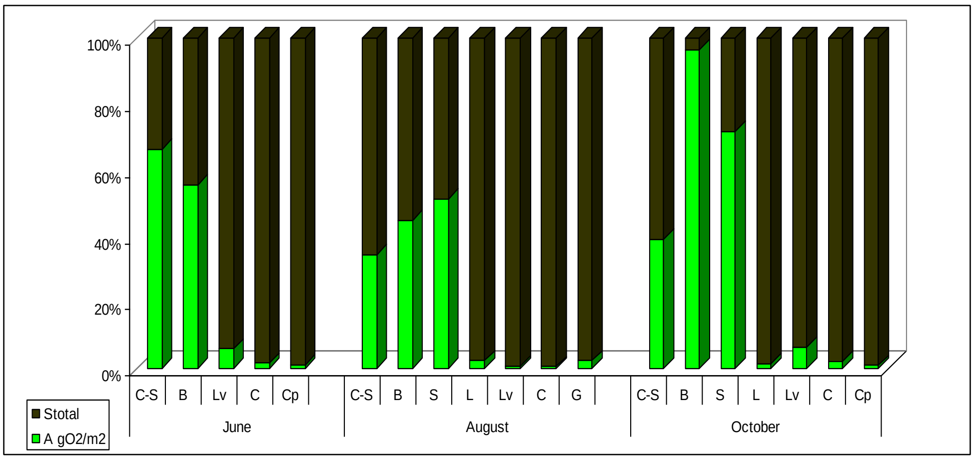


Fig. 21 Relationship between the content of suspensions (Stotal– mg/l) and phytoplankton primary production (A – gO_2/m^2) in the Costesti-Stinca reservoir, next to the dam, and in the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, Cp-Cislita-Prut, G-Giurgiulesti), 2012

It is extremely important to establish the relationships between different environmental factors, but particularly, between different groups of aquatic organisms. Thus, it was obvious a classic correlation between the biomass of planktonic organisms in summer time (Fig. 22).

It is worth to mention that in summer of 2012 the concentrations of mineral phosphorus, in most of cases, were higher than those of organic phosphorus, and in autumn of 2012- opposite. It was obvious the increase of phosphorus concentrations along the river.

Fig. 22 Relationship between the phytoplankton biomass (Bf, g/m^3) and zooplankton biomass (Bz, mg/m^3) in the Costesti-Stinca reservoir, next to the dam, and in the Prut River (B-Braniste, S-Sculeni, L-Leuseni, Lv-Leova, C-Cahul, G-Giurgiulesti), summer of 2012

One of indicator of environmental factor impact on aquatic organisms is the accumulation level of metals in aquatic organisms. It was collected a certain amount of materials; some of them are currently under investigation (in particular, the fish samples collected in autumn and winter), but some preliminary results on metal accumulation in fish are presented in Table 15.

Table 15 Concentration of metals in the body muscles of fish from the Prut River, mg/kg wet weight

Species	Zn	Cu	Pb	Ni	Mo	V	Cd	Wet weight of fish, gram
Sander lucioperca	35.6	5.2	3.3	6.9	1.9	2.6	0.44	970
Sander lucioperca	42.2	4.7	2.8	4.6	2.0	1.8	0.23	465
Aspius aspius	48.2	6.9	4.2	7.8	2.6	2.8	0.72	1160
Pelecus cultratus	64.4	11.2	4.8	10.2	2.8	2.6	1.25	660
Abramis brama	53.2	8.1	2.8	9.1	2.0	1.8	0.53	960
Abramis brama	46.6	5.6	2.5	6.7	1.6	2.0	0.41	460
Barbus barbus	26.8	4.5	2.6	5.2	1.3	1.2	0.50	410
Carassius auratus gibelio	25.6	5.2	2.2	8.0	2.1	2.5	0.54	280
Carassius auratus gibelio	20.8	3.5	1.8	7.6	1.8	2.1	0.47	160

These researches are of high importance not only for revealing the processes of migration and accumulation of chemicals in aquatic ecosystems, but also for assessment of fish products quality and, as consequence, of human health impact.

As conclusion, in most cases for investigation period, the waters of Prut River were satisfactory for hydrobionts development, but the concentrations of suspensions, nutritive elements were not always favorable for planktonic organism development. However, in general the Prut River waters met the requirements for multifunctional aquatic ecosystems (which may serve as source of drinking water, as well as of water for irrigation, pisciculture and aquaculture).

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