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

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GA4: PRUT RIVER INVESTIGATION

HYDROCHEMICAL PARAMETERS

There were collected 33 samples of water between 8 November 2014 and 7 March 2015 in the frame of the project MIS ETC 1150 from Costesti-Stinca reservoir and the Prut River, stations: Costesti, Braniste, Sculeni, Leuseni, Leova, Cahul, Cislita-Prut and Giurgiulesti. At each point of sampling the following works were done in field conditions: the measurement of water transparency and temperature, preservation of dissolved oxygen, and preservation of biological material.

In January 2015 the Prut River was covered by ice, therefore the water sampling was performed only in the lower sector of the river, where the ice was thinner (Fig. 1).

Fig. 1 Sampling of water at Cahul station (January 2015)

pH, dissolved oxygen, biochemical oxygen demand

At monitored stations of the Prut River and Costesti-Stinca reservoir the water pH ranged 8.02 – 8.29 (Fig.2), what corresponded to the class of quality I in accordance with the *Regulation on environment quality requirements for the surface waters* (2013).

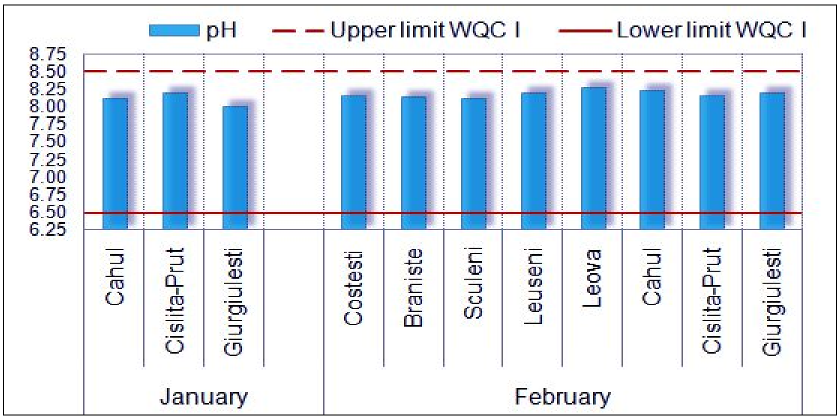

Fig. 2 Variation of pH in the Prut River and Costesti-Stinca reservoir, winter 2015

The content of dissolved oxygen in winter period is highly influenced by the water temperature. At all monitored stations the content of dissolved oxygen, also, indicated the class of quality I (Fig. 3).

In accordance with the long term observations, in autumn and winter the water level of the Prut River is the lowest during the year (Fig. 4). Thus, the dilution of discharged waste waters into the river is minimal, and this can be the main cause of the increased values of CBO_5 in October 2014 - February 2015 (Fig. 5).

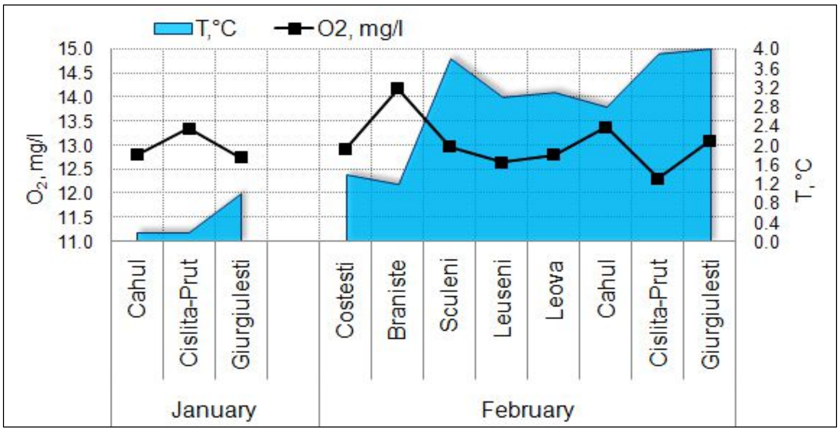

Fig. 3 Correlation between the content of dissolved oxygen and the water temperature in the Prut River and Costesti-Stinca reservoir, winter 2015

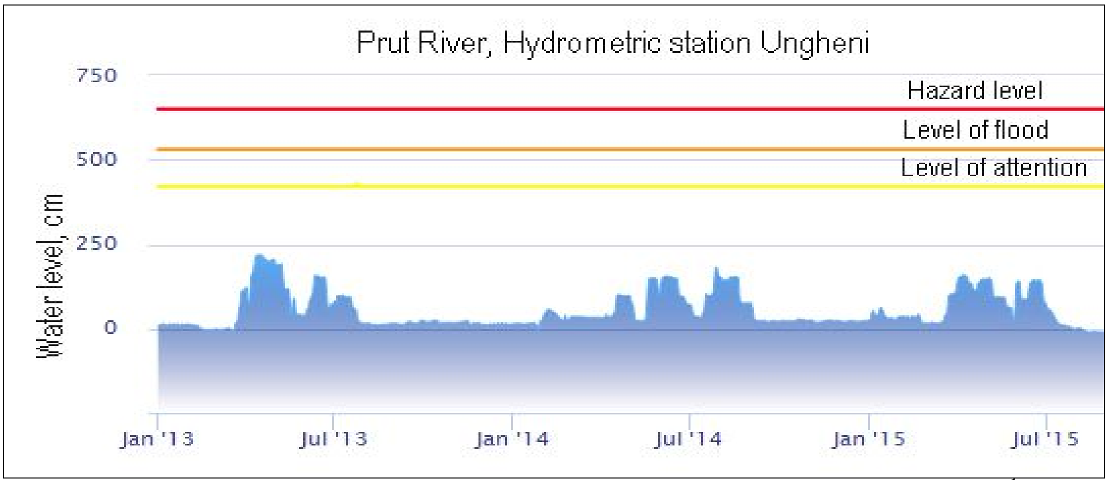

Fig. 4 The water level of the Prut River according to multiannual observations[1]

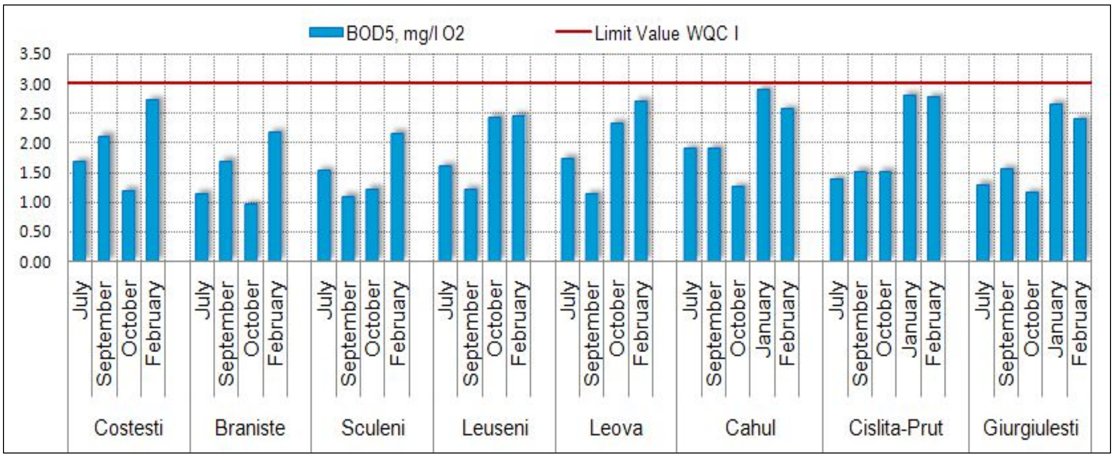

Fig. 5 Dynamics of the biochemical oxygen demand (CBO_5) in the Prut River and Costesti-Stinca reservoir (July 2014 – February 2015)

[1] http://www.meteo.md/mold/grafice/nivelul.htm

The increasing tendency of the content of **suspended substances (SS)** in Leuseni-Giurgiulesti sector is noticed also in winter season (Fig. 6, *a*).The freezing of banks determines the decrease of the content of SS, which go into the river with precipitations. Thus, in this period the total content of SS is 2-3 times lower than in the spring and summer (classes of quality II and III, but in previous period of time – class V). The share (%) of organic suspensions in their total content is presented in Fig. 6, *b*. According to obtained data, in the winter season the highest share of organic solids was recorded in a lentic ecosystem (Costesti station).

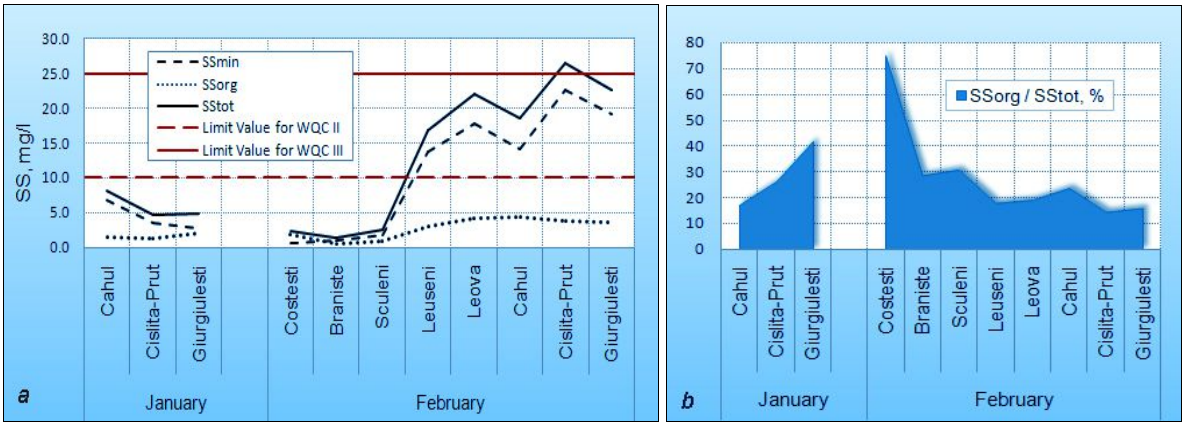

Fig. 6 Temporal dynamics of suspended substances along the Prut River, winter 2015

Main ions

In January and February 2015 the values of mineralization varied between 376.4 mg/l (Sculeni, February) and 573.1 mg/l (Cahul, January). It was remarked the increase of the content of main ions along the Prut River, especially on the sector Leuseni-Giurgiulesti (Fig. 7). In January the mineralization of water at Cahul, Cislita-Prut and Giurgiulesti stations was higher than that from February.

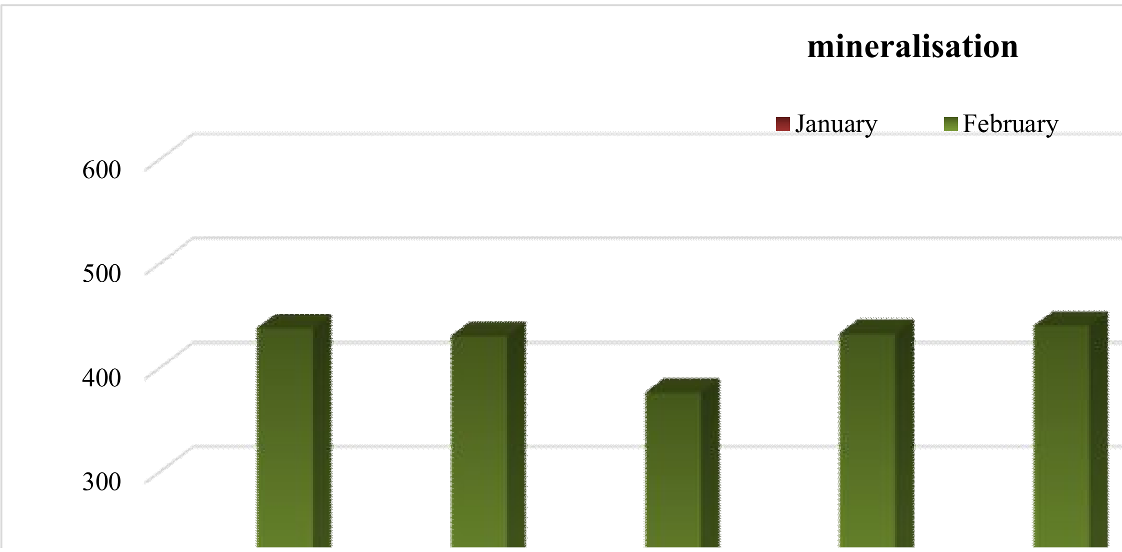

Fig. 7 Mineralization of water of the Prut River, January-February 2015, mg/l (Cs - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Lv - Leova, C - Cahul, Cp - Cislita-Prut, G – Giurgiulesti)

In January 2015 it was observed an obvious increase of concentration of **sodium and potassium ions** (up to 66.0 mg/l) at Cahul station. Their contents in Leuseni-Giurgiulesti sector were higher in comparison with those from Costesti-Stinca – Sculeni sector. The values of **calcium** content in the Prut waters were placed more often in the limits 65.1 (Cahul, January) – 71.1 mg/l

(Giurgiulesti, February), of **magnesium** content – between 15.8 (Braniste, February) and 27.4 mg/l (Cislita-Prut, February). In February the concentrations of calcium and magnesium in Cahul-Giurgiulesti part of the river were higher comparing with those from January.

Downstream the river the content of magnesium went up, but this was not sufficient for the change of dominant cation. In Leova-Giurgiulesti sector increased concentrations of magnesium can occur because of local enterprises, which discharge their waste waters into the river.

The dissolved salts of calcium and magnesium are the main components, which determine the water hardness. The hardness of the Prut waters in January-February 2015 (Fig. 8) varied from 4.70 mg*echiv/l (Costesti-Stinca, February) to 5.8 mg*echiv/l (Cislita-Prut, February). In conformity to received results, the water hardness of the Prut River had higher values in the end of the winter. In general, taking in account its medium hardness, the Prut water is considered to be suitable for drinking.

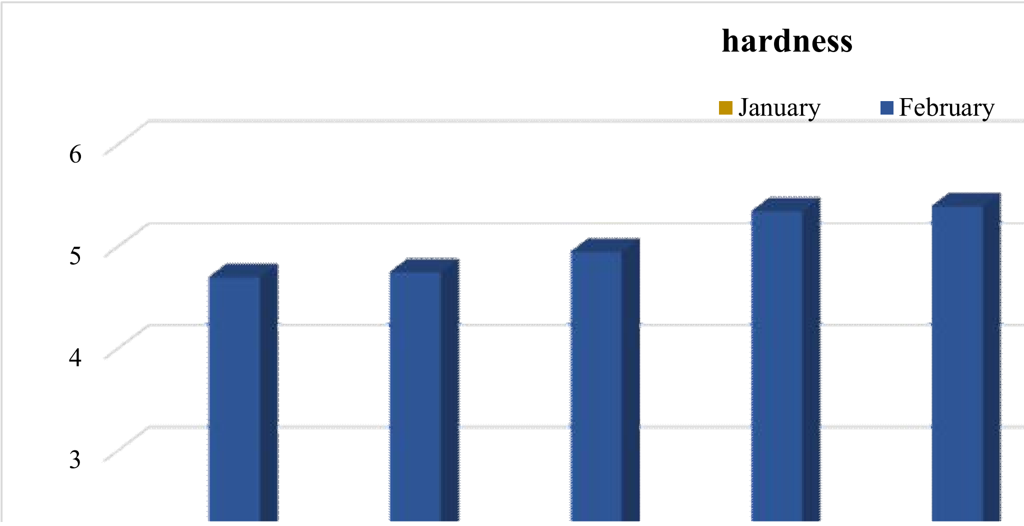

Fig. 8 Prut River water hardness, January-February 2015, mg*echiv/l (Cs - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Lv - Leova, C - Cahul, Cp - Cislita-Prut, G – Giurgiulesti)

In the waters of the Prut River the content of **hydrogen carbonate and carbonate ions** ranged in the period of investigation between 161.7 mg/l at Sculeni (February) and 247.1 mg/l at Cahul and Giurgiulesti (January). The concentration of hydrogen carbonates and carbonates went up from Sculeni to Giurgiulesti (Fig. 9).

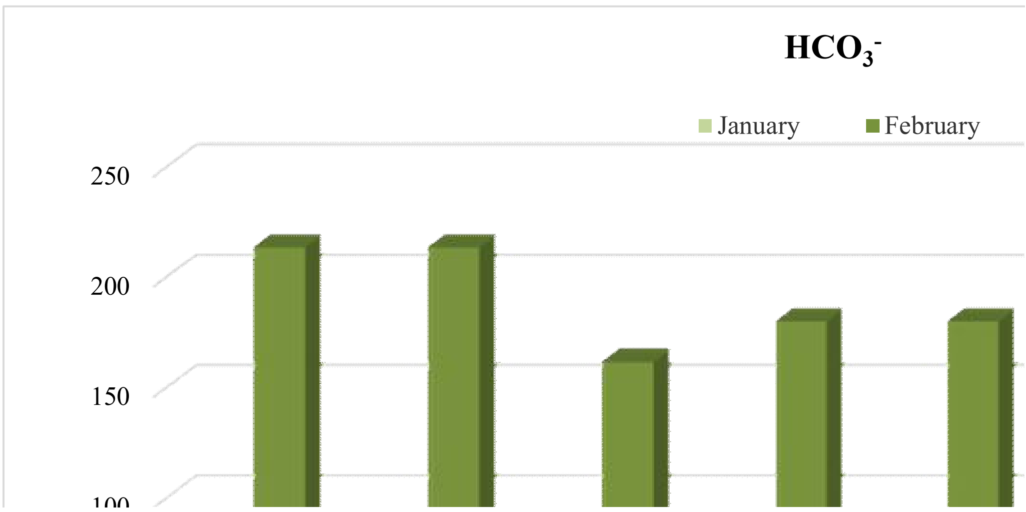

Fig.9 Hydrogen carbonate ions in the Prut River, January-February 2015, mg/l (Cs - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Lv - Leova, C - Cahul, Cp - Cislita-Prut, G – Giurgiulesti)

In the beginning of the year it was observed an evident increase of concentration of **sulphate ions** – up to 144.0 mg/l (Giurgiulesti, February) (Fig. 10). The concentration of sulphates went suddenly up from Leova to Giurgiulesti. This sector is the most polluted with sulphates, which are brought into the Lower Prut by way of household waste waters and those of agricultural enterprises.

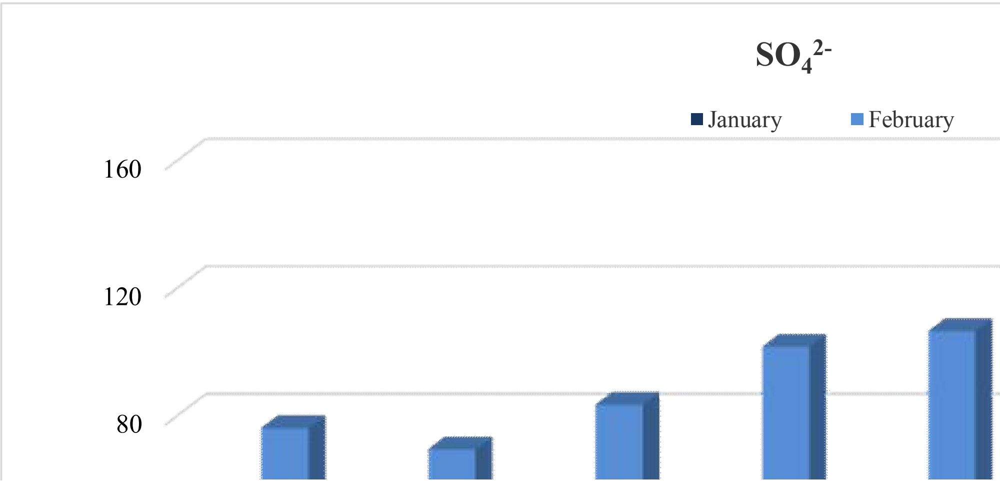

Fig. 10 Sulphate ions in the Prut River, January-February 2015, mg/l (Cs - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Lv - Leova, C - Cahul, Cp - Cislita-Prut, G – Giurgiulesti)

The quantities of **chloride ions** had a slight trend of increase along the river (Fig. 11). The highest concentration of chloride ions (44.8 mg/l) was recorded at Giurgiulesti station, and the lowest (33.0 mg/l) – at Costesti-Stinca in February.

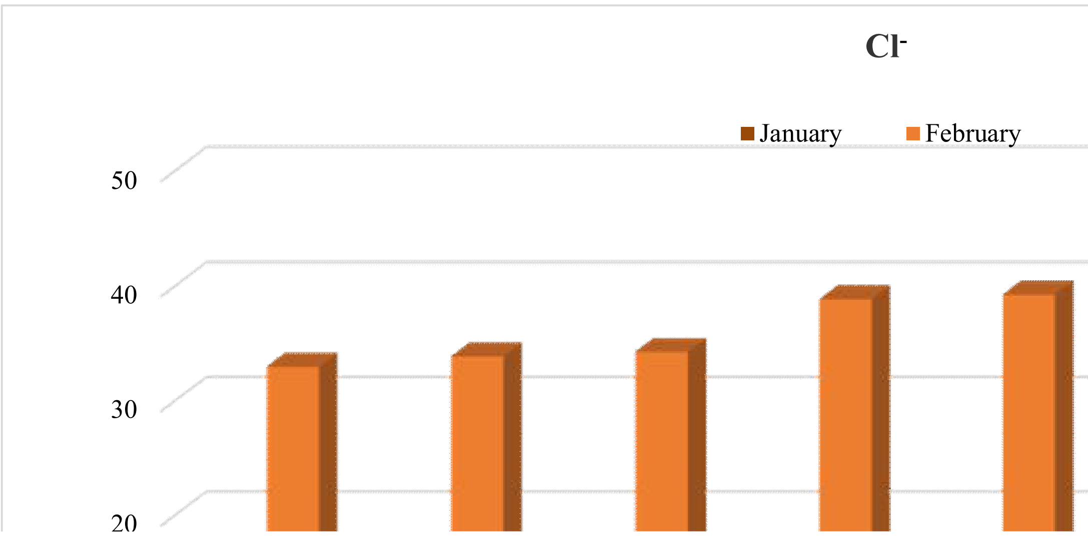

Fig. 11 Chloride ions in the Prut River, January-February 2015, mg/l (Cs - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Lv - Leova, C - Cahul, Cp - Cislita-Prut, G – Giurgiulesti)

In conclusion, in January-February 2015 the Prut waters fit the requirements on water quality for drinking purposes, according to the *Regulation on environment quality requirements for the surface waters* (2013) and, in most of cases, they belonged to the hydrogen carbonate class, group of calcium, type II (C^{Ca}_{II}), according to the classification of Aleokin (1970).

Nutritive (biogenic) elements

Nitrogen compounds. In winter 2015 the content of ammonium ions ($N\text{-}NH_4^+$) registered higher values in comparison with autumn 2014. In January in the Lower Prut the water quality may be assessed as of class I. The recorded concentrations of ammonium ions in February indicated a possible pollution – in five of eight cases the concentrations indicated the class of water quality II. Increased values were recorded at Braniste (0.32 mgN/l), Leuseni (0.34 mgN/l) and Cislita-Prut (0.3 mgN/l) stations (Fig. 12).

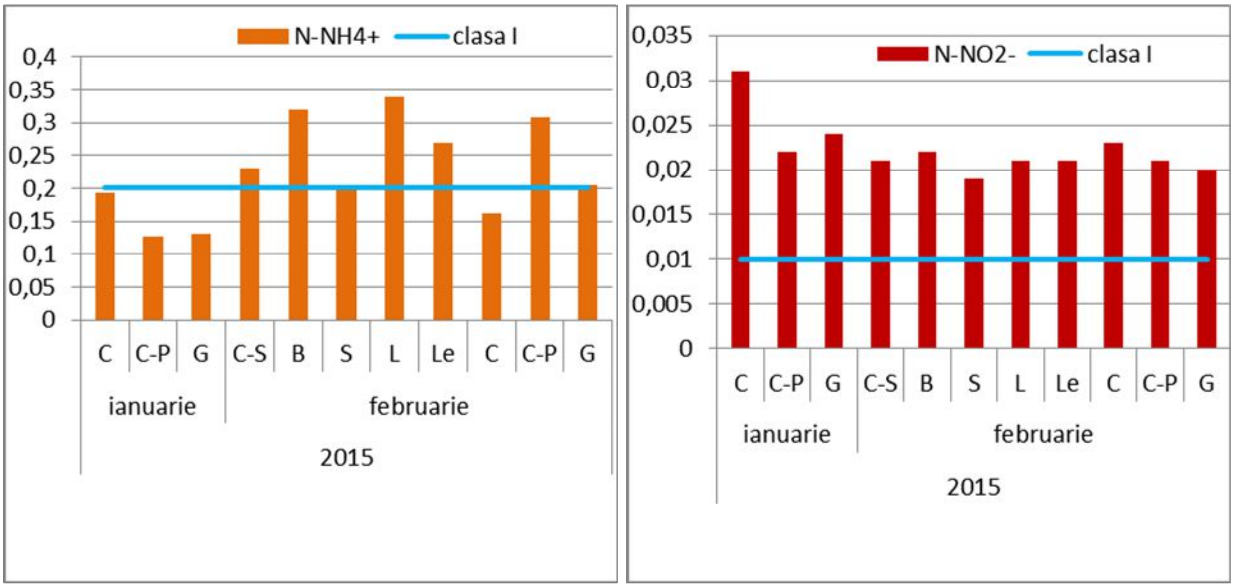

Fig. 12 Dynamics of ammonium ($N\text{-}NH_4^-$) and nitrite ($N\text{-}NO_2^-$) nitrogen in Prut River waters, January-February 2015, mgN/l (C-S - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Le - Leova, C - Cahul, C-P - Cislita-Prut, G – Giurgiulesti)

Nitrites were found in all analysed samples and their concentration indicated the class of water quality II. Their content in winter 2015 not exceeded 0.35 mgN/l, this figure being registered in January at Cahul station.

Also in January on the river sector Cahul-Giurgiulesti the content of nitrates formed more than 90% from the total content of mineral nitrogen (Fig. 13). In February in Costesti – Branişte – Sculeni – Leuşeni – Leova sector the share of nitrates in the mineral nitrogen was lower – about 70%.

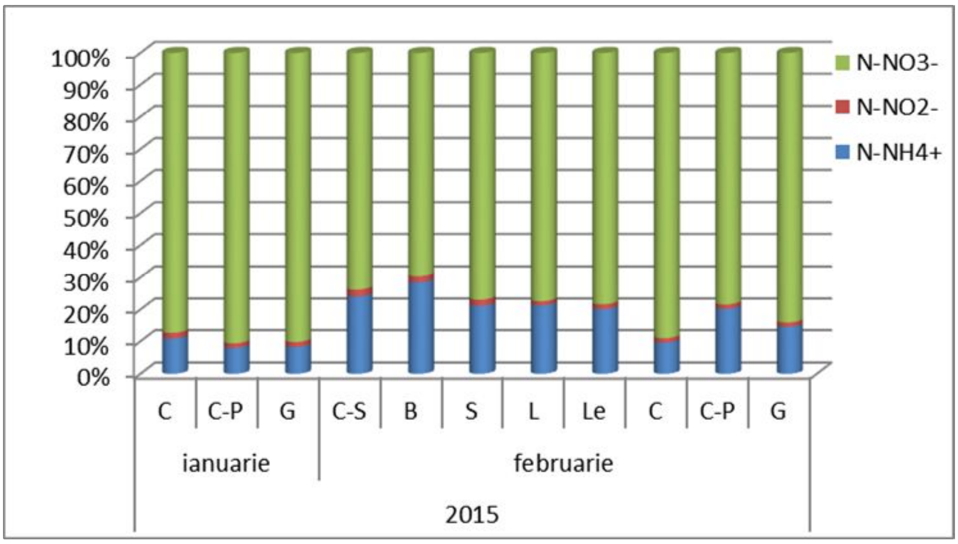

Fig. 13 Correlation between the mineral forms of nitrogen, Prut River waters, January-February 2015 (C-S - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Le - Leova, C - Cahul, C-P - Cislita-Prut, G – Giurgiulesti)

Phosphorus compounds. According to the content of mineral phosphorus, in winter period the water of the Prut River corresponded in all cases to the class of quality I. Anyway, the lower sector of the river – from Cahul to Giurgiulesti was characterized by a higher share of mineral phosphorus than upper sector - Costesti-Stinca– Braniste – Sculeni (Fig. 14).

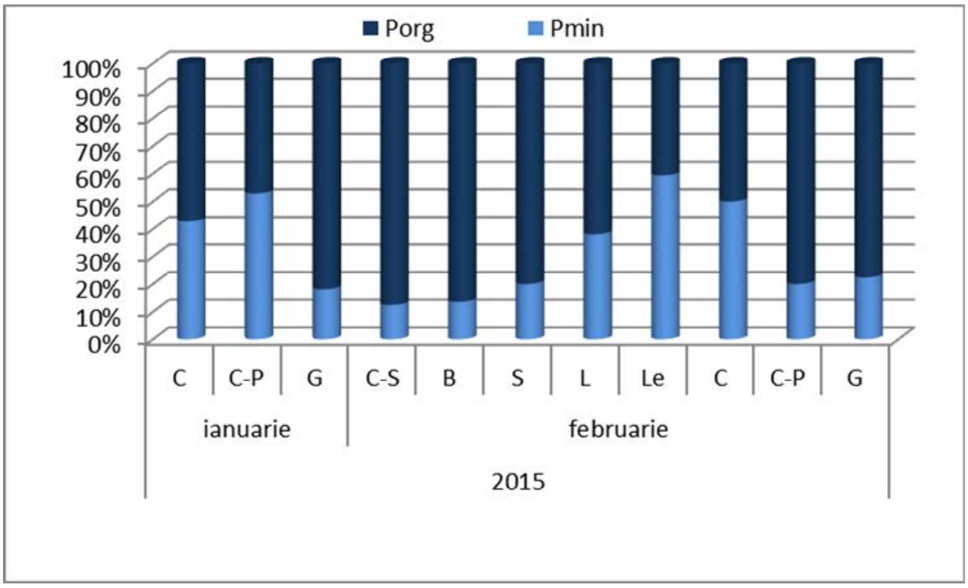

Fig. 14 Ratio between the mineral (Pmin) and organic (Porg) forms of phosphorus in the Prut River waters, January-February 2015 (C-S - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Le - Leova, C - Cahul, C-P - Cislita-Prut, G – Giurgiulesti)

If to compare with the results for summer and autumn 2014, than in winter 2015 in the dynamics of phosphorus compounds in most cases dominated the organic form, which share was more than 60% of the total content of phosphorus (Fig. 14).

The analysis of silicon in winter water samples demonstrated its lower content in comparison with previous seasons – summer and autumn. Its content not exceeded 2 mg/l (Fig. 15). This fact can be explained by the decrease of number of phytoplankton species in cold season.

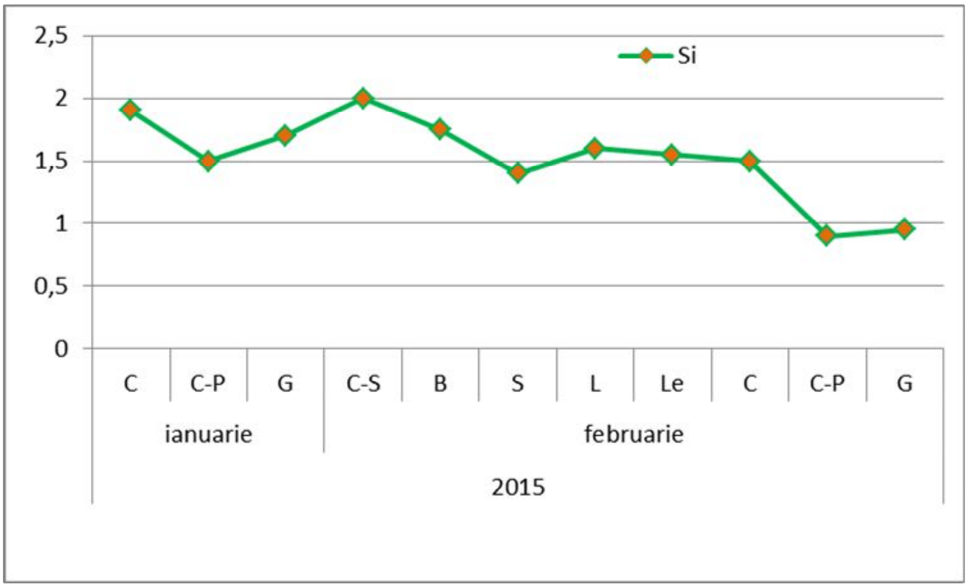

Fig. 15 Dynamics of silicon in the Prut River waters, January-February 2015, mg/l (C-S - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Le - Leova, C - Cahul, C-P - Cislita-Prut, G – Giurgiulesti)

HYDROBIOLOGICAL PARAMETERS

Bacterioplankton

From 8th November 2014 to 7th March 2015 there were collected and analysed 11 samples of bacterioplankton.

It was determined that the number (density) of total bacterioplankton ranged 0.4 (Giurgiulesti) – 4.4 (Sculeni) million cells/ml (Fig. 16). The number of saprophytic bacteria varied between 0.1 and 1.83 thousand cells/ml.

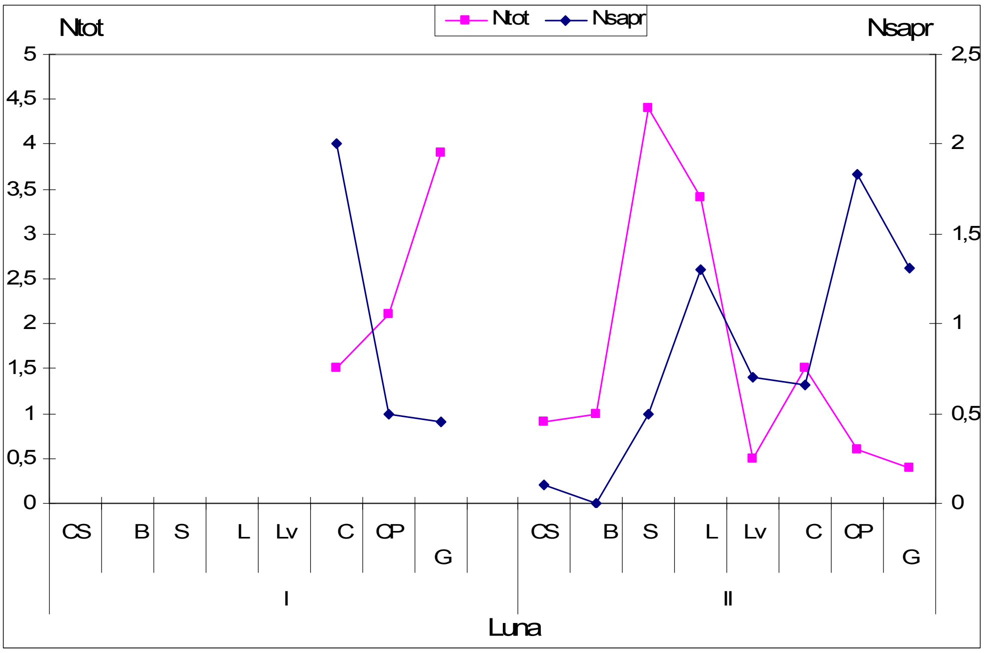

Fig. 16 Dynamics of total number of planktonic bacteria (Ntot, million cells/ml) and number of saprophytic bacteria (Nsapr, thousand cells/ml) in the Prut River, January - February 2015 (CS - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Lv - Leova, C - Cahul, CP - Cislita-Prut, G – Giurgiulesti)

The bacterial production (P) and destruction (R) in January-February 2015 not exceeded 0.52 cal/l in 24 hours and, respectively, 3.47 cal/l in 24 hours.

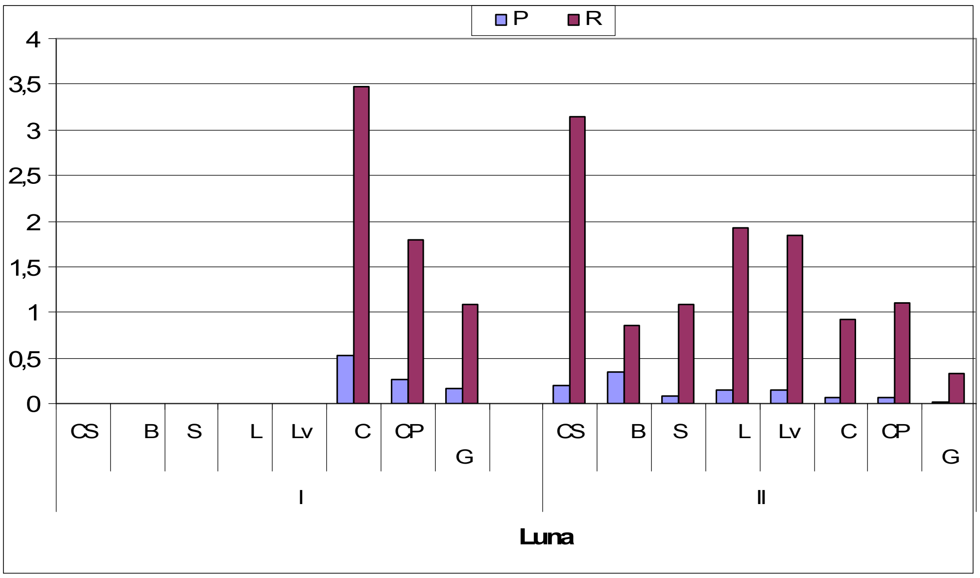

Fig. 17 Monthly dynamics of bacterioplankton production (P, cal/l in 24 hours) and destruction (R, cal/l in 24 hours) in the Prut River, January-February 2015 (CS - Costesti-Stinca, B - Braniste, S - Sculeni, L - Leuseni, Lv - Leova, C - Cahul, CP - Cislita-Prut, G – Giurgiulesti)

The physiological groups of microorganisms were identified for all investigated stations (Tab.1).

Table 1 Density of ecophysiological groups of microorganisms (thousand cells/ml) in the Prut River, January – February 2015

Station	Month	1*	2	3	4	5	6
Cahul	I	1.5	0.39	0.8	1	0.5	0.045
Cislita-Prut		1.2	0.35	0.89	0.83	0.41	0.037
Giurgiulesti		1	0.2	1.6	1.2	0.4	0.03
Costesti-Stinca lower sector	II	0.27	0.007	0.08	0.3	0.02	0.025
Braniste		0.35	0.011	0.06	0.4	0.01	0.035
Sculeni		0.78	0.08	0.3	0.39	0.7	0.154
Leuseni		1.8	0.095	0.25	0.53	2.8	1.2
Leova		0.5	0.35	0.26	1.2	1	0.3
Cahul		0.51	0.12	0.24	2.4	0.65	2
Cislita -Prut		0.29	0.11	0.29	2	0.3	1.1
Giurgiulesti		0.65	0.18	0.31	0.8	0.7	0.8

* groups of microorganisms: 1- ammonifying bacteria, 2 – denitrifying bacteria, 3 – phosphate solubilizing bacteria,4 – phosphate mineralizing bacteria, 5 – amylolytic bacteria, 6 – cellulosolytic bacteria.

Phytoplankton

During 08.11.2014 – 07.03.2015 there were collected 22 samples of phytoplankton from Costesti-Stinca reservoir and the Prut River, stations: Costesti, Braniste, Sculeni, Leuseni, Leova, Cahul, Cislita-Prut and Giurgiulesti.

In winter period there were identified 41 species in the composition of phytoplankton from the Prut River: *Cyanophyta* - 5, *Bacillariophyta* - 25, *Chlorophyta* - 7, *Euglenophyta* - 3, *Desmediales* – 1. From quantitative point of view, in February 2015 there was established a continuous grow up of phytoplankton density from Sculeni station (0.91 million cells/l) to Giurgiulesti station (3.9 million cells/l). The values of biomass in winter ranged 0.97-7.12 g/m^3, growing up from Sculeni to Cislita-Prut stations (Fig. 18).

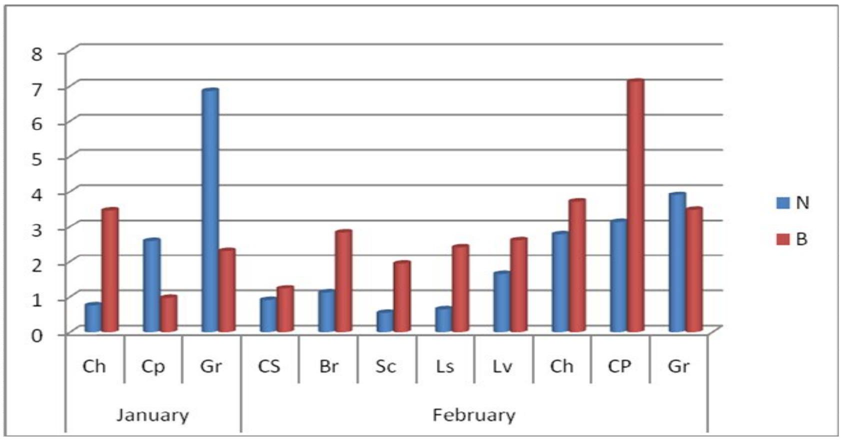

Fig.18 Density (N, million cells/l) and biomass (B, g/m^3) of phytoplankton in the lower part of Costesti-Stinca reservoir (CS) and the Prut River, January – February 2015 (Br- Braniste, Sc-Sculeni, Ls-Leuseni, Lv-Leova, Ch-Cahul, Cp-Cislita-Prut, Gr-Giurgiulesti)

Being dominated by bacillariophyte algae from genera *Cyclotella, Synedra, Navicula* and *Cymbella*, the phytoplankton had higher biomass than density at the most of investigated stations. The cianophytes were found in the lower sector of the river, from Leova to Giurgiulesti stations, being represented by the species *Oscillatoria lacustris, Oscillatoria planctonica* and *Synechocistys aquatilis*. Only in the lower part of Costesti-Stinca reservoir the structure of phytoplankton was dominated by pyrrophyte algae and more exactly – the species *Glenodinium gymnodinium* (Fig. 19).

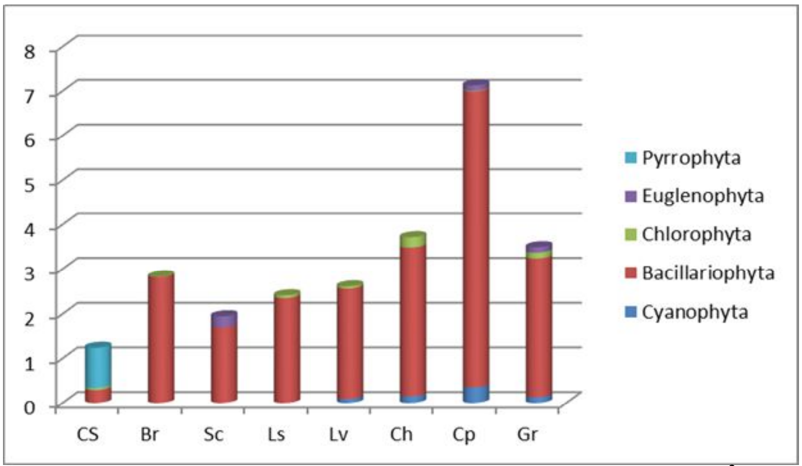

Fig. 19 The role of the main groups of algae in the formation of biomass (g/m^3) of phytoplankton in the lower part of Costesti-Stinca reservoir (CS) and the Prut River, February 2015 (Br- Braniste, Sc-Sculeni, Ls-Leuseni, Lv- Leova, Ch-Cahul, Cp-Cislita-Prut, Gr-Giurgiulesti)

In conformity to values of saprobic index (*S*), which was calculated on the base of quantitative parameters of planktonic algae, in February 2015 the water of the Prut River fit to class of quality II (good) and III (moderately polluted) (*S* ranged 1.58-2.23). A higher degree of pollution of Prut waters was found at Leuseni, Cislita-Prut and Giurgiulesti stations (Fig. 20).

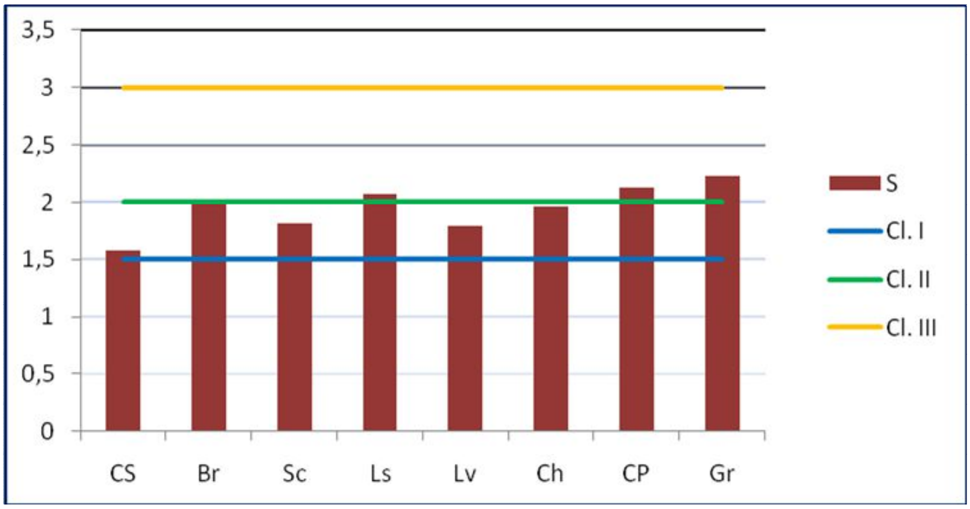

Fig. 20 Values of saprobic index (S) in Costesti-Stinca reservoir and the Prut River according to indicator species of phytoplankton, February 2015

Zooplankton

Hydrological situation in January 2015 was not favourable for collection of zooplankton samples at a part of monitored stations. Due to this fact, from 8th November 2014 to 7th March 2015 there were collected 10 quantitative samples of zooplankton as following: Costesti - 1, Braniste - 1, Sculeni -1, Leuseni -1, Leova -1, Cahul -2, Cislita-Prut -1 and Giurgiulesti -2. There were indentified 19 taxa from the main groups of zooplankton: 12 – *Rotifera* (63.2 %), 6 – *Copepoda*

(31.6 %) and 1 – *Cladocera* (5.3 %). This ratio of taxa in zooplankton communities (Fig. 21) is pretty typical for winter biocenosis of frozen rivers and is caused by physiological characteristics of hydrobiontes, as well as the presence of food base in winter for each group of zooplankton. Even at water low temperatures the eurythermale species of rotifers have sufficient food: protozoa, flagellate algae, diatoms, detritus and bacterioplankton. The complex of rotifers in winter biocenosis is represented by species *Brachionus angularis*, *B. nilsoni*, *B. quadridentatus*, *Cephalodella ventripes*, *Filinia longiseta*, *Keratella quadrata*, *Polyarthra dolichoptera*, *Rotaria rotatoria*, *Synchaeta grandis*.

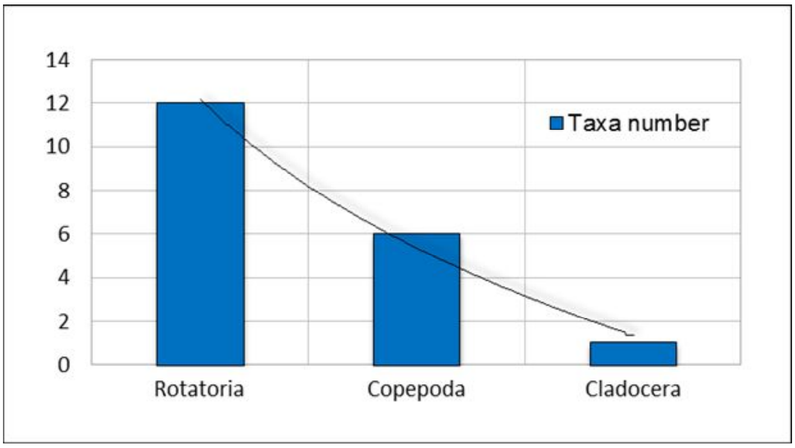

Fig. 21 The number of taxa from the main groups of zoolankton in the Prut River and Costesti-Stinca reservoir (January-February 2015)

Despite the difference in climate and hydrological conditions, the same tendency of distribution of species along the course of the Prut River was remarked in winter sezon 2015 and July –October 2014 (Fig. 22). This trend of reducing species diversity of zooplankton in Sculeni-Leova sector is an indicator of unfavourable environmental conditions for this group of aquatic organisms, whose representatives are usually used to assess current contamination.

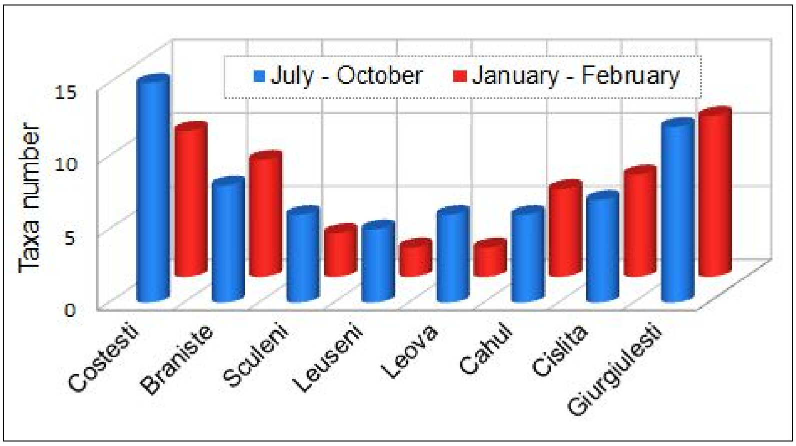

Fig. 22 The number of zooplankton taxa in the Prut River and Costesti-Stinca reservoir in two hydrological seasons: July – October 2014 and January-February 2015

Taxonomic structure of zooplankton communities in winter in the form of relative abundance is presented in Fig. 23. The dominance of rotifers in zooplankton communities is an indicator of increasing ecosystem trophicity (Крючкова, 1987; Садчиков, 2007). Taking in account this fact, we can assume that the concentration of biogenic elements in the Prut water was higher in January.

According to density, the rotifers were the dominant group in January, and copepods – in February. In the last case the numerical domination of copepods was determined by the adult forms (*Acanthocyclops gigas*, *A. viridis*, *Cyclops viridis*, *Mesocyclops leuckarti*, *Metadiaptomus asiaticus*) in Costesti-Braniste sector, and by larval (nauplius) form of this group of crustaceans.

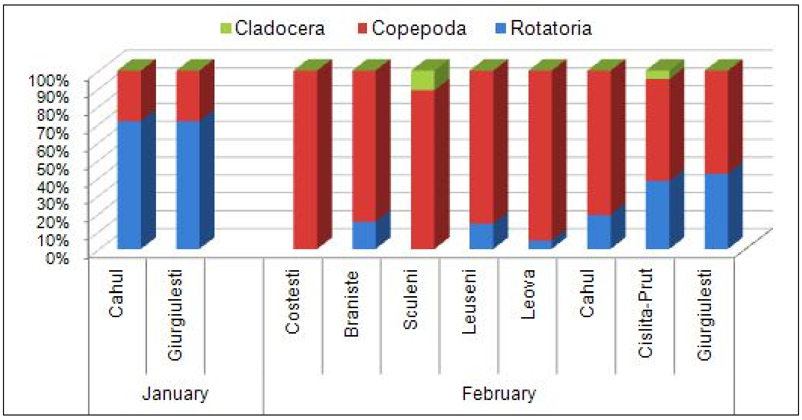

Fig. 23 Relative numerical abundance of zooplankton taxonomic groups in the Prut River and Costesti-Stinca reservoir, January-February 2015

74% (14 species) of identified taxa in zooplankton samples in winter season are indicator organisms. The distribution of zooplankton species according to the group of saprobic indicators for monitored area of the Prut River and Costesti-Stinca reservoir is given in Fig. 24,*a*.

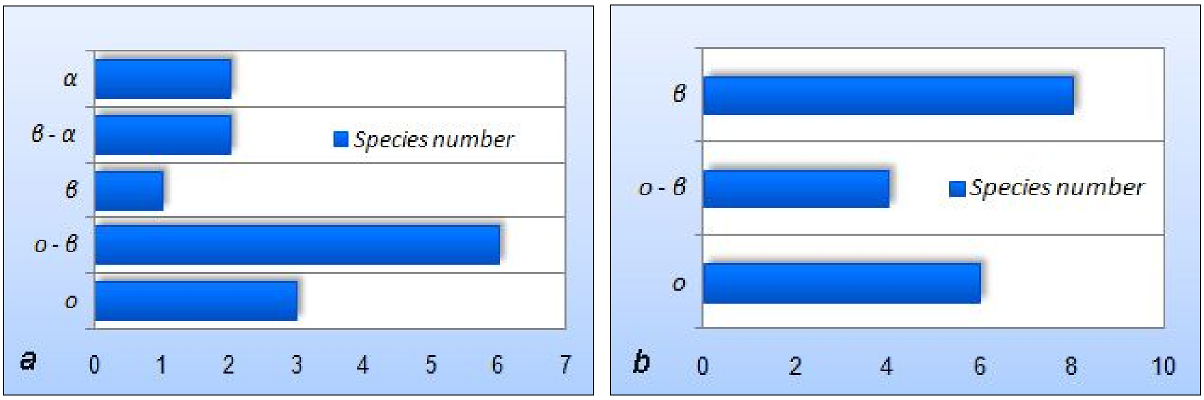

Fig. 24 Distribution of zooplankton species according to the grup of saprobic indicators, the Prut River and Costesti-Stinca reservoir (*a*: January – February 2015; *b*: July – October 2014)

In conformity with Fig. 24, it can be concluded that the diapason of saprobitiy zones in winter season is larger (5 zones) than that in summer-autumn season (3 zones). This can mean that in winter the habitat conditions were more differentiated and the general vector of saprobity moved from *β*-mezosaprobic zone into oligo-*β*-mezosaprobic zone (Fig. 24, *a* - *b*).

Macrozoobenthos

There were collected more than 20 samples of benthic macroinvertebrates from the Prut River and Costesti-Stinca reservoir from 08.11.2014 to 07.03.2015, and namely in January and February 2015. Species composition, structural characteristics of macrozoobenthos were studied and the water quality was assessed based on macrozoobenthos indicator organisms.

Thus, a similar tendency in the distribution of density and biomass of benthic invertebrates was observed as in the previous sampling period and more exactly a reduction along the course of the Prut River (Fig. 25-28)

The highest value of density was registered in February at Braniste station - 21710 ind./m^2 of zoobenthos without mollusks and total zoobenthos, the significant part of this value consisted of *Echinogammarus ischnus behningi* (Martynov 1919) - 7920 ind./m^2 and *Eukiefferiella sp.* - 7960 ind./m^2 (Fig. 25-26).

The highest value of total biomass was registered at Sculeni station -1358.98 g/m^2, the main part of biomass being formed by mollusks: *Dreissena polymorpha* (Pallas, 1771) - 995.76 g/m^2, *Dreissena bugensis* (Andrusov, 1897) - 210 g/m^2, *Fagotia acicularis* (Férussac, 1823) - 126.44 g/m^2 (Fig. 27-28).

The lowest value of density of total zoobenthos was recorded at Giurgiulesti station - 40 ind./m^2 (Fig. 25-26), and of total biomass - at Costesti-Stinca stations – 1.032 g/m^2 in February (Fig. 27-28).

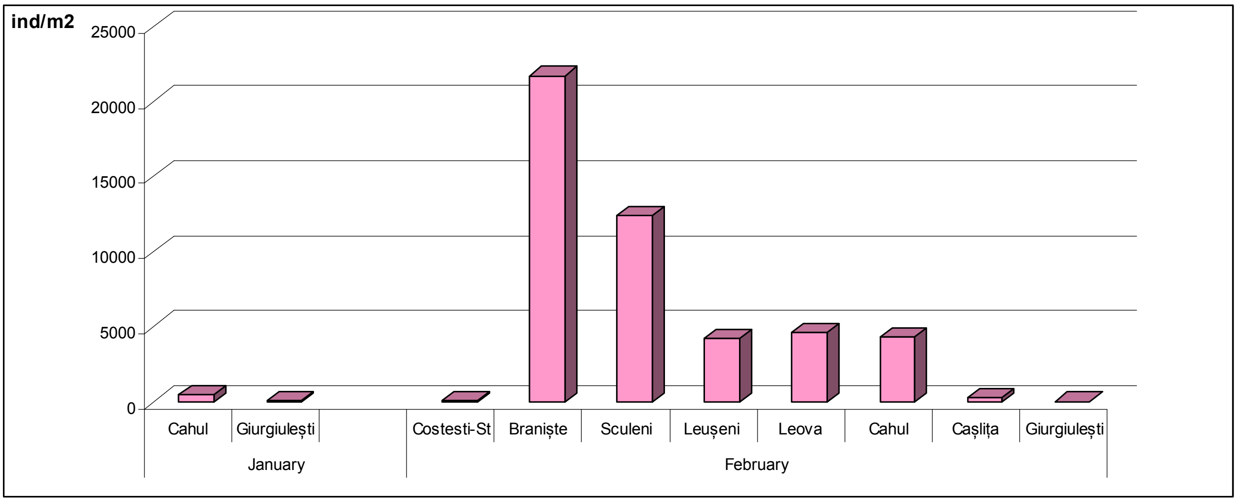

Fig. 25 Density (ind./m^2) of total zoobenthos in the Prut River, January – February 2015

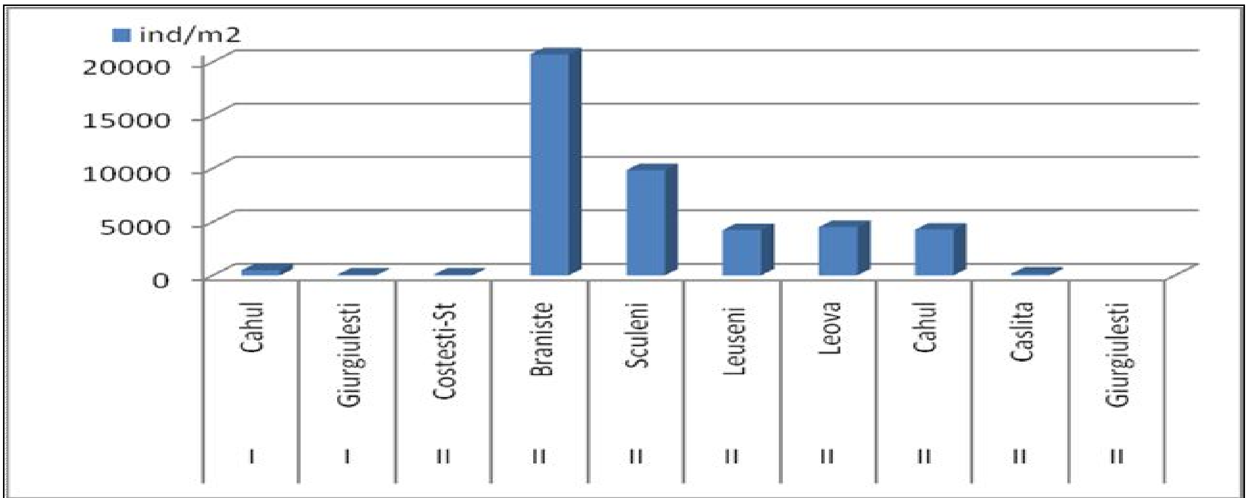

Fig. 26 Density (ind./m^2) of zoobenthos without molluscs in the Prut River, January (I) – February (II) 2015

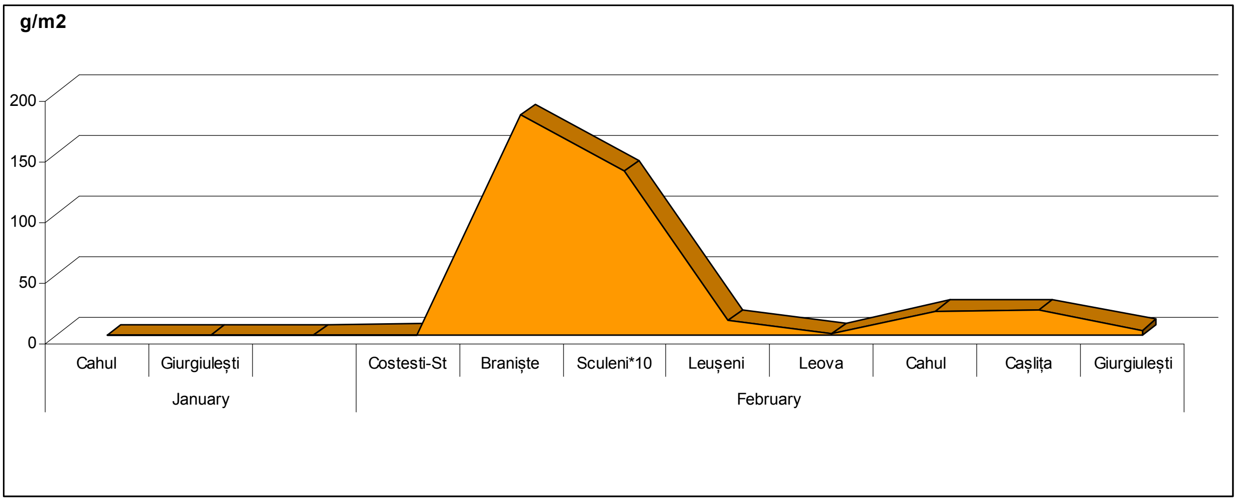

Fig. 27 Biomass (g/m^2) of total zoobenthos in the Prut River, January – February 2015

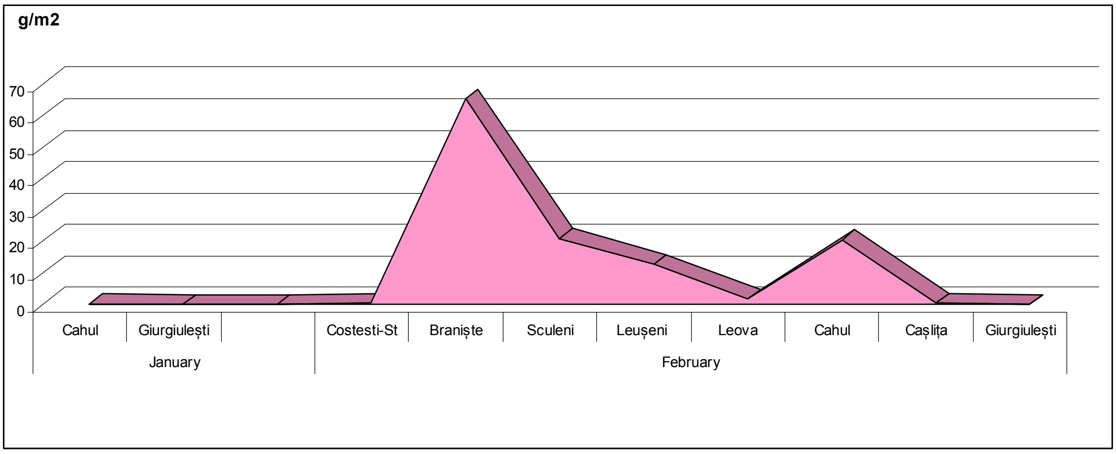

Fig. 28 Biomass (g/m^2) of zoobenthos without molluscs in the Prut River, January – February 2015

In winter 2015 the total number of invertebrate taxa reached 52, including 4 - taxa of *Annelida,* 11 - of *Chironomidae,* 8 - of *Crustacea*, 5 - of *Ephemeroptera*, 5 - of *Trichoptera*, 6 - of *Gastropoda,* 3 - of *Bivalvia* and 10 - taxa of other groups (Hydra, Nematoda, Collembola, Odonata, Heteroptera, Coleoptera). According to this data, the highest biodiversity was registered for *Chironomidae*. Among sampling points the highest biodiversity was characteristic for Braniste - 23 invertebrate taxa. The lowest level of biodiversity was registered at Giurgiulesti station- only 1 species - *Lithoglyphus naticoides* (Pfeiffer 1828) (Fig. 29).

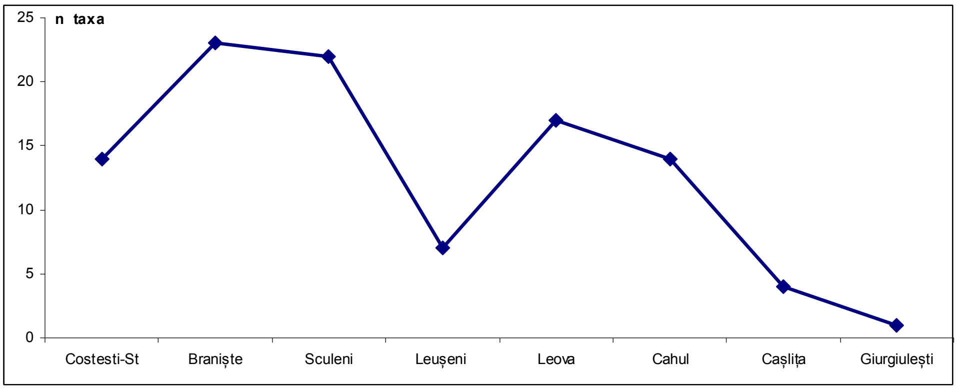

Fig. 29 Biodiversity of benthic macroinvertebrates by sampling points, February 2015

The saprobity index was calculated based on macrozoobenthos data from February 2015. According to obtained results, its values ranged 1.41 – 3.64, which revealed a wide range of saprobity zones – from oligosaprobic to polisaprobic and of water quality – from class I (very good) at Costesti station to class V (bad) at Cahul station (Fig. 30, Tab. 2).

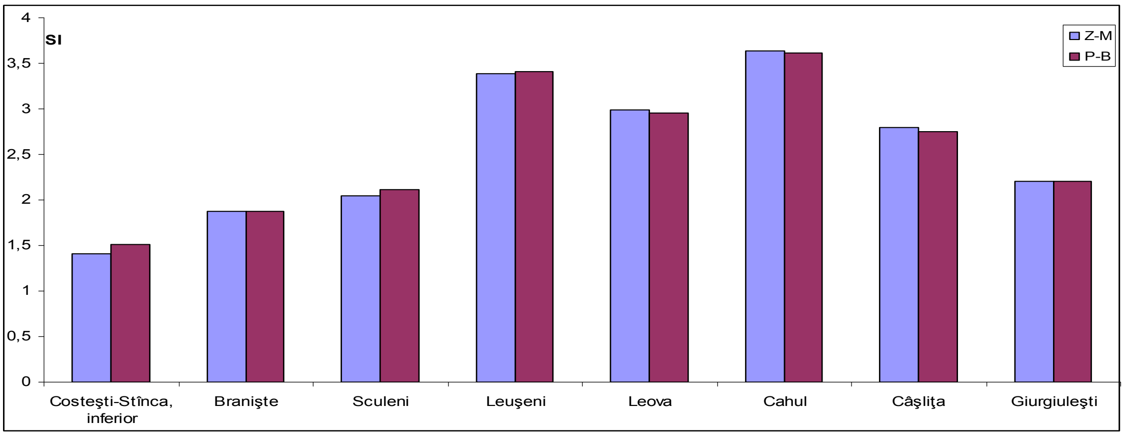

Fig. 30 Macrozoobenthos saprobic index (Z-M - Zelinka-Marvan, P-B - Pantle – Buck), lower part of Costesti-Stinca reservoir and the Prut River, February 2015

Table 2 The values of saprobic indices Zelinka-Marvan (Z-M) and Pantle – Buck (P-B) based on macrozoobenthos data, saprobic zone and the water quality class, lower part of Costesti-Stinca reservoir and the Prut River, February 2015

Sampling stations	Number of indicator species	Saprobic index Z-M	Saprobic index P-B	Water quality class	Saprobic zone
Costesti-Stinca	13	1.41	1.51	I	oligo- β-mesosaprobic
Braniste	16	1.88	1.88	II	β-mesosaprobic
Sculeni	15	2.04	2.11	II	β-mesosaprobic
Leuseni	5	3.39	3.41	V*	α- mesosaprobic
Leova	12	2.99	2.95	IV	α- mesosaprobic
Cahul	11	3.64	3.61	V	polisaprobic
Cislita-Prut	4	2.79	2.75	IV*	α- mesosaprobic
Giurgiulesti	1	2.2	2.2	II*	β-mesosaprobic

*If the number of indicator taxa is less than 10, than the identified class of water quality is not certain.

Ichthyofauna

Nowadays the dramatic effects of biological invasions for natural ecosystem functionality are well known, being, however, understood too late by humankind. In most cases, due to unreasonable anthropogenic activities, the habitats of native fish species were degraded, and in this way the self-expansion and proliferation of non-native species was facilitated implicitly.

According to our estimation, the presence of more than 30 alien fish species have been reported in the natural aquatic ecosystems of the Republic of Moldova since XX century, but only 4 of them are considered real invaders of natural aquatic ecosystems: *Carassius auratus s. lato*, *Perccotus glenii* Dybowski, 1877, *Pseudorasbora parva* (Temminck et Schlegel, 1844) and *Lepomis gibbosus* (L., 1758).

Currently, *Carassius auratus s. lato* became a multi dominant species in the ecosystem of the Lower Prut. Due to specific abiotic conditions in the natural lakes Beleu and Manta, it formed ecotypes with slow growing and an exceptional competitive ability, having a direct tangency with the almost total disappearance of the native species *Carassius carassius* (Linnaeus, 1758) and *Tinca tinca* (Linnaeus, 1758).

In the ecosystem of the Lower Prut the species *Perccottus glenii* (Dybowski, 1877) is met accidentally, but upstream the Costesti-Stinca dam (the basin of the Middle Prut) it demonstrated much higher quantitative values (Bulat ş.a., 2014). Its enough high numerical abundance in the irrigation channels in the area of locality Isaccea (Romanian Danube) not excludes its expansion in the Prut River in two directions simultaneously: from Danube (Năstase, 2008) and from the network of small rivers from the north of the country (Moşu, 2007).

Currently, *Pseudorasbora parva* (Temminck & Schlegel, 1846) demonstrates high quantitative values in flooding areas, tributaries of the Prut River and riverbed lakes. *Lepomis gibbosus* (Linnaeus, 1758) is especially numerous in flooding areas and drainage channels in the Lower Prut zone; in the other biotopes it occurs quite rarely.

Besides the naturalized alien species with invasion effect, a fairly large ecological group of intervenient fish species is distinguished, most of them having Pontic-Aral-Caspian and Mediterranean origin. Primarily, they have established in coastal marine biotopes or estuaries, but have spread rapidly upstream rivers with the start of hydrotechnical works on major rivers and water streams (the first half of XX century) and destruction of natural barriers, which have been formed in the period of glacial transgressions.

The captures of *Gobiidae* from the Prut River consisted mainly by the species *Neogobius fluviatilis*, *Babka gymnotrachelus*, in some places by *Proterorhinus semilunaris, Ponticola kessleri* and *Neogobius melanostomus* (especially in the area of Giurgiulesti port).

For the first time the species *Benthophilus nudus* (Berg, 1898) was registered in the Prut River (downstream the Cislita-Prut station); this species was not previously mentioned in the specialized literature related to ichthyofauna of the Prut River.

The information on biological characteristics of the taxon is ambiguous and full of unclear details. It is known that *Benthophilus nudus* (Berg, 1898) is a lithophylous, zoobenthophagous species. It reaches the sexual maturity at one year old, and reproduces in May-June. A female of 5-8 cm in length lays in average 1500 eggs (from 700 to 2500), and perish after the spawning. The male protect the clutch of eggs till the embryo hatching, and after that also perish (Fig. 31).

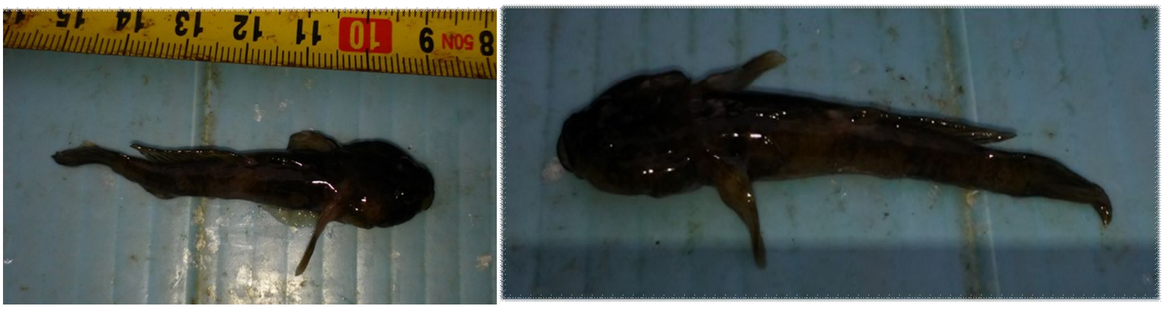

Fig. 31 Complete degeneration of tissues at breeders of *Benthophilus nudus* after reproduction

In fact this species lives only a year. After hatching the fry feed with zooplankton, and later switch to worms, insect larvae, molluscs and fish fry. The feeding becomes more intense during night.

The authors recorded for the first time this species in the Prut River in spring of 2015, in the area of Cislita-Prut port, which was construction in 2014. The control fishing with dredge (1.0 x 0.5 m) revealed a quite high numerical abundance of this species in captures – 15 individuals. By repeating ten times control fishing, it was determined that *Benthophilus nudus* (Berg, 1898) belongs to the category of dominant (D4 – 5.7%), accessory (C2 – 50%) and satellite (W3 – 2.8%) species, which put in evidence the pronounced affinity of this fish for given habitat (Fig. 32).

Fig. 32 The Black Sea tadpole-goby - *Benthophilus nudus* (Berg, 1898) – a recently recorded species in the Lower Prut riverbed

After the construction of Cislita-Prut port, significant changes in the ecology of many fish species were observed. As result of noise and mechanic pollution of such narrow lotic hydrobiotop, the reproductive, wintering and trophic migrations of fish from Danube River into Prut and vice versa were disturbed.

But some opportunistic species, on the contrary, have concentrated in the port area, where can find abundant food (grain dropped into water during ship loading). The species which the most profited from the building of the port is Prussian carp (*Carassius gibelio* (Bloch, 1782)) – it is a eudominant (D5 – 52.7%), euconstant (C4 – 100%) and characteristic (W5 – 52.6%) species in the captures. Its numerical abundance was of 139 individuals. From the group of economically valuable fish species, in the captures were found juveniles of carp (D3- 4.2 %), which is lured by easily accessible food (Tab. 3).

Table 3 Ecological indices calculated for the bottom dregde (1.0 x 0.5 m, number of dredgings =10, distance of one dredging =10 m), Prut River, Cislita-Prut

Nrd.	**Species**	An	**D**		**C**		**W**	
			%	Class	%	Class	%	Class
1.	*Benthophilus nudus* (Berg, 1898)	15	5.7	D4	50	C2	2.84	W3
2.	*Carassius gibelio* (Bloch, 1782)	139	52.7	D5	100	C4	52.65	W5
3.	*Vimba vimba* (Linnaeus, 1758)	8	3.0	D3	30	C2	0.90	W2
4.	*Neogobius fluviatilis* (Pallas, 1814)	13	4.9	D3	50	C2	2.46	W3
5.	*Proterorhinus marmoratus*	6	2.3	D3	30	C2	0.68	W2
6.	*Rutilus rutilus* (Linnaeus, 1758)	18	6.8	D4	70	C3	4.77	W3
7.	*Sygnatus abaster*	6	2.3	D3	20	C1	0.45	W2
8.	*Blicca bjoerkna* (Linnaeus, 1758)	7	2.7	D3	20	C1	0.53	W2
9.	*Gymnocephalus baloni* (Holcík & Hensel, 1974)	8	3.0	D3	20	C1	0.60	W2
10.	*Gymnocephalus cernua* (Linnaeus, 1758)	8	3.0	D3	30	C2	0.90	W2
11.	*Cyprinus carpio* Linnaeus, 1758 (juveniles)	11	4.2	D3	30	C2	1.25	W3
12.	*Alburnus alburnus* (Linnaeus, 1758)	15	5.7	D4	30	C2	1.70	W3
13.	*Abramis brama* (Linnaeus, 1758)	5	1.9	D2	20	C1	0.38	W2
14	*Cobitis taenia* (Linnaeus, 1758)	5	1.9	D2	20	C1	0.379	W2
H=2.7		$\mathbf{H_{max}=3.8}$		**e≈19%**		**Is=0.31**		

The penetration of *Benthophilus nudus* (Berg, 1898) into the Prut River shall be considered as an inevitable process in the current ecological conditions of increasing anthropogenic pressing, which facilitated the biological progression of this fish species and enlargement of its primary area of distribution. Previous studies (Bulat ș.a., 2014) revealed an increasing abundance of this species in Dniester River and its systematic occurrence in fish captures, collected in the Lower Danube during expeditions from autumn of 2014 (being quite numerous near Isaccea station).

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