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Nistru river - trends of environmental change

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Abstract. The construction of Novodnestrovsc barrage on middle course of Nistru provoked the modification of hydrologic, hydrochemical, hydrobiologic, ecologic and thermal regimes of middle and lower course of Nistru River. The changes had a strong impact upon Nistru water quality and chemistry, caused strong negative restructuring of hydrobiont communities, influenced the species diversity and the quantitative development of aquatic fauna, which registered a considerable decrease, lead to the essential diminishing of Nistru river economic potential. Species particular for the flowing water have disappeared and new species appeared that are particular for lentil water, which prove that Nistru is gradually changing from a river into a lake with still water. To stop and decrease the process of ecological degradation of Nistru river there are necessary measures to reconstruct Novodnestrovsc and Naslavcea barrage on Ukraine territory, to avoid the deviation from the original project documentation during the construction period and to accomplish the stipulations of international environment treaties regarding the minimizing of ecological impact upon the surface waters and of prejudice provoked to the Republic of Moldova economy. The absence of an unified interstate mechanism of complex use of Nistru River natural resources lead to the degradation of biological resources, essential diminishing of biodiversity and of economic potential of Nistru river.
Key Words: Convention, Nistru River, environment protection, biodiversity, ecological security, implementation instrument.

Introduction. Nistru is a trans-boundary river that traverses Ukraine and Republic of Moldova from north to the south and overflow into the Black Sea. Nistru river basin occupies 57% from the republic territory and constitutes the main fresh water source for this basin locality from Republic of Moldova, as well as for south Ukraine. Nistru insure about 54% from the RM economic necessities in aquatic resources. For RM, as densely populated territory (about 129 people per km^2), the water insurance quota of one person with local water is about 0.332 thousand m^3/year. Nistru River with its water resources represents a major importance for alimentary security of the population, for industrial and agrarian development.

Nistru river basin, while traversing the territories of Ukraine and RM, is subject to intense growing anthropogenic press, provoked by the impact of industrial, agrarian, energy generation and manage waste pollution sources.

The long term observation of the ecological state showed that Nistru River slowly but categorically lose its economical value as fresh water and water product source. The bilateral collaboration between Republic of Moldova and Ukraine in the problem of ecological degradation process diminishing of Nistru river until present didn't reach any practical results, which fact endanger the wellbeing and the health of the people from middle and lower course of Nistru. At present the collaboration process based on Collaboration Accord from 1994, morally outdated, is developing with difficulty and the ecological state of Nistru continues to degrade.

The gravity of the problem is also realized by the international community that implicated actively by its organisms, OSCE and CEE of UNO, to help RM and Ukraine in development of bilateral collaboration relations, which will correspond to the principles of water Frame-Convention of UE and to the Conventions regarding the protection and use of transboundary waters and international lakes, Helsinki 1992, regarding the collaboration on transboundary water courses. The following project „Nistru-3" under the care of OSCE/CEE of UNO is now acting, within which was determined that the

biodiversity protection must become a priority problem in transboundary collaboration between RM and Ukraine for the following period.

Regardless all the accomplished meetings, Ukraine didn't present to RM the document regarding the evaluation of ecological impact upon the environment of the thermo-electric power station (Cuciurgan), within the accord project regarding the functioning of Dnestrovsc electric power station, there are no foreseen any ecological compensations from Ukraine part for the prejudice brought to Nistru river and to aquatic ecosystems from the territory of RM. The documents, on which basis can be evaluated the ecological damage and determined the compensatory volume, are elaborated by the international community, but they seem to be inexistent for Ukraine.

Republic of Moldova is interested in solving the problems of Nistru River, taking into account its importance for the economy of the republic. Taking into consideration the globalization process of ecological problems, RM is open for any local and international collaboration, which fact was accomplished by the adhesion of Republic of Moldova to 18 international environment Conventions, to the signing of many bilateral and multilateral agreements with neighboring countries Romania and Ukraine.

The project „Management of water quality and biodiversity protection in lower course of Nistru River" is now acting, the bilateral Convention between Republic of Moldova and Ukraine regarding the use of aquatic, biological resources and biodiversity conservation of Nistru river is elaborating at present.

With all its intense activity in the field of environment, RM is encountering many problems, which until present couldn't be solved within bilateral agreements. An important task is the ceasing of ecological decline of Nistru River, provoked by irresponsible attitude of Ukrainian authorities toward environment problems. These problems can be solved only within international treaties with the assistance of international community.

Material and methods

Study object. It is represented by the quality and evolution trends of aquatic ecosystems of Nistru River; sources of ecological impact; parameters that characterize the ecological status of Nistru basin ecosystems components.

Study method. The evaluation of the ecological status of Nistru River was accomplished by analyzing the existing scientific data from the specialty reference material regarding the water quality, hydrological, hydrochemical, biological parameters of Nistru river ecosystems and the juridical aspects.

Results

Sources of ecological impact. Nistru river basin is characterized by a high concentration of industrial enterprises with high potential of ecological risk.

In its upper course an economical multi-branch complex is functioning, characterized by a high concentration of industrial enterprises of mineral deposits extraction, of machine tool, radio-electronics, of light industry, of chemical, oil, alimentary etc. The majority of the enterprises are located in Lvov and Ivano-Francovsk regions, where 70% from Nistru debit is forming.

Another industrial complex with significant ecological impact is situated in the middle part of the basin – Chisinau, Tiraspol, Tighina cities.

On the whole river course several small town are situated with highly pollutant enterprises, including the cement factories from Rezina and Râbniţa, metallurgical work from Râbniţa.

In the middle course of the river Dubasari accumulation reservoir is built, while on Turunciuc river – Nistru tributary Cuciurgan accumulation Lake is built that is used as refrigerant lake for thermo-electric power station from Dnestrovsc.

Dubasari barrage closed the migration route toward the reproduction places for valuable migratory fish species and stopped the downstream movement of gravel and sand from Carpathians.

Cuciurgan accumulation lake provokes significant diurnal oscillations of Nistru level and temperature, increase the water turbulence and lead to the increasing of water mineralization level from Cuciurgan accumulation lake, which increased from 0.6 g/l in 1960 to 1.1 g/l at present.

In 1985 on the middle course of the river, at the entrance of Nistru on the territory of Republic of Moldova, the barrage of Ukrainian hydro-electric power station from Novodnestrovsk was built in a defile with a width of 54 m. The water evacuation takes place from the inferior level. The eliminated water temperature is practically constant, of 6-8^{o}C, during the whole year. The water downstream the barrage has an oxygen insufficiency, contain the decomposing produces of organic substances. The chemical composition of the water is influenced not only by the water volume from downstream the barrage, but also by which level of accumulation lake the water is eliminated [10, 14].

Downstream of this barrage another barrage is built-up, the tampon-reservoir from Naslavcea, with the destination to regulate the flow of Nistru river. Because it was built with deviation from the initial project, especially of ecological requirements, it doesn't complete its destination. The river discharge depends on the work regime of Novodnestrovsc hydro-power station and on the water volume flowed from the accumulation lake. The daily, seasonal and annual alternations of water discharge modified strongly the hydrologic regime of Nistru downstream Naslavcea.

Water quality. The thermal regime of middle Nistru is strongly influenced by the regulation of river discharge with the cold water mass from Novodnestrovsc accumulation Lake. The water samples collected on 24.04.03 at 200 m downstream Naslavcea barrage had the temperature of 4.2^{o}C. The influence of cold water flow upon the thermal regime of the river lasted up to Dubasari barrage. The mean temperature for the period 2005-2007 downstream Naslavcea reservoir reached in spring the value of 8.7^{o}C, in summer – of 15.5^{o}C, in autumn – of 10.1^{o}C [10, 14].

For the same period the water mineralization of Nistru river downstream Naslavcea barrage was of 257.4-416.7 mg/l of type hidrogen-carbonat-chloric or hidrogen-carbonat, group of calcium, sodium or calcium-sodium group. The mean annual values for 2005-2006-2007 had respectively the values 321.4; 301.8 and 389 mg/l. Near Otaci town the water mineralization was varying within the limits 428–497 mg/l. The total hardness of Nistru water near Naslavcea village during April–May of 2003 was varied within the limits 3.8–5.2 mmol/l. The pH value was within the limits 7.1-8.3. The value of redox potential (Eh) was in the limits 277-383 mV [4, 5, 14].

The solved oxygen content in 2005-2007 downstream Naslavcea tampon-reservoir varied from 4.42 to 13.3 mg/l. The saturation degree of water with solved oxygen at the normal level can be observed only in spring months and was of 67.4–70%. After the values of CBO_5 the Nistru waters in the sector Naslavcea – Dubăsari in summer season were characterized as polluted and moderately polluted. The CBO_5 index had the values lower than LAC (limited admissible concentrations) only in the section of Naslavcea village in July and September. From Naslavcea barrage into the river penetrated waters with $CCOCr_5$ values between 0.6-4.5 mgO_2/l [4, 5, 14].

In the same period the Nistru waters downstream the barrage contained 0.008-0.054 mg/l nitrites and from 1.9 mg/l to 13.3 mg/l ions of nitrates. After the content of ammonium ions content the river water in summer and autumn the water quality was classified as moderately polluted, with concentrations of 0.01 and 0.068 mg/l. The mean seasonal concentration (spring-summer-autumn) of phosphate ions on Nistru sector near Naslavcea village had the values of 0.625; 0.312 and 0.385 mg/l [4, 5, 14].

Aquatic fauna. The first modifications in species number and of ichthyofauna diversity decreasing started at the same time with the hydrotechnical activities of riverbed separation from meadow, which during the inundations served as reproduction places for

limnophilous fish species from lower Nistru. Significant changes of Nistru river ichthyofauna species composition started after the building of Dubasari barrage in 1955 and beginning of river water flow regulation. The barrage closed the migration route of anadromous and semi-anadromous rheophilous and limnophilous fish species to the places of spawning, by separating the river course and isolating 140 km of river, which until then was used by the most valuable fish species from downstream for reproduction. The barrages stopped the movement process of gravel and sand mass from upstream the river and the aquatic fauna lost their traditional place of living and spawning. This process was even more aggravated by the intense river gravel extraction works from downstream Dubasari barrage [9, 10, 12].

The state of aquatic fauna became worse after the building of Novodnestrovsc barrage. The water evacuated from the inferior levels of the Novodnestrovsc lake with the mean temperature of about 4-8^{o}C and practically without any planktonic organisms (except some species of rotatorians and a small number of diatomeae algae) isn't at all favorable for the normal development of aquatic fauna in the river sector from Naslavcea to Camenca. The situation is aggravated by the consumption of biogenic elements by filamentous algae and submersed macrophytae that are abundantly developing in this sector. This fact, at its turn, is limiting the phytoplankton development, which in the last years became even less diverse. In the period autumn-winter the water evacuated from the Novodnestrovsc lake has a rather high temperature, which fact cease the river freezing on the sector Novodnestrovsc - Soroca, sometimes even in the most hard winters, which leads to the deregulation of the biological rhythms of the hydrobionts that inhabit this sector, especially of fishes.

The ichthyologic studies accomplished in Nistru delta in 2006 revealed 42 fish species and subspecies from 12 families. The ichthyofauna state was characterized as unsatisfactory; the most part of the ichthyofauna is constituted by the non-valuable species. The research expeditions on the sector Naclavcea – Napadova accomplished during 2006-2007 revealed 34 fish species and subspecies from 11 families. The most numerous is the family Cyprinidae with 18 species, followed by family Percidae with 4 species, Gobiidae with 3 species, Gasterosteidae with 2 species and families Acipenseridae, Esocidae, Cottidae, Siluridae, Cobitididae, Syngnathidae, Eleotridae with one species each. The ichthyofauna of the sector is attributed to the rheophilous-limnophilous complex, to which belong typical rheophil (asp, European chub, common dace, asper, barbel) and typical limnophil species (carp, crucian carp, carpbream, gudgeon, spined loach). Among 42 above mentioned fish species and subspecies 8 species weren't registered: bighead carp, silver carp, grass carp, golden orfe, burbot, zander, tench, câra. The comparative analysis of ichthyofauna state in middle Nistru shows the drastic changes of species diversity and of fish population structure, the number decreasing of valuable and rare fish species, especially of rheophils, and the progressive increasing of non-valuable populations. The modifications are so accentuated that can cause the disappearance of many valuable and rare fish species [12].

The modifications of ecological conditions after the building of Novodnestrovsc accumulation lake lead to the significant decreasing of fish haul quantity in Nistru river. Until the human involvement in Nistru ecology the fishing was rather rich. According to historical data in 1914 from Nistru river, adjacent lakes and ponds about 7130 tones of fish were fished, from Nistru liman – about 19 tones, from Nistru and Turunciuc – about 300 tones. The dynamics of industrial fishing after 1990 decreased dramatically. From lower Nistru and Dubasari accumulation reservoir were fished in tones respectively: in 1980 – 90.2 and 56.0; in 1985 – 98.5 and 31.4; in 1995 – 11.5 and 14.7; in 1997 – 16.0 and 5.7; in 1998 – 13.8 and 2.1; in 1999 – 3.0 and 4.2; in 2000 – 13.0 and 3.4; in 2001 – 5.3 and 11.1; in 2002 – 10.9 and 20.0; in 2003 – 19.2 and 25.2.

The malacofauna composition of lower Nistru that serves as indicator of biocenosis ecological status, according to the accomplished in 2005-2007 studies, was represented by 37 species from 2 classes: Gastropoda and Bivalvia, 6 orders and 19 families. The comparative studies with previous data showed that during 24 years the malacofauna of Nistru River suffered several modifications. The species *Euglea casertana* registered only in the lower sector wasn't identified anymore. The composition of the main species also

changed, the species *Valvata piscinalis* and *Sphaeriastrum rivicola,* which were dominant in 1980, at present are very rare. There were recorded 2 new species for this sector of Nistru: *Theodoxus euxinus* and *Anodonta complanata,* that were present only in the middle and upper course of the river and one new species for RM was identified – *Xeropicta krynickii*. The species particular for this sector only is *Hippentes complanatus*, that prefers stagnant water with abundant vegetation [3].

The results of malacofauna studies accomplished in 15 points from Naslavcea to Palanca (middle and lower Nistru) in the period 2003-2009 were compared with the data obtained for the period since 1946. In the period 1946-2009 58 species were studied. There were registered various species of *Lymnaea, Segmentina nitida* (Palanca) and *Viviparus contectus* (Sucleia v.) particular for stagnant and slowly running waters. The species *Euglesa supina* particular for flowing rivers isn't registered anymore, which show that Nistru is gradually transforming from a river into a lake. A significant modification of malacofauna in middle and lower Nistru can be observed caused by the change of hydrological and hydrochemical parameters of the river [15].

In the study period the zooplankton had a trend toward decreasing regarding the numerical and gravimetric parameters practically in all the river ecosystems. For example, in lower Nistru the zooplankton number beginning with the period of 80's of the XXth century decreased 10 times (the biomass – 5 times), in Dubasari accumulation lake (1955-2002) – 57 times (the biomass – 40 times), in middle Nistru the quantitative parameters are in dynamic balance during the whole study period. In the structure of zooplankton communities from river and lake ecosystems of Nistru river hydrografic basin in the period 1990-2002 only 129 zooplankton species and subspecies were identified (rotifers – 83, copepoda – 16 and cladocera – 30), that represent a decreasing by 2.0-2.5 times by comparing with the period 1960-1970. The quantitative parameters of zooplankton decreased 3-10 times by comparing with the period of 1970's and constituted in 1991-2002: in middle Nistru – 0.98 g/m^3 , in lower Nistru – 1.93 g/m^3 and in Dubasari lake – 3.29 g/m^3. In 1995-2002 the quantity of mineralized organic matter constituted respectively 2.5 g/m^3; 8.0 g/m^3; 5.2 g/m^3. It was emphasized that at the whole in all the transects can be observed the invert correlation between the content of ammonium ions, nitrite and mineral suspensions in water and quantitative parameters of zooplankton, but zooplankton number as well as its biomass register practically parallel curves with the curve of organic substances content in water [2, 6].

The zooplankton fauna of Nistru River (11 stations) in 2007 was composed of 37 dominant species from 4 taxonomical groups: Rotifera, Cladocera, Copedopa and Harpacticida. The species diversity in the sample varied from 2 to 6 tax. The dominant role belongs to genera *Brachionus, Eucyclops, Cyclops*. The total number of the organisms varied between 1.5 thousand ind/m^3 and 10.5 thousand ind/m^3. The saprobiologic index oscillated between 1.34 and 2.88 the mean value is of 1.94 and correspond to the IIIrd class "moderately polluted" [8].

In 2007 on the river sector from Naslavcea to Cocieri and in Dubasari accumulation reservoir 54 zooplankton species were registered: 13 Cladocera species, 14 Copepoda and 26 Rotatoria species. In summer period their number is the highest and reach 25500 and 38100 ind/m^3 and the biomass of 594.8 and 1351.8 mg/m^3 [17].

The zoobenthos from the water area of Dubasari accumulation Lake is characterized by high abundance and biomass of oligocheta, chironomida, crustaceans, molusks, nematoda, insects. In some sectors high quantity of insect larvae can be met: efemerids (Ephemeroptera), tricopterans (Trichoptera), dragonflies (Odonata). The benthofauna (zoobenthos) from the sector Naslavcea - Camenca is represented mainly by amphipoda and insect larvae, less – by chironomids and oligochaete. Downstream Camenca in benthonic communities more and more frequent become the Bithynia mollusks, *Viviparus viviparus* L., *Lithoglyphus naticoides* C. Pfeiffer, lake mussels *Anodonta cygnea* L. and *A. piscinalis* Nilsson, river mussel *Unio pictorum* L. It is interesting the fact that *Sphaeriastrum rivicola* Lamarck, *Sphaerium corneum* L. and *Pisidium amnicuim* O. F. Mueller, which were frequent here 10-15 years ago, at present are rather rare. In the last years from Râbniţa to Dubăsari widely spread became the species *Planorbarius corneus* L. and freshwater mollusk *Lymnaea stagnalis* L., in the silt

there inhabit mostly Anodonta mussels and river mussels, while on submersed objects that aren't overgrown with algae inhabit Dreisena. Thus, it can be observed the replacement of rheophil mollusk complex with the typical limnophilous one. The maximum total number of 6680 ind/m^2 of benthonic organisms was reached in July downstream Soroca city, on the account of crustaceans and mollusks development which constitute 87.3% fro the total quantity of zoobenthos. The total biomass of 606.76 g/m^2 was determined in the same sector. The diversity of benthonic organism species varies from 2 to 11 taxes. At the average the water quality is characterized with the IIIrd quality class – moderately polluted [8].

In benthos samples downstream Soroca 14 nematode species were registered. The species from family Tobrilidae, which are attributed to algophagous, were dominant after the species number and abundance. The species from order Neotobrilus were discovered for the first time on the territory of RM. The group of bacteriophagous are widely spread (Monhysteridae, Plectidae, Cephalobidae, Panagrolaimidae, Rhabditidae) and indicate the biotopes with high content of organic substances. In the meiobenthos near the riverbank from Soroca to Olăneşti the most spread are the nematodes species of families Tobrilidae, Dorylaimidae and Monhysteridae [13].

The microorganisms (bacterioplankton) constitute the connecting link between the biotic and abiotic environment. The aquatic microorganisms are involved in the self-purification processes of natural waters. The quantitative development of the total bacterioplankton studied in the period 1981-2008 varied in some periods from 0.4 millions cell/ml to 19 millions cell/ml, the mean values are comprised in the limits 4.0-7.5 millions cell/ml. Significant changes occurred also in the development of heterotrophic bacteria. Thus, their number density in 1981-1985 (1.67 thousand cell/ml) have grow 2 times by comparing with 1976. In 1991-1992 this index had the value of 4.70 thousand, in 2002 – 8.0 and in 2008 – 5.3 thousand cell/ml. Similar situation was registered at the quantitative distribution of microorganisms physiological groups that participate in the circuit of the main biogenic elements: nitrogen, phosphorus, carbon. In the microbiological databases of the last years the water quality of lower Nistru river can be included in the classes of satisfactory pure-polluted, betamesosaprobic-alfamesosaprobic zones and mesotrophic-eutrophic categories. In some stations (Varniţa, Sucleia) the river water is strongly polluted (alfamesosaprobic zone) [7].

The analysis of study results of the bacterioplankton in the river and in Nistru liman in 2006 showed that its number in all the studied cases corresponded to the class of natural eutrophic water. The river water was characterized by a lower number of bacteria by comparing with the liman and according to pollution level belong to category of weakly polluted (2.75-4.40 million cell/ml), while in the liman and adjacent lake water the bacterioplankton number was 2.5-6 higher and reached the class of polytrophic and hipertrophic water, which are characterized as polluted and very polluted [9].

The data from 2007 on bacterioplankton quantitative composition in middle Nistru was within the limits 0.21-5.75 million cell/ml, the number of saprophyte bacteria changed in the limits 0.6-94.1 thousand cell/ml. The maximum value of these indexes was registered in July upstream Tighina city. From the studied sectors of Nistru river the most polluted was the one from upstream Tighina city (IVth pollution class on average), in the other sectors the water was moderately polluted (IIIrd pollution class). At the average per year the total bacteria quantity constituted 0.75 million cell/ml (IIIrd pollution class), the number of saprophyte bacteria - 11.7 thousand cell/ml (IVth pollution class). By comparing with 2006 in the river decreased the quantity of microorganisms and of organic substances, the water quality improved to the IIIrd class – is "moderately polluted" [8].

The last studies show that not only the thermal and hydrologic regimes of the water lead to the modification of aquatic fauna downstream Novodnestrovsc barrage, but they are also conditioned by the change of redox status of the water downstream Novodnestrovsc barrage. The redox status of the water is conditioned by the concentration of hydrogen peroxide in water, of reduction substances and OH radicals. The redox state of the water is a parameter that characterizes the ecological status of aquatic ecosystems. If the concentration of reduction substances overpasses the

concentration of hidrogen peroxide the hydrobiont development is negatively affected. The concentration of OH radicals is optimal in the limits 3-5.10^{-16} mol/l [4].

Aquatic flora. Associations of submersed aquatic plants identified in the period 2002-2007 in middle Nistru, in Dubăsari accumulation Lake and lower Nistru are represented by species from families Potamogetonaceae, Hydrocharitaceae, Haloragceae, Ceratophyllaceae, Lemnaceae. Among familie Potamogetonaceae more species were recorded. *Potamogeton perfoliatus* – the pondweed dominated and was registered in 62% of the studied samples, with the biomass within the limits 67.2-665.2 g/m^2. Other wide spread species were *Myriophyllum spicatum* (fam. Haloragceae) – spiked water-milfoil, registered in 46% from the collected samples, *Ceratophyllum demersum* (fam. *Ceratophyllaceae*) - rigid hornwort, registered in 38% of the samples, *Potamogeton crispus* (27%), *Elodea canadensis* (fam. Hydrocharitaceae) – Canadian waterweed, (24%) and *Potamogeton pectinatus* (19%). Along with vascular plants in the collected samples various algae species were registered (43%), belonging to genera *Spirogira, Rhizoclonium, Cladophora, Enteromorphia.*

The building of barrages on Nistru favored the abundant development of ploadostadion and submersed vegetation, which is determined by sharp oscillations of water level, decreasing of water flow speed, increasing of water transparency, modification of chemical composition and of the temperature, provoked by the regime and exploitation conditions of Dnestrovsc accumulation reservoir, because Dubăsari accumulation lake, being silted, doesn't influence anymore upon the river flow. The content of biogenic elements in the last 20 years in Nistru river didn't' change significantly and doesn't have any considerable contribution to the process of modification of vegetation quantity and species composition. The modifications of hydrologic regime of the river lead to the modifications in the composition of vegetation communities downstream Novodnestrovsc barrage [1].

Because of the abundant development of filamentous algae and of submersed macrophites the process of biogenic elements absorption occurs from the transit waters that limit the phytoplankton development and initiate the process of riverbed sedimentation on the river sector Naslavcea - Napadova.

The phytoplankton biomass in middle Nistru in 2006 on the water surface varied from 923 to 1041 mg/m^3 and reached its maximum value of 16364 mg/m^3 in summer. The diatomeae and green algae dominated [9].

In 30 samples took from Nistru river in 2007 a species variation from 9 to 28 tax per sample was registered. The total maximum phytoplankton number (1.95 thousand cell/ml) was recorded in summed on Gura Bâcului village section duet o the presence of diatomeae and green algae, and the maximum of total biomass (4.893 mg/l) was recorded in section of Râbniţa town, where more diatomeae algae were identified. The saprobic index varied in the limits from 1.62 to 2.08 and its annual average was of 1.81 the water quality after phytoplankton parameters was at the level of 2006, IIIrd class – moderately polluted [8].

Discussion. The initiation of degradation process of Nistru river ecosystem started along with the initiation of hydro-amelioration activities of Nistru meadow. This process became worse after the building of Dubasari barrage through essential changes in species composition of aquatic flora and fauna on the whole middle and lower course of the river. At present the barrage doesn't influence anymore the river flow because it is practically sedimented, but still continue to represent an obstacle for fish migration.

The building of Novodnestrovsc barrage disbalanced completely the ecosystems of Nistru River.

The hydrologic regime of the river downstream the barrage became extremely unstable. During several years the decreasing of water discharge can be observed. The ecological discharge of the river isn't respected, which leads practically to its transformation into a chain of lakes in some periods. Although, a tampon reservoir was built at Naslavcea to regulate the hydrologic regime, the daily variation of the water level

in lower water reach 2-3 meters and more, this fluctuations are revealed up to Camenca, where the daily oscillation constitute 0.2-0.5 m.

The thermal regime of middle Nistru is strongly influenced during the whole year. In autumn-winter period the water evacuation with relatively high temperature is mentioned that cease the river freezing on the sector Novodnestrovsc - Soroca.

The water evacuated from the inferior levels of Novodnestrovsc lake practically doesn't contain planktonic organisms and isn't favorable for the normal development of aquatic fauna in the river sector from Naslavcea to Camenca. The situation is also aggravated by the consumption of biogenic elements by the filamentous algae and submersed macrophites that are abundantly growing in this sector. This fact, at its turn, limits the phytoplankton development.

The river water quality is negatively influenced by the increased water quantity of ion metamorphosed type, with increased content of solved organic substances, phenols, mineral states of nitrogen and phosphorus, heavy metals, oxygen insufficiency, which change the chemical compositions and mineralization level of Nistru river waters. After the dichromatic oxidability values the Nistru water on this sector is classified as polluted and strongly polluted by solved organic substances. On the basis of average microbiological data from the last years the water quality of Nistru River is characterized by the IIIrd class of quality, which is moderately polluted.

The comparative study of malacofauna composition showed that during 24 years the malacofauna of Nistru River is represented by a smaller number of species. New species were recorded, such as *Lymnaea, Segmentina nitida* (Palanca) and *Viviparus contectus* (Sucleia) particular for stagnant water and for weakly flowing ones. The species *Euglesa supina* particular for running rivers isn't registered anymore, which prove that Nistru is gradually transforming from a river into a lake with stagnant water.

In the study period the zooplankton had a trend toward numerical and gravimetric parameters decreasing practically in all the river ecosystems. In the composition of zooplankton communities from river and lake ecosystems from the hydrographic basin of Nistru River in the period 1990-2002 only 129 zooplankton species and subspecies were identified, which represent a diminishing by 2.0-2.5 times by comparing with the period 1960-1970. In 2007 on the sector Naslavcea v. to Cocieri v. and in Dubasari accumulation lake 54 zooplankton species were registered.

The zoobenthos from the water area of Dubasari accumulation Lake is characterized by a high abundance and biomass of oligochetae, chironomids, crustaceans, molusks, nematodes, insects, while after the species composition the replacement of rheophil mollusk complex with the typical limnophilous one is observed.

In benthos samples downstream Soroca 14 nematode species were registered, attributed to algophagous, indicating a biotope with increased content of organic substances.

After the quantitative composition of bacterioplankton in Nistru in 2006 it was revealed that the water quality corresponded to the class of natural eutrophic water, and in 2007 to IIIrd class of pollution, after the number of saprophyte bacteria – to IVth class of pollution.

Because of abundant development of filamentous algae and submersed macrophites the intense process of biogenic element absorption from water, the process of riverbed sedimentation started on the river sector Naslavcea - Napadova.

The studies proved that the main factors which negatively influence Nistru river ecosystem are the hydrologic, thermal, hydrobiologic regimes etc, The pollution degree has a less important role practically in all the river ecosystems.

From all mentioned above we conclude that along with the building of Novodnestrovsc barrage the hydrologic, hydrochemical, hydrobiological, ecological and thermal regimes of Nistru River modified and produced negative ecological impact upon the water quality of middle and lower Nistru, provoked obvious modifications of hydrobiont communities, of species diversity, the quantitative development of aquatic fauna registered a considerable decreasing, lead to the significant decreasing of economic potential of Nistru River and to a considerable prejudice for the economy of Republic of Moldova.

To stop and diminish the degradation process of Nistru river ecosystems, there are necessary measures of reconstruction of Novodnestrovsc and Naslavcea barrages to eliminate the deviations from the project documentation in the construction period and accomplishment of international environment treaty outlines regarding the diminishing of ecologic impact upon Nistru river.

The accomplishment of these requests foresee the necessity to improve the international instruments and mechanisms of influence upon the subscribing parts for the mandatory accomplishment of international obligations taken within Environment international Conventions and bilateral agreements.

The absence of such inter-state unified mechanism of complex use of Nistru river natural resources lead to the degradation of biological resources, to significant diminishing of biodiversity and of economic potential of Nistru River, which have for the economy of Republic of Moldova real disastrous consequences.

Conclusion. To restore the aquatic ecosystems of Nistru River it is necessary to finalize and approve the project of bilateral Convention (RM and Ukraine) regarding the protection and rational use of aquatic resources of Nistru river basin and in parallel the improvement of influence instruments upon the subscriber parts within the Environment international Conventions for mandatory accomplishment of assumed international obligations.

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