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ENVIRONMENT INTEGRATION OF ECOLOGICAL AND BIOLOGICAL INFLUENCES IN THE LAKES FROM LOWER SECTION OF PRUT RIVER

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Abstract

In this material is presented several aspects of integration in the natural environment of anthropogenic changes on the environmental and biological conditions in the lakes located in the lower basin of Prut. Environmental conditions, whose influence is analyzed, it refers to the integration of the natural landscape of lakes, the work performed and hydro scheme for their exploitation, and biological influences on the conditions relate to ihtiofauna and fisheries potential realized.
Keywords: lakes, ponds, Natural Park, environment, ecological, biological, Prut

1. INTRODUCTION

Declaring Natural Park "*Low floodplain of Prut*" in the southern part of the Prut basin is the final result of the interaction between human and nature in time. This natural protected area was created as a distinct area with significant landscape and a large biological diversity that, by maintaining harmonious interaction of man with nature and protect the diversity of habitats and landscape, are encouraged to use traditional lands and some activities by the local population, also provides opportunities for public recreation and tourism and can be carried out scientific, educational and cultural in this area.

The group of lakes and pools MAŢA-RĂDEANU from inside the reservation of Low floodplain of Prut (at position no. 2.414 of Annex I of the Law no. 5/2000) is a defining sector to establish a special protection area of Natural Park type, in the south part of the Prut basin, as part of the Danube Green Corridor.

The group of lakes and pools, in the north part of the Lower Prut, develops through hydro-technical works made on an area exceeding 640 hectares. Analizing the maps we can conclude the following categories of initial land use in this sector: pools (360 hectares),

pasture (71 ha), wetland-grassland (50 ha), unproductive (about 160 ha). This group of lakes is located on the right bank of the Prut river, between 113 km/milestone no. 1255 and 121 km+400m/milestone no. 1252, the confluence of Prut with the Elan river, milestone no. 1253, the territory of Cavadineşti - Vădeni village. In their natural state, the high water mark of flooding in the free area was more than 568ha. Arranges for fish (568 hectares) and agricultural works (78 hectares) was executed in the 1980's. The land was divided in two separate sectors by the Elan river.

The North sector (Mata pool, on the border with the Vaslui county) consists of two ponds (135 hectares representing the lower area of pool and 57 meters - higher area of pool) and the South sector (Rădeanu pool: 342 meters sheen of water + 78 meters agricultural area). In the Rădeanu pool, in the south west of the brook Elan (lower course), it has integrity in the area in which natural gloss surface water alternates with reed, backwater, wetland, where colonies of birds are present all year round. Surface area proposed for special protection of birds habitat is 194 hectares.

Basically, as a result of improper exploitation of numerous hydro-technical works, in particular due to lack of financial resources at the present time there are only 148 hectares of functional ponds fisheries.

2. THE MATA-RĂDEANU GROUP OF LAKES

The land is located on the right bank of Prut, between km 113 and km 121+400 m, in the confluence area with Elan. The group of lakes is located on the administrative territory of Cavadineşti commune, being bounded to the east by Prut river, in the west by high terrace of Moldova Plateau, to north by unproductive lands from Vaslui county, which was proposed for fish arranges (Cârja II fish farm).

The total area of the complex is 646 ha, of which 568 ha are reserved for fisheries and 78 ha for farming (table no. 1).

This use planning it was starting with the premise that this will raise the economic value of an area of Mata-Rădeanu pools and unproductive lands and low productivity often subject to flooding. Fishing technology provided includes, in all categories of ponds, a systematic fish farm necessary to technological exploitation.

Table no 1 Situation of before and after land use planning in Mata-Radeanu lakes

Total surface of land lot (ha)	Initially use category	Influence's surface (ha)	Use category after influence (ha)	Agricol use after influence (ha)	Differeces of surface (ha)
89,48	pasture	71,34	8,34	63,0	18,14
57,50	pasture- swamp	49,70	34,70	15,0	7,80
375,0	lake	357,75	357,75	-	17,25

87,0	unproductive	53,54	53,54	-	33,46
162,0	unproductive	93,15	93,15	-	68,85
3,0	lake	3,0	3,0	-	
39,79	unproductive	17,50	17,50	-	22,29

The scheme of arrangement was made depending on the area and the technological requirements of exploitation, and has been taken into account:

- Elan river confluence with the Prut River and the possibility of coincidences of flood to these water courses;
- need to ensure a zone of protection from the banks of the Prut to the dam of defend against flood;
- need for a leakage section of floods on the Elan river;
- need to use land lines with the highest placement for dams defense;
- need to ensure water supply to debits and the volumes necessary to processes of production and discharge of the water to complete the production cycle;
- need to location of fish nursery to share the highest and best opportunity of access;
- need to ensure for agricultural use of land with the highest rates as dams defense to be made at lower rates.

The Mata-Rădeanu agro-fisheries group of lakes is currently used for fishing with total area of 103,3 hectares of II-nd summer ponds category, 33 ha of I-st summer ponds category, 0,5 ha of hibernation ponds category and 1 ha of reproductive basins category.

Reporting the currently area to the initial area, built in the fisheries, it appears that for summer II use is a percentage of 21%, for the summer I a percentage of 44%, 12,7% for hibernation, the battery reproduction is used in the percentage of 100%.

Area with initial agricultural destination of 78 ha is claimed by the original owners. Some areas of fish ponds as is the case pond of 57 ha and the other one of 180 ha have been used for the cultivation of maize. Yields aggregated over the entire period amounts to 200 tonnes.

3. ŞOVÂRCA FISH ARRANGE

The land is part of the basin of the Prut river and is located on the right side of this river between km 87+350 m and km 106+250 m. Surface arrangement is 223 ha including 180 ha represented by Şovârca pool and 43 ha over from former C.A.P. Rogojeni, unproductive land influenced by Prut's floods. The unit is actually managed by S.C. PESCOGAL S.A. Profile arrangement is complex with systematic breeding and nursery

station of artificial reproduction for phytoplanktonophags. The cycle of exploitation of fish is two years, and production is profiled on *Cyprinus carpio* species and species of the complex east-Asian, the latter obtained at the station of its own reproduction, elevated the status of alevin (embryo) to fish of two summers age. In the design scheme of arrangement has been taken into account the cycle of exploitation, by providing an average depth of it, 5 m and the growth of 1,9-2 meters from hibernation, the need for supply and evacuation to possible gravity, the need for mechanization of technological sequences such as fish gathering to fishing holes and taking fish and uploading mechanized feed directly into fishing boats.

Both I-st summer growth ponds and the II-nd summer increase ponds, have provided a fishing holes concreted both the depth and the batter. Fishing hole from I-st summer growth ponds is equipped with mechanisms for lifting fish over the dam platform.

The necessary volume of filling is 3.244 thousands m^3. Flow during the creation of a material fisheries is 3 l/s/ha and 10 l/s/ha during hibernation of fisheries material, as required a total volume of 9.741 thousands m^3 of water. The water supply of this arrangement is made by Prut river through a pumping stations used as well for supply and evacuation. Station is equipped with four pumps of Brateş 350 type. From the four pumps installed, two of them are set to work to remove the reversible water inside. After a fish farm for 14 years, during which the maintenance work, and only canals correction was made in the pond of 157 ha in four years of operation, status arrangement are as follows:

The pond of 37 ha, for increasing I-st summer material was dropped from the circuit used for fisheries and agriculture. At the same time it was considered necessary compartmentalization because alluvia from neighboring verstants (Dumbrăviţa Valley), in the upstream area, this wasn't provided technological depths. Compartmentalization has been achieved only at the rate of 75%, being virtually complete. At II-nd summer growth pond evacuation from the dam is gnawed on his inside in a percentage of 66%.

4. VLĂDEŞTI FISH ARRANGE

The land is located on the right bank and the arrangement area is about 323 ha. The unit is managed by S.C. ZĂTUN S.A. The arrangement profile is complex and systematic breeding nursery. The cycle of exploitation of fish is profiled on production of *Cyprinus Carpio* species and the complex east-Asian species, the latter taken from units that have artificial reproduction regime of these species. In the design scheme of arrangement has been taken into account the cycle of exploitation, by providing a medium depths of 5m and the growth of 1,9-2 meters from hibernation, the possibility of gravity supply and evacuation too, the need for mechanization of technological sequences such as fish gathering to fishing holes and taking fish and mechanized uploading feed directly into fishing boats, like in the Şovârca fish arrange, too.

5. COTU-CHIULUI FISH ARRANGE

The land is part of Prut basin and is near the Upper Brateş lake, in floodplain of Prut. Area is located within the Stoican and Folteşti villages and was given to administration by Galati Forest District, being placed in the category of unproductive land use, as swamp, after being transferred to C.C.P.P.P.I.P. Galati. Area is bounded to the west by the defend dam of Upper Brateş lake and to the east by the defend dam of the Prut river.

This arrange has a total surface of 105, 5 ha, and put forward a set of unproductive land such as Cotu-Chiului lake, embankment to the Prut river, very poorly operated, before systematization, producing 3-4 tonnes of fish per year.

Production profile of the arrangement was to ensure after-embryo stages of development and growth of I-st summer *Cyprinus Carpio* species and east-Asian complex of species. Later this arrangement has become genofound basis for the species, such as: *Cyprinus Carpio, Stizostelion lucioperca, Esox lucius, Silitrus glanis* and east-Asian complex species. Initially design of the cycle of exploitation was a vegetative period, currently it is two to five years.

Production of growth in juveniles basin, in the natural food, without concentrated food, was estimated to 1000 kg/ha, estimated production is expected to be achieved by the administration of complex chemical fertilizers and organic fertilizers.

6. USING NATURAL LAKES

Surface of natural lakes unarranged in lower section of the Prut basin varies from 41,8 ha to 75 ha. Depth is different, the Pochina pool and Leahu pool have record average depths 1,5 to 2 m in the central area, while Vlaşca and Cotu Mare pools have average depths l, 2 m, minimum of 0,2 m and maximum of 2 m. Productivity natural fish does not exceed in any one of these pools l00 kg/ha of fish (table no. 2).

Hydrological regime of these pools depending on the water level of emissary. They refreshing and fill with water during short floods of spring and summer or in more years during the floods. Flooding is done gradually and in relation to flooding during the pools mentioned above can be classified, such as:

- pools with early flooding, as Vlasca, being supply even during the reduced floods;
- pools with late flooding, as Pochina and Leahu, covered by excedeed waters in years with medium and maximum floods.

Because of the lack of drainage, in Pochina and Leahu pools it was observed reduction of surface water only at the end of vegetative season. The water is lost through evapotranspiration and soil infiltration. The biggest losses in this area are recorded in july, during the hottest of the year, specifying for this area. The water level decreases on average 0,4 m, and in the hottest years may fall to 0,8 m.

The regime of water temperature is characterized by an emphasis during the heating season and local variations in relation to depth. Seasonal fluctuations in water temperature throughout the vegetative period varies between 15-27 °C.

The bentos, quantitatively, depends on the duration of stagnation of flood water. A stagnation of longer-term ensure a high level in *chironomides*, around 30 g/m^2.

Ihtiofauna of lakes and pools in the Prut river floodplain is characterized by constancy. Fishing harvest of these pools provides generally reduced yields, which is an average of 75 kg/ha. In this quantity the cafas species prevail, around 50 kg, pike perch 0,5 kg, pike 4 kg, roach 8 kg, bass 5 kg, oblets 6,5 kg, bream 3,2 kg, wild carp 0,4 kg. Stock base is made up of youth. In recent years have seen an increase in the percentage of kidnappers fish, as pike, it reached 25-30% of the stock.

Table no. 2 The most important natural lakes in lower sector of Prut basin

Name	Surface in GIS (ha)	Observations
Pochina Lake	64,11	Natural resevation
Şovârna Lake	135,83	Aquatic unit situated in Prut floodplain
Vlaşca Lake	41,27	Natural resevation
Zătun Lake	18,94	Pilot project for environment protection
Cotu Chiului Lake	71,68	Aquatic unit situated in Prut floodplain
Brăneşti Lake	21,96	Aquatic unit situated in Prut floodplain
Vlădeşti Lake	102,42	Aquatic unit situated in Prut floodplain
Măicaşu Lake	362,97	Fish genetic base
Leahului Lake	26,63	Aquatic unit situated in Prut floodplain
Broscarului Lake	6,95	Aquatic unit situated in Prut floodplain
Beleu Lake	659,56	Biosphera's Reservation in Moldova Rep.
Teleajen Lake	13,28	Aquatic unit situated in Prut floodplain
Cacia Lake	17,25	Aquatic unit situated in Prut floodplain
Maţa Lake	140,71	Natural resevation (partial area of 81 ha)
Rădeanu Lake	42,48	Aquatic unit situated in Prut floodplain

7. BRATEŞ LAKE - THE MOST IMPORTANT NATURAL WATER UNIT OF PRUT BASIN

7.1. Brief overview and data about the evolution of the Brateş lake

Brateş lake is situated near the Prut-Danube confluence, in the contact between the flooded plain of Prut and Danube, east of the city of Galati (fig. no. 1).

Before 1917, Brateş lake occupy an area much larger (over 25.000 ha) and stretched far north, where the pools and ponds in here represent the best places to fish reproduction.

Later it was executed a series of embankments and hydro works that have permanent off remote this region to flood, which caused a considerable decrease in fish production.

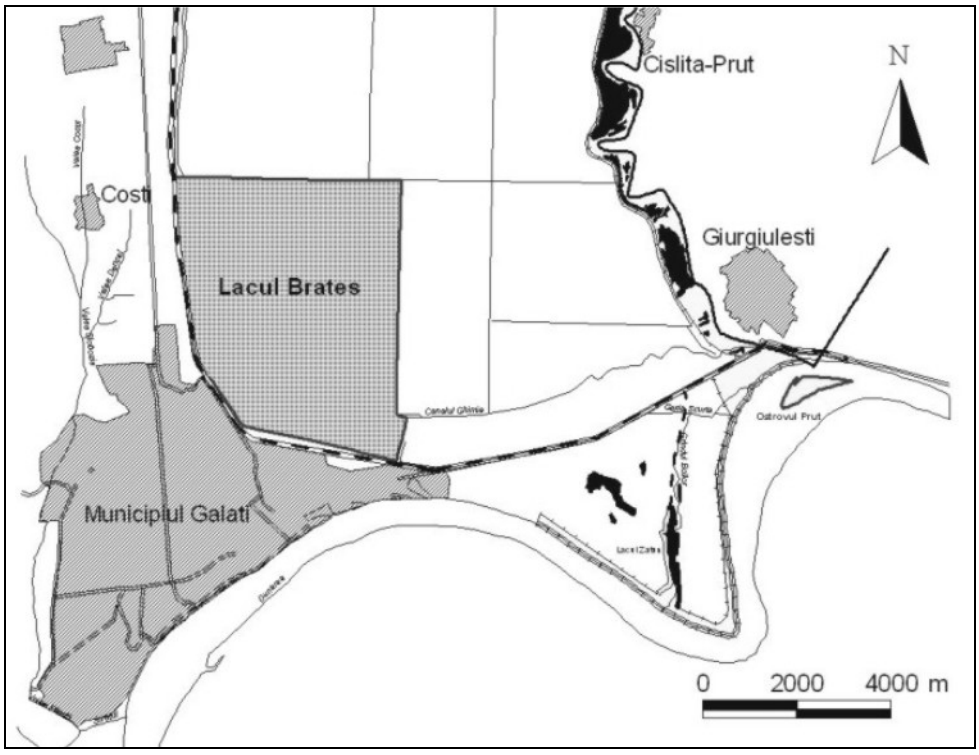

Fig. 1. Situation of Brates lake

In the second half of the twentieth century, the lake area fell by about 10.000 ha, remaining with a total area of 11.154 ha, of which only 7.200 hectares of area was covered with water, the remaining area is covered by reeds and the grazing lands.

The mean works performed in the area are the following:

- 1927 - 1931: it was builded Galati-Reni railways, which separates Brateş lake by Bădălanului pond and the Danube;
- 1949 - 1962: there have been hidroameliorative works in fisheries zone Brateş down (channels, dam);
- 1971 - 1984: it was arrange Brateş intensive carp farm with total area of 2.400 ha, which enter into production in 1971.

Following these works, Brateş lake was compartmentalized as follows:

1. Upper Brateş Region, located on the upstream dam Şiviţa-Prut with an area of 12.871 ha.

2. Lower Brateş Region, between dam Şiviţa-Prut, Barlad-Galati railway, Galati-Reni railway and Prut.

3. Bădălanului Pool Region, between Galati-Reni railway, Prut and Danube.

The area where the Brateş lake is included in the conditions listed above, which is why the lake must be protected both physical and legal. Measurements made on the ground by means of G.P.S. and G.I.S. processing programs, contributes to knowing the exact position and area.

7.2. Antropic impact for the development of ihtiofauna ecosystems in Brateş lake

Stagnant water ecosystem, known as the Brateş lake, located in the flooded area of the lower course of the Prut river, at the confluence with the Danube, was supplied with water mainly from the Prut river by Gârla Ghimia, than water supply from Chineja river, springs from the hills around Galaţi and from rainfall and melting of snow.

Starting with first half of XX-th century, Brateş lake with its vast area has been flooded by human intervention, important transformations that have been based on special considerations of economic, military, social and systematization of the territory.

Work began with the implementation of the Galati-Prut railway, which separately Brateş by Mădălanului pools (located between the rail line and the Danube), and later continued with the implementation of Şiviţa-Prut dam, that divided Brateş ecosystem into two distinct parts: Upper Brates, upstream of the dam, passed only in agricultural use and Lower Brates, situated between the dike and Galati-Prut railway.

In 1965 it was started embankments of Lower Brateş, motivated by its need for removal under the influence of the flood, in which the largest area of land has gone into the agricultural, aquatic ecosystem being reduced to a fish arrange with the area of 2.441 hectares, consisting of a nursery of 320 ha and a basin of 2.120 ha, intended primarily on flood alleviating of Chineja brook. Secondary use of these arrangement was fishing in the concentrated regime, planning to achieve 1.400 tonnes of fish per year (700 kg/ha), the most part of production being the growing carp.

In the present time, motivated on the one hand by the problems caused by feed required supply, but also the opportunities offered by the expansion in production of species planktonophags, the arrange operating technology was gradually replaced with modern methods, such as policulture, carp being the most frequent species. Ihtiofauna of Brateş lake is varied and abundant, represented of 46 species of fish belonging to 31 genera and 11 families, was composed mainly of species characteristic to standing water in the region of countryside.

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