

PLANT EVOLUTION IN THE PERIMETER OF LAKE ȘERBĂNEȘTI - BACĂU

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Key words: habitats, island with natural vegetation

INTRODUCTION

On the Bistrita River, there is a series of lakes constructed for energetic purposes; Lake Șerbănești or Bacău 2 is situated on the town perimeter, between Gherăiești and the bridge nearing the central bus station. For the last decades, the upstream region, located between the channel and the main riverbed has been clogged up. When it rains, the water turns brown. That means it is not only Lake Lilieci that retains alluviums, but also the downstream lakes. (Photo 1).



Photo 1. Lake Șerbănești

We should mention that the most attractive recreational area in Bacău at the end of the last century was Lake Bacău 1, with „the Island” which is in a process of ecological restoration at present. We haven't inventoried this basin because it is of no interest concerning protection. The study was carried out in the upstream lake, Bacău 2 or Șerbănești, where we have identified an island which is smaller than the one already known, from the downstream lake, it is covered 100% with natural vegetation where the fishermen cannot get; it is a roosting area and we have identified there all the vegetation layers which web ring to attention in our study. This island was indicated on the topographic maps of 1980, but we do not have any information on whether it was specially constructed or it was formed following the hydro-technical works, being subsequently covered

with vegetation, enlarged more by silting and developed into a micro-delta suitable for roosting. (Photo 2)

The area has a meadow relief on the Bistrita's secondary riverbed and it is administrated by the hydropower plant.



Photo 2. The island at the end of the reservoir, close to Gherăiești

MATERIAL AND METHOD

The vegetation is described by using the monitoring method, the identified phytocoenoses are prone to colonizing, they had not encountered any competition and they are the main formations to accentuate the „polderization” phenomenon. The study was carried out in 2014.

RESULTS AND DISCUSSIONS

The **habitat 3150- natural eutrophic lakes with *Magnopotamion* or *Hydrocharition***- type vegetation (R 2202, R 2203, R 2204, R 2205, R 2206) named Lakes and ponds with dark grey to blue-green, more or less turbid, waters, particularly rich in dissolved alkalis (usually with a PH greater than 7), with free-floating surface communities of *Hydrocharition* or in this case, in deep, open waters, with associations of pondweeds (*Magnopotamion*) is represented by Aas. *Potamogetonum perfoliatii* Koch 1926, localized on the left-hand side of the

dam, up to the canal lock, sheltered by the amounts of water, in complete submergence, and covering a few hectares surface area. The water is greenish brown and the soil type is Limnosol.

The vegetation coverage of this population ranges from 20% to 80% with a tendency towards expansion; no damages detected. The only disturbing factor identified is sport fishing, but the vegetation is not being affected. Hence, the anthropic impact is low.

The vegetation succession evolves into the palustrine type, that is, in a few decades we may have a swamp in the basin with Bistrita's riverbed the only remaining element, similar to what had happened downstream, on Galbeni Lake and Bacau Island.

The vegetation is represented by *Potamogeton perfoliatus* which is the main submersed species from the river basin. It develops in maximum two-meter depth waters. Clumps of *Scirpus lacustris*, *Phragmites australis* and *Typha latifolia* appear only at the end of the dam, where the water is shallow. On the right-hand dam, because of the weak intensity in the water course, especially in the bay, the submersed vegetation has been replaced with reed beds, rush beds and bulrushes. The most significant species in the river basin are invasive, they retain slurry and accentuate silting.

On the right-hand side of the basin, up to the canal lock, the turbidity currents are very weak, alluviums have been deposited close to the dams and herbaceous vegetation and the first willow saplings have settled.

The Habitat 3270 „Rivers with muddy banks with *Chenopodium rubri* p.p. și *Bidention p.p.* vegetation” (R5312) is represented by *Ass. Polygono lapathifolii- Bidentetum tripartitii* Klika 1935. It is situated at the end of the dam, on humid silt, it is partially pastured, ca. 5% of the surface is covered with *Crataegus monogyna* shrubs, very few *Ulmus minor* juvenile specimens, etc.

The herbaceous vegetation covers the soil very well, the pools are very small.

The conservation status is inadequate. We don't have any information on whether rare plants existed or not. The phytocoenosis with *Cyperus serotinus* identified 15 years ago has been rediscovered (along the margins of the nearby pools) with the same floristic composition. The quickest vegetation successions take place in the river basins. The humidity conditions change over the years and the vegetation is replaced. Although invasive, this vegetation type is representative, it doesn't cohabit with other types of phytocoenoses, except for the transition phase. Phytocoenoses with *Bidens tripartita* cover smaller areas that in the basin from downstream of the bridge where there was a swamp before de ecological restoration works. (Photo 3)

Throughout the years, during silting, this vegetation type was a pioneer; it colonized the silt and subsequently it was replaced with mesophile

meadow (*Agrostion stoloniferae*) used as pasture for animals.



Photo 3. *Cyperus serotinus*

Habitat 92A0 „*Salix alba* and *Populus alba* galleries”(R4406, *Ass. Salici-Populetum* Meijer-Dress1936). It is spread at the end of the dam, on the right-hand side of it, it covers the island and it has a surface area of almost 1 ha. The poplar field population at the end of the dam has a surface area greater than the island. The relief is represented by the island and the alluvium layers, covered with woody, palustrine and aquatic vegetation. The microrelief is flat, the northern part of the island, 50-100 cm high, faces the river currents during floods. The southern part is approximately 2m high, as a result of the alluviums retained by vegetation. There are permanently humid soils on the sides. Upstream of the island, a grove with wet soil was formed, with poorly represented underbrush elements there are no species with various ages under the brush, only scrubs are present).

The area is moderately exposed to floods and tourism in the proximity of the observatory. It is only the island that is safe from disturbing factors, a secure shelter for birds while roosting.

Next to islands and dams, there is vegetation with permanent submersion represented by *Potamogeton perfoliatus*. After decades, this biotope is susceptible to transform into a swamp connected to the dam. The flooding is occasional and seasonal for the vegetation of the island. An increase of 1-2 m in the Bistrita's discharge might submerge the vegetation; it is a wet-weather related biotope and it does not get destroyed; on the contrary, alluviums are retained and the water depth towards the banks decreases. The soil here is permanently moist yet not immersed because of the thick vegetation and the underground water which is in very close proximity. The poplar field population from Gherăiești is not flooded because it is located between the channel and the former course of the stream and it belongs to *Salici-Populetum* as well. It is frequently visited by tourists.

The soil on the island is alluvial, permanently moist. In the old poplar population near the park, the soil is wet, mixed with sands and pebbles. Trophicity is high.

The color of water is slightly brown, mostly caused by suspensions and to a small degree by diatoms towards autumn.

The vegetation coverage is full; the arborescent, arbustive and herbaceous layers cover the ground 100%

The conservation status is favorable.

The evolving tendency of this habitat goes slightly towards expansion. Over decades, the water depth decreases, the swamp on the sides expands and leaves behind meadows. The meadow has a secondary origin, with few herbage species. This vegetation zone (the right-hand side of the river basin) has greatly expanded because there is no current on this side of the river basin and also because of the altitude at which the channel opens into the basin and where the two islets are located. There are more alluviums retained downstream than on the left side of the basin and a large area with luxuriant vegetation that can reach the canal lock has formed.

There is no known significant damage in the present. There is no future threat, either. The risk factors are floods, vegetation successions, fishing, grazing, vandalism, tourism, plastic objects thrown away, trash, all of them at moderate intensity.

In the proximity of the *Salici-Populetum* phytocoenoses, there are also fragments of phytocoenoses with *Salicetum cinereae*, *Scirpetum lacustris* and *Caricetum ripariae* associations.

The woody vegetation on the island consists of plants of various ages. In the arborescent layer, there are *Populus alba*, *P. canescens* (grey poplar, on the bigger islet its diameter is 80-90 cm), *Alnus glutinosa* (juvenile), *Ulmus minor* (juvenile), *Juglans regia* (juvenile, spread by birds), *Salix alba* (white willow), with a diameter of 40-60 cm cover more than 30% of the surface of the island, *Cerasus avium* (bird cherry) is juvenile.

The underbrush layer from the island is very well developed. It consists of *Cornus sanguinea*, *Ligustrum vulgare*, *Salix elaeagnos* (rosemary willow), *Crataegus monogyna*, *Hippophaë rhamnoides* ssp. *fluviatilis* (white sea buckthorn), *Ligustrum vulgare* (privet), *Viburnum opulus* (*guelder-rose*), *Frangula alnus* (glossy buckthorn) with very large specimens, 10- 15 cm thick and over 5 m high), *Rubus sulcatus*, *Salix cinerea* (better represented between the island and the observatory; were it to expand over the next decades it could develop into a phytocoenosis), *Rosa canina* (dog-rose), *Viscum album* on poplars, *Salix purpurea* (purple osier), *Sambucus nigra* (elder). *Amorpha fruticosa* (false indigo bush) is cultivated on the banks, for anti-erosion and ornamental purposes. Out

of the lianas, the most significant is *Clematis vitalba* (Old man's beard).

The fragment of phytocoenosis with *Aas. Salicetum cinereae* is in a favorable conservation status with a small tendency to expansion. The fishermen created footpaths that disturb the birds while roosting. Species identified around *Salix cinerea* shrubs are: *Typha angustifolia*, *Scirpus lacustris*, *Lythrum salicaria*, *Juncus effusus*, *Iris pseudacorus*, *Mentha aquatica*, *Alisma plantago-aquatica*, *Salix purpurea*, *Typhoides arundinacea*, *Leersia oryzoides*, *Epilobium hirsutum*, *Sonchus arvensis*, *Deschampsia caespitosa*, *Heracleum sphondylium*, *Cirsium palustre*, *Holcus lanatus*, *Potentilla reptans*, *P. anserina*, *Calystegia sepium*, *Carex riparia*, *Carex hirta*, *Glyceria notata*, *Eleocharis palustris*, etc.

Under the trees, the shrub layer is made up of *Rubus caesius* and *Humulus lupulus*.

The herbage layer covers a very small area.

On the dry soil at the end of the dam there are *Lysimachia nummularia* (moneywort), *Equisetum palustre*, *Angelica sylvestris*, *Urtica dioica*, *Erigeron annuus* (daisy fleabane), *Chaerophyllum aromaticum* (herb linn), *Sonchus oleraceus* (smooth sow thistle) underbrush, *S. arvensis* (field milk thistle) on the banks, *Artemisia vulgaris* (motherwort) on the bank.

In the swamp, there are *Phragmites australis* (it covers approximately 20% of the perimeter with herbaceous vegetation of humid climate), *Scirpus lacustris* (rush, it covers approximately 20% of the perimeter with herbaceous vegetation of humid climate), *Typha latifolia* (cat tail), *Lycopus europaeus* (gypsywort), *Solanum dulcamara* (nightshade), *Alisma plantago-aquatica* (water plantain), *Sparganium erectum* (simplestem bur-reed), *Lythrum salicaria* (purple loosestrife), *Iris pseudacorus* (flag), *Carex riparia* (sedge), *Leersia oryzoides*, *Eupatorium cannabinum* (holy rope), *Bidens tripartita* (three-lobe beggarticks), *Mentha verticillata*, *Calystegia sepium* (hedge bindweed), *Lysimachia vulgaris* (garden loosestrife), *Galium palustre* (marsh bedstraw).

In water, there are *Potamogeton perfoliatus* (perfoliate pondweed), *Elodea canadensis* (Canadian pondweed).

In the herbaceous carpet from the poplar forest at Gheraiesti, on the moist soil, there have been identified the following species: *Brachypodium sylvaticum* (approximately 80% coverage rate), *Torilis arvensis* (spreading hedgeparsley), *Geum urbanum* (wood avens), *Urtica dioica*, *Ballota nigra* (black horehound), *Agrimonia eupatoria* (common agrimony), *Cirsium vulgare* (spear thistle), *Erigeron annuus*, *Viola reichenbakhiana* (early dog-violet), *Plantago major* (greater plantain), *Verbena officinalis* (common vervain), *Galium aparine* (cleavers).

Overgrazing has caused the extensive spread of ruderal plants in the herbaceous vegetation near

the poplar plantation. There is a great number of thistles (*Carduus acanthoides*, *Eryngium campestre*).

In the basin perimeter, there are also other associations, such as *Ass. Sparganietum erecti* Roll. 1938 *Ass. Typhaetum angustifoliae* Pignati 1953, *Typhaetum latifoliae* G.Lang 1973, *Scirpo-Phragmitetum* W. Koch 1926 that cover large areas, they are not the object of monitoring Natura 2000 habitats and they are only analyzed within the actions of Apele Române Siret S.A. society. They are sheltered, the vegetation coverage ranges from 20% to 100% with an expansion tendency because of the advanced silting and the biological particularities. Abiotic risks (a rise in the water level), biotics risks (competition with other groups of plants) or anthropic risks have not been identified. They make the region attractive. They have big biomass, diminished floristic diversity, with only sporadic specimens of some accompanying species, such as *Sagittaria sagittifolia*, *Sparganium erectum*, *Butomus umbellatus*, etc. In water there is *Potamogeton perfoliatus*.

CONCLUSIONS

The apparition of submerged and emergent vegetation on almost two-thirds of the basin's surface will strongly accentuate the retaining of alluviums and, at the same time, it will make an efficient biological filter for the eventual pollutant substances that get among these phytocoenoses. However, in future, a bend of the Bistrita may remain through the center of the river basin; this points to the fact that the basin is ageing and the amount of energy in the turbines diminishes. The silting is advanced on the West (right) side of the basin because the stream is weaker there. The largest vegetation areas are represented by *Potamogeton natans*, *Scirpus lacustris* și *Typha angustifolia*.

For the whole region, the risk of the disturbing factors identified is of moderate intensity, future threats may appear. They are: floods, vegetation successions, grazing, frequent use of footpaths, tourism, vandalism, fishing, plastic objects thrown in the water and carried along, trash; they are not of

great importance for the vegetal carpet, as for river birds, they must be taken into consideration, especially during the hatching period.

ABSTRACT

In the present study, we analyse the cormophyte vegetation from the perspective of ecological monitoring actions, in a basin of a micro-hydropower plant situated where the Bistrita River discharges into the Siret River, a basin which is part of an avifaunistic protected area. There have been identified plant associations which are comprised in the following habitats: 3150-natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* vegetation; 3270 – Rivers with muddy banks with *Chenopodionrubri* p.p. and *Bidention* p.p. vegetation; 92A0 –*Salix alba* and *Populus alba* galleries. The factors responsible for disturbing the ecological balance of this sector of the Bistrita River are: floods, vegetation successions, grazing, frequent use of footpaths, tourism, vandalism, fishing, plastic objects thrown into water and carried along, trash, etc.

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