2nd International Conference - Water resources and wetlands. 11-13 September, 2014 Tulcea (Romania); Available online at http://www.limnology.ro/water2014/proceedings.html
Editors: Petre Gâştescu ; Włodzimierz Marszelewski ; Petre Bretcan; ISSN: 2285-7923; Pages: 146-151;

ASPECTS CONCERNING THE BIODIVERSITY OF THE LAKES OF TÂRGOVIŞTE PLAIN

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Abstract

Târgovişte Plain is remarkable in the landscape for its higher step, similar to a gulf, which penetrates deep into the Subcarpathians of Ialomiţa to the north and fades out southwards, at the contact with Titu Plain, which is a subsidence plain. Administratively, Târgovişte Plain is entirely included within the boundaries of Dâmboviţa County (in its central-southern area). In the area under analysis there is a varied secondary, local hydrographic network, represented by the tributaries of Ialomiţa River (Izvoarele, Racoviţa, Brazilor, Slănicul de Sus, Slănicul de Jos, Răzvădeanca, Pâscov), Dâmboviţa River (Valea Satului, Ilfov, Mierea-Rădăcini, Colentina, Bordeiul Baranga, Crevedia) and Sabar River (Cobia, Siliştea, Mătăsaru). The anthropic lakes of Târgovişte Plain, through their use, have: hydropower functions (Văcăreşti, on Dâmboviţa River), or fishery functions/ a complex role (Bunget 1, 2, Brăteşti, Adunaţi and Ilfoveni, on Ilfov River) or a role in the lessening of the high floods / a non-permanent role (Udreşti on Ilfov River). In the more humid areas of the riversides, on the border and at the surface of the lakes, in the low areas, where the water-bearing structures are near the surface, one can notice the development of hydrophilic and aquatic vegetation. A 597ha aquatic area of the Lakes from Ilfov Valley has been included in Natura 2000 as an area of avifauna importance for its 22 species of protected birds, enumerated in Annex I of the Council Directive 2009/147/EC (Birds Directive) and for its additional 77 species of birds with regular migration, not mentioned in Annex I of the Council Directive 2009/147/EC.

Keywords: Târgovişte Plain, lakes, biological communities, area of avifauna importance

1.INTRODUCTION

The present paper aims to illustrate the biological communities of the lakes present in Târgovişte Plain. This relief unit is a piedmont plain standing out in the landscape due to a higher level, similar to a gulf, penetrating deeply northwards in the Subcarpathians of Ialomiţa and fading out in the south, at the contact with the subsidence plain of Titu.

The lakes of Târgovişte Plain, in point of their uses, can be classified into: power production (Văcăreşti, on Dâmboviţa River), fishery/complex uses (Bunget 1, 2, Brăteşti, Adunaţi and Ilfoveni, on Ilfov) and attenuation of the high floods /non-permanent Udreşti on Ilfov). To these, one can add the lake of Priseaca, used for occasional fishing.

In the more humid places from the riversides, by the lakes and on their surface, in the low areas, where the phreatic water is situated near the surface, a hygrophile and aquatic vegetation can be noticed. An aquatic area of 597 ha out of the lakes of Ilfov Valley was included in *Nature 2000* as an area of significance for its avifauna, which includes 22 protected species.

2.MATHERIALS AND METHODS

Situated in the Romanian Plain, the Plain of Târgovişte lies at its margin, being limited in the south, south-west and south-east by the subsidence Plain of Titu-Sălcuţa and in the east by the piedmont Plain of Cricovul Dulce.

From an administrative perspective, the Plain of Târgovişte is totally comprised within the boundaries of Dâmboviţa County – being placed in its central-southern area. The limits considered as areas of interference where the morphological features of the units coming in touch combine, define this plain as a set of forms of relief with different altitudes and development.

The contact between the Romanian Plain, the Subcarpathians and the Getic Piedmont stands out in the landscape due to a higher level, namely the Plain of Târgovişte, which appears like a gulf, penetrating deeply northwards in the Subcarpathians of Ialomiţa and fading out in the south, at the contact with the subsidence plain of Titu.

From a hypsometric perspective, north of the Plain of Târgovişte, the altimetric values highlight the existence of some forms of relief going up to a maximum height of 550m, constituting an area of transition towards the Subcarpathians. This marginal morphometric complex represents the system of high terraces of Dâmboviţa and Ialomiţa River, characteristic for the entire Subcarpathian sector and for the whole general interfluve level pertaining to these rivers (Sencovici, 2009).

On the western side of this plain, another high level appears, ranging between 300 and 400m. It decreases in altitude from north to south, where it ends by long spurs that rise above the Plain of Târgovişte by about 50-100m: Mălăeştilor Peak, Butoiului Hill and Cerbului Hill.

On the eastern side of the plain, the spur called Pintenul Măgurii maintains the same value of the altitudes (341 m in the neo-tectonic brachianticline of the hill Măgura Bucşani), appearing suspended over the Ialomiţa Valley.

In the Plain of Târgovişte, the altitudes record a slow decrease from NW to SE, namely from 350m to 180m. However, in this area, the generations of valleys and the two main valley corridors of Dâmboviţa and Ialomiţa create significant tiers in the structure of the physical-geographic elements, especially in the vegetation and in the hydrological peculiarities.

In this sense, one can note the existence of a tier situated between 350 and 300m, developed in the north of the region and gently penetrating into the valley corridors of the Subcarpathian sector. Another intermediary tier situated between 300 and 200m, has a large development in between the two main valleys gathering the waters of the plain, on the background of which it appears as a large interfluve. The lowest level, ranging between 200 and 100m, with an intense fragmentation and numerous elements specific of the plain, has clear transitional features compared so the subsidence area of the Romanian Plain. This transitional character is highlighted as well by the penetration of this low step both along the main valleys and along the generations of valleys pertaining to the plain, constituting in this way the morphological equivalent of their lower terrace.

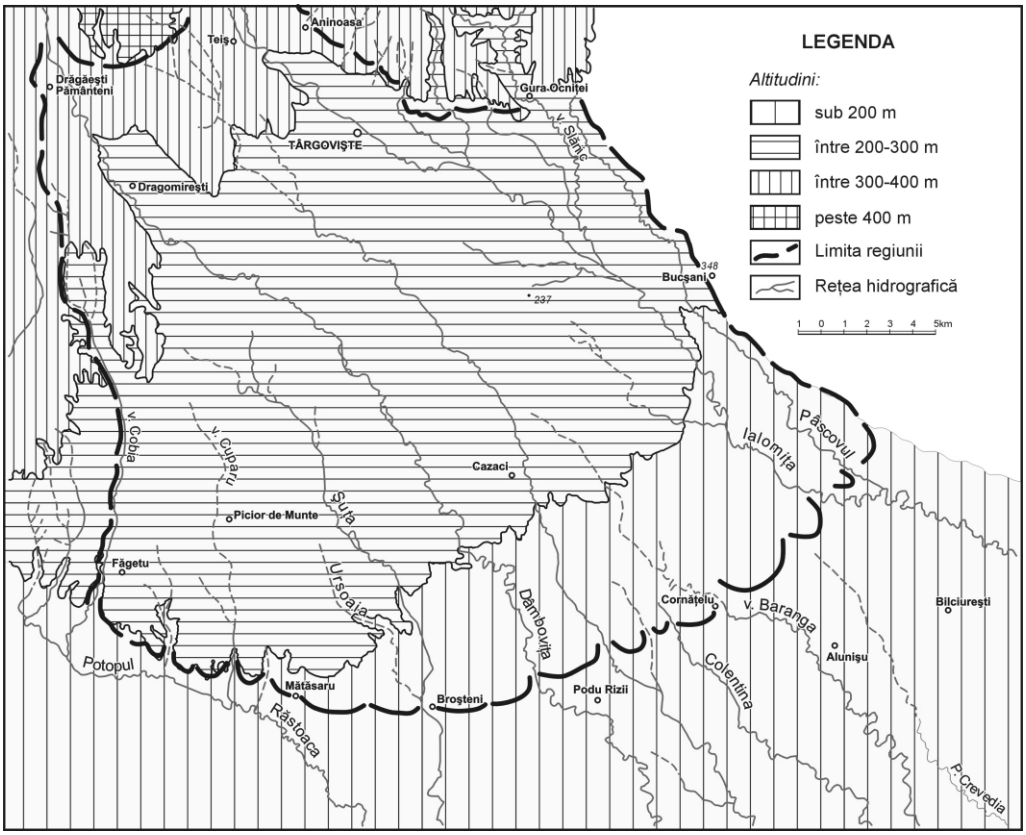

Figure 1. Hypsometric map

3.RESULTS AND DISCUSSION

In the Plain of Târgovişte, the lithology and the relief, the precipitation regime and the vegetal layer are main factors determining the features of the phreatic waters, of the surface waters and the potential of the average liquid flow at the surface given by the relation between precipitations and evapotranspiration.

Underground waters. Given the specific relief conditions - a piedmont plain resulted from the terracing of the dejection cones and the two hydrographic arteries, Ialomita and Dâmbovita, with large riversides and terraces - the free (phreatic) underground waters are well represented and situated on several horizons in agreement to the altimetric position of the forms of relief - riversides, terraces, dejection cones.

The complex geological structure determined an unequal repartition of the underground water resources. According to the type of spatial distribution of the porous permeable deposits, of the hydrogeological parameters (hydraulic gradient, hydraulic conductivity etc.), and also according to their relation to the impermeable deposits and the surface waters, one can note deep and shallow water-bearing structures.

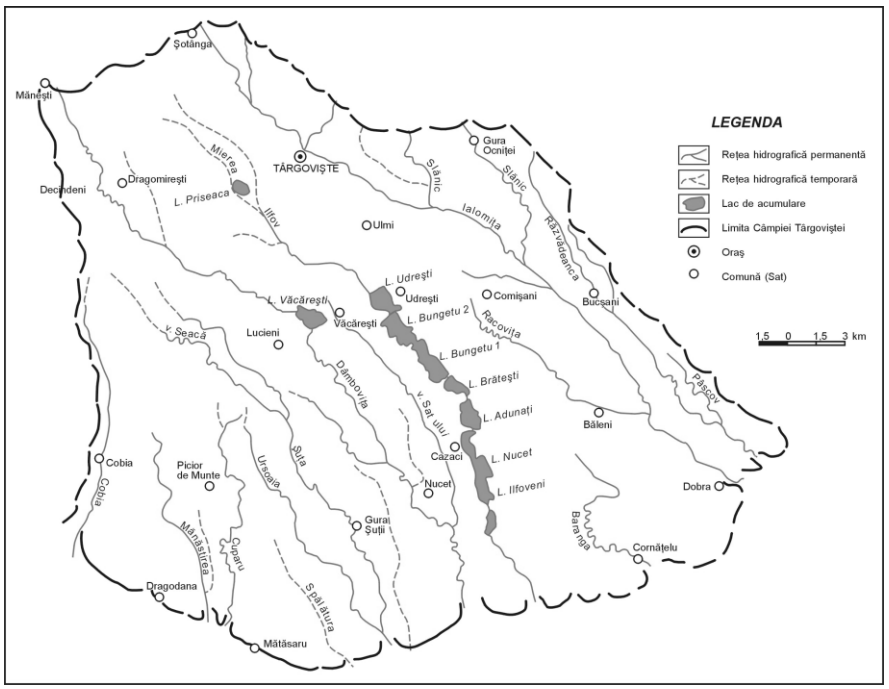

Fig. 2. Lakes of Târgovişte Plain

Rivers. The hydrographic network is characterized by an almost parallel distribution in the north and a divergent distribution in the south of the region, given by the three main allochtonous arteries: Ialomita, Dâmbovita, Argeş.

The local secondary hydrographic network is represented by the tributaries of Ialomita (Izvoarele, Racovita, Brazilor, Slănicul de Sus, Slănicul de Jos, Răzvădeanca, Pâscov), Dâmbovita (Valea Satului, Ilfov, Mierea-Rădăcini, Colentina, Bordeiul Baranga, Crevedia) and Sabar (Cobia, Siliştea, Mătăsaru)

In the area of Târgovişte Plain, in its northern region, which narrows down to a width of 7-8km near Târgovişte Municipality, originate the rivulets Ilfov (springing from Dealul Teişului), and Baranga, Crevedia, Racovita, Miereş etc. In the constructible area of Târgovişte municipality, one can find the rivulets Milioara and Târgovişteoara, along which, in the 16th century, the ditch of the fortified city ("***şantul cetății***") was built.

The length of the rivers, within the boundaries of the piedmont plain, is variable depending on the geographic position. Namely, the allochtonous ones -Dâmbovita 50km, Ialomita, 42km and the local ones, supplying with water especially the phreatic water-bearing structures situated in the Quaternary deposits, have smaller lengths - Ilfov 12km, Cobia 21km and Şuta 26.5km. The length of these rivers can be explained by the position of the piedmont plain, by its narrowing down in the longitudinal profile and by the direction of development of the river valleys. *The average width of the basins* varies as follows: Cobia (1.7km), Dâmbovita (2.2km), Ilfov (5.6km) and Ialomita (2.8km).

The average altitude of the basins depends on the actual aspect of the relief. The average altitude of the basins is, for Dâmbovita, 237m, for Ialomita, 283m, for Ilfov, 234m and for Pâscov, 203m. In the basin of Ialomita, the higher average altitude is given by the fact that the rivers on the left, which come from the Subcarpathian area, are drafted on a train of dejection cones.

The anthropic lakes of Târgovişte Plain, through their main functions, belong to two categories, namely: power production (Văcăreşti Lake, on Dâmbovita) and 6 lakes on Ilfov River, and fisheries (ponds and fish ponds) and, complementarily, they serve to alleviate the high floods, in irrigations and to provide

water for local recreation and sportive fishing areas (out of them, one, with a non-permanent character, has the role of alleviating the high flood waves, namely l. Udreşti, and 5 have complex functions: Bunget 1, 2, Brăteşti, Adunati and Ilfoveni) (Sencovici, 2009).

Photo. 1 Ilfoveni storage lake

Photo. 2 Bunget 2 storage lake

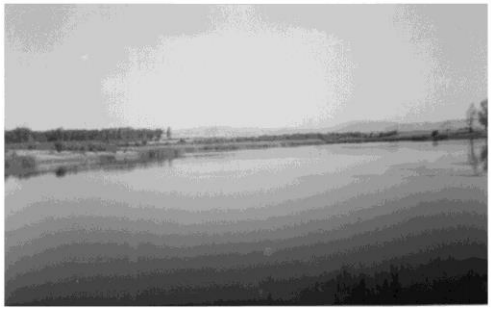

Photo. 3 Canal stemming from Văcăreşti storage lake **Photo 4.** Udreşti storage lake

Also included in the lacustrine landscape of the Plain of Târgovişte are the basins serving as fish ponds for research belonging to the Station of Fisheries Research, Nucet, one of the best developed pilot fisheries of Eastern Europe.

Table 1. Storage lakes (according to Atlasul cadastrului apelor din România / The Atlas of the Water Register of Romania, 1992)

	Total volume [mil.m^3]	**Volume of the Normal Top-water Level** [mil.m^3]	**Area**	**Use**
Ilfov River				
Udreşti	1.5	1.2	61	Complex
Bunget I	3.1	2.77	93	Complex
Bunget II	3.1	2.70	91	Complex
Brăteşti I	4.1	3.6	97	Complex
Adunati	3.1	2.6	96	Complex
Ilfoveni	4.1	3.6	104	Complex
Nucet	1.6	1.32	60	Fisheries
Dâmbovita River				
Văcăreşti	54.0	14.10	234	Power

The Station of Fisheries Research, Nucet – is a pilot fisheries station with about 80 ponds whose areas range between 0.5 and 5 hectares, summing up 110ha, adapted for the development of complex technological experiments of intensive fish breeding, for the demonstration of technologies and researches in the domain of genetics and for fish improvement and also for the preservation of a lot of fish genitors of different hatchery species and of some nuclei of the rare species of the Romanian fish fauna.

To regularize the river bed and to direct the waters towards Iazul Morilor and towards the hydraulic ram Ialomita-Ilfov, two storage lakes have been arranged, one downstream from Teiş Bridge and one downstream from Valea Voievozilor Bridge.

3.1.Hygrophile-palustrine and aquatic biodiversity

In the wetter riverside areas, along the lakes or in the low areas, with phreatic water near the surface, the vegetation is made up of hygrophile and palustrine plants, and in the lacustrine areas, there is aquatic vegetation, either floating or submerged, attached to the muddy bottom of the water.

Out of the submerged water plants attached on the bottom of the lakes, one can note: whorled milfoil (*Myriophyllum verticillatum*), hornwort (*Ceratophyllum demersum*), *Potamogeton perfoliatus*, *Potamogeton natans*, *Potamogeton crispus*, tape grass (*Vallisneria spiralis*); with floating leaves: frogbit (*Hydrocharis morsus-ranae*), European water plantain (*Alisma plantago-aquatica*), arrowhead (*Sagittaria sagittifolia*), flowering rush (*Butomus umbellatus*), water soldier or water pineapple (*Stratiotes aloides*), Canadian waterweed (*Elodea Canadensis*), and floating – common bladderwort (*Utricularia vulgaris*) and common duckwood (*Lemna minor*) (Sencovici, 2010).

Attached to the bottom of the slack waters, sometimes deeper down, one can note the presence of the water soldier or water pineapple (*Stratiotes aloides*), Canadian waterweed (*Elodea canadensis*). On the surface of the waters , one can find some plants at first attached to the bottom, then, floating, such as common bladderwort (*Utricularia vulgaris*) and common duckweed (*Lemna minor*) (Muică et all, 2004). All these plants and other smaller, microscopic ones, such as different algae, make up a thicket and a living environment for a corresponding fauna. Highly frequent are also the filamentous algae (Ivan, 1992).

The belt of plants assuring the passage from the water area to its margin, the palustrine vegetation, is represented by common reed (*Phragmites australis*), and bulrush (*Typha latifolia, T. angustifolia*). On the margin of the lakes and of the ditches full of water there are: yellow iris (*Iris pseudacorus*), pond sedge (*Carex riparia, Carex acutiformis*), Northern water hemlock (*Cicuta virosa*), bur-reed (*Sparganium erectum*), *Glyceria fluitans*.

In the wet micro trenches, there appear: buttercup (*Ranunculus sceleratus*), compact rush (*Juncus conglomeratus*), common spike-rush (*Eleocharis palustris*), water mint (*Mentha aquatica, M. arvensis*).

On the sandy alluvial deposits, one can find different pioneering species or species resilient to unfavorable conditions, such as: common sea buckthorn (*Hippophae rhamnoides*) and locally salt cedar (*Tamarix ramosissima*), a continental Eurasiatic species (for example in the riverside of Dâmbovita, in the area of the locality Nucet) (Muică & Sencovici 2007). Locally, on sandy soils there appear, as well, lawns of rat's tail fescue (*Vulpia myurus*) and tufted grass (*Holcus lanatus*).

The coppices and the palustrine vegetation (bulrush, reed, rush) along the waterside provide shelter and food to the water voles (*Arvicola terestris*), diverse species of frogs, and different birds such as: common kingfisher (*Alcedo atthis*), white wagtail (*Motacilla alba*), yellow wagtail (*Motacilla flava*), reed bunting (*Emberiza schoeniclus*), thrush nightingale (*Luscinia luscinia*).

In the abrupt, sandy riverside of Dâmbovita River, in the area of the locality Nucet, European bee-eaters (*Merops apiaster*), characteristic South-European birds, dig their galleries for nesting.

In the small river courses, one can find European chub (*Leuciscus cephallus*); in the tributaries of Ialomita and Dâmbovita: barbel (*Barbus barbus*), European perch (*Perca fluviatilis*), crucian carp (*Carassius carassius*) and common rudd (*Scarandinus erithrophthalmus*).

In the wet watersides, sometimes storks (*Ciconia ciconia*) stop over, yet they are much less numerous than in the past.

3.2.The lakes along Ilfov Valley – a site of importance for the avifauna

The site, totaling 597 ha, comprises the series of lakes situated along Ilfov Valley (the fisheries of the storage lakes of Udreşti, Bunget I, Bunget II, Brăteşti, Adunaţi and Ilfoveni, summing up 2181ha). The main soil types present here are the reddish brown earths and the pseudogleic ones. The vegetal communities presented above (common reed - *Phragmites australis*, bulrush - *Typha latifolia, T. angustifolia*, yellow iris - *Iris pseudacorus*, pond sedge - *Carex riparia, Carex acutiformis*, Northern water hemlock - *Cicuta virosa*, bur-reed - *Sparganium erectum*, floating sweet-grass - *Glyceria fluitans*) constitute an adequate area for nesting, resting or feeding for many bird species, including for species significant for the bird reserves of Europe (Bugariu, 2005).

The site hosts numerous protected bird species, and it is important for the populations of the aquatic bird species that appear during the migrations and in winter.

22 protected bird species have been identified, enumerated in the 1st annex of the Directive 2009/147/EC (Birds Directive) and 77 bird species of regular migration, not mentioned in the 1st annex of the Directive 2009/147/EC.

The protected species of birds enumerated in the 1st annex of the Directive 2009/147/EC (Birds Directive) are *Ciconia nigra* (black stork); *Ciconia ciconia* (white stork); *Nycticorax nycticorax* (night heron); *Ardeola ralloides* (squacco heron); *Ixobrychus minutus* (little bittern); *Egretta alba* (great white egret); *Egretta garzetta* (little egret); *Platalea leucorodia* (Eurasian spoonbill); *Plegadis falcinellus* (glossy ibis); *Cygnus cygnus* (whooper swan); *Mergus albellus* (smew); *Phalacrocorax pygmeus* (pygmy cormorant); *Chlidonias niger* (black tern); *Chlidonias hybridus* (whiskered tern); *Sterna hirundo* (common tern); *Tringa glareola* (wood sandpiper); *Philomachus pugnax* (ruff); *Himantopus himantopus* (black-winged stilt); *Lanius collurio* (red-backed shrike); *Crex crex* (corncrake); *Falco vespertinus* (red-footed falcon); *Dendrocopos medius* (middle spotted woodpecker).

4.CONCLUSIONS

The lakes of the Plain of Târgovişte include a highly diverse flora and fauna, important for the biological communities of the whole country. The site containing the lakes of Ilfov Valley (the fisheries of the lake storages of Udreşti, Bunget I, Bunget II, Brăteşti, Adunaţi and Ilfoveni), of the area of the localities Nucet (6%), Ulmi (2%), Văcăreşti (9%), of the ecoregion of the Romanian Plain are highly important especially for the populations of the aquatic bird species coming during the migrations and in winter in its area. These birds are also menaced by dangers such as the presence of hunters, the uncontrolled depositing of domestic waste, the burning of the reed and of the vegetation but also the development and the extension of some invasive species.

Generally, in point of its biogeography, the territory of the Plain of Târgovişte is part of the Province of Dacia and, according to the present biogeographic classifications, it belongs to the continental region of Europe.

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