



THE LAKES OF THE TRANSYLVANIAN PLAIN: GENESIS, EVOLUTION AND TERRITORIAL REPARTITION

Victor SOROCOVSCHI

“Babes-Bolyai” University, Faculty of Geography
Cluj-Napoca, Romania
svictor@geografie.ubbcluj.ro

Abstract

This article is concerned with the genesis of the Transylvanian Plain lakes' basins and their evolution in time and space. Natural lakes in this area are reduced in point of their types of geneses (pseudokarst and landslide lakes) and number. Their evolution in time is quite fast, especially of the pseudokarst lakes. Among the anthropic lakes, the ponds represent the most frequent genetic type, which gives a particular aspect to the landscape of the Transylvanian Plain. They used to be much more numerous in the past than at present. Those whose dimensions are not significant, situated on the tributaries of the main rivers, have a rapid evolution. The anthropic salt lakes formed following the exploitation of salt in the western area of the country had a fast evolution and they are not numerous today.

Keywords: lake, genesis, evolution, repartition, territory

GENERAL CONSIDERATIONS

The Transylvanian Plain represents the least extended unit (3908 km²) of the three great divisions of the Transylvanian Plateau, holding 26 % of this hilly area. Situated in the center-north of Transylvanian Depression, in between the alpine peaks of Căliman Mountain eastwards and Apuseni Mountains in the southwest, the Transylvanian Plain appears as a low hilly region whose land is used mainly in agriculture.

Despite the apparent uniformity of the landscape, in the region situated between the 3 rivers Someș and the river Mureș, the components of the geographic landscape differ in space and allow the delimitation of two units (The Plain known as Câmpia Someșană in the north and the one called Câmpia Mureșană in the south) with several subunits each having its distinctive features (fig. 1).

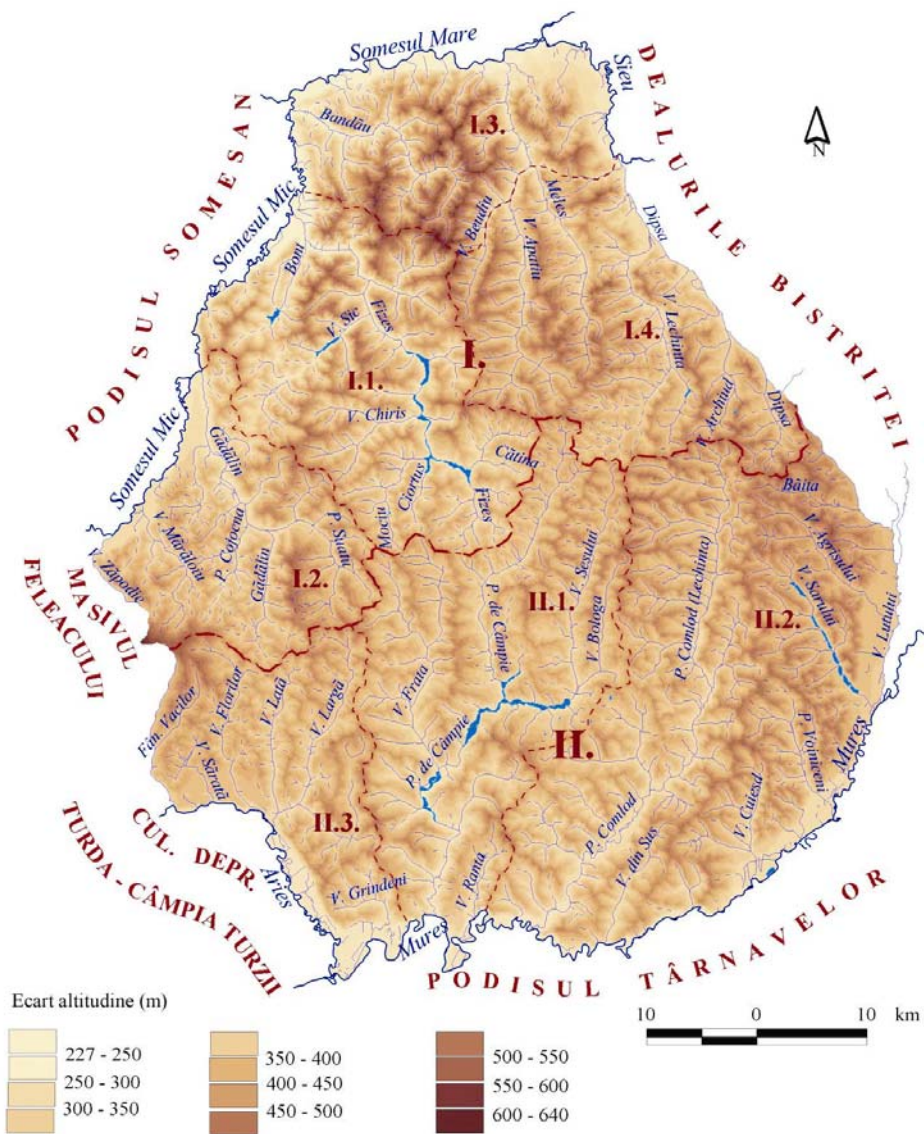


Fig.1. The Transylvanian Plain and their subunits

- I. The Someșană Plain: I.1. The Fizeș Plain; I.2. The Sic Hills; I.3. Unguraș Hills; I.4. Lechința Hills.*
- II. Mureșană Plain: II.1. Sârmaș Plain; II.2. Mădăraș Hills; II.3. Coasta Grindului*

In the area of the Transylvanian plain can be encountered numerous lakes with varied geneses, and morphometric, hydric and physico-chemical features. The presence of the lake units inside certain geographic units situated in the middle of the “plain”

(Câmpia Fizeşului, Câmpia Sârmaşului) leaves a special mark on the landscape of these territories.

LAKE GENESIS, EVOLUTION AND REPARTITION

The individualization of the lake basins appeared following the action of natural and anthropic factors. In point of their origin, the lakes that exist on the territory of the Transylvanian Plain belong to two main categories: natural and anthropic. Most of the lakes are associated in complexes; rarely do they appear solitarily.

Natural lakes

Not numerous, the lakes that have a natural origin are solitary, their dimensions and depth are not significant and they are relatively uniform as genesis. In this category are included the lakes resulted following landslides (*Dătăşeni Lake*), those from the erosion basins situated on the upper course of certain rivulets (*Pogăceaua* and *Zoreni Lake*) or from micro-depressions resulted following the melting of the salt and the settling of the area (*Ştiucii Lake*).

Pseudokarst lakes. In this category, P. Gâştescu (1971) included *Ştiucii Lake* in Bonţ Valley, the last tributary on the left of Fizeş River. The lake's formation through salt melting and settling-subsidence is closely connected to the location of its basin on the diapir visible on the alignment of the localities Dej – Săcălaia – Sic – Cojocna – Turda – Ocna Mureş. Salt is present at the surface on the northern border of the lake, at the salty well of Săcălaia (near the confluence of Săcălaia Valley and Bonţ) and at the well dug inside the precincts of the chalet of A.J.P.S. Cluj, on the eastern border of the lake.

Following the significant transport of slope materials, the salt was isolated from the water by means of a tight layer of silt, the salt melting process being stopped. Gradually, the water turned sweet and at present the lake is well populated with fish and invaded by vegetation in a significant area, which increased from 17 ha in 1957 to 27.25 ha in 2000.

The evolution of the lake's basin was followed through a detailed analysis and a comparison of the two size and depth measurements achieved by Al. Săndulache (1957) and Gh. Şerban, V. Sorocovschi (2000). We noticed significant modifications brought by the alluvial deposits transported by the lateral tributaries (fig.2). The leveling out of the negative and positive forms of relief indicates a permanent clogging of the lake's basin. If, initially, the morphology was specific for the lakes formed on a diapir with accentuated negative forms, on the map of the year 2000, the bottom of the basin appears flat, which is the characteristic appearance of most of the ponds from the Transylvanian Plain. Important modifications occur as well in the evolution of the lake's morphometric elements. Namely, this comparison makes it possible to highlight a significant dwindling of the lake's surface (by 10 ha), length (over 0.2 km), depth (the average depth decreased by 2.3 m and the maximum depth decreased by over 5 m) and the basin's slope (which decreased by over 8 m/km).

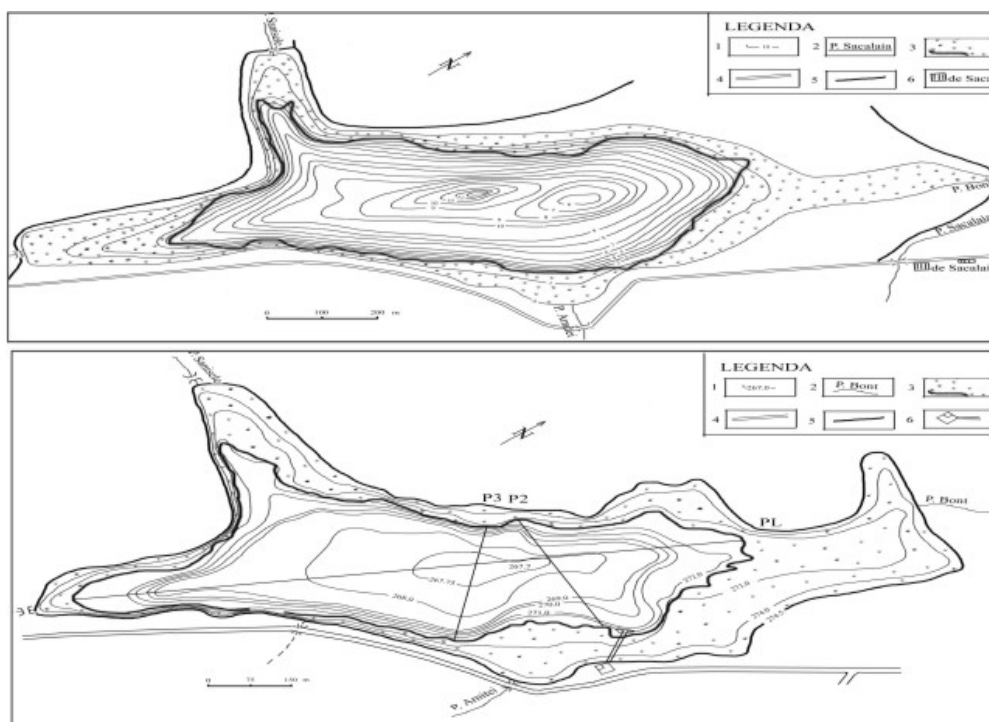


Fig. 2. Bathymetric maps of the Știucii Lake - 1957 (a) and 2000 (b).

Landslide lakes. The high frequency and intensity of the slope processes favored the individualization of certain lake basins with low surfaces and low depths. In this category are included a few lakes situated in the area of the localities Pogăceaua, Dătășeni and Archiud.

Pogăceaua Lake is situated in the southeast of the Transylvanian Plain in Mădăraș Valley, a tributary on the right side of Comlod, at an absolute altitude of 370 m and a relative altitude of 28 m reported to Fânațelor Rivulet, at whose source is placed the lake. Some unbelievable information about the lake exists since the 19th century, when it was attributed exaggerated depths (Orbán B., 1862).

The Pogăceaua Lake was formed behind the initial landslide-induced wave represented by the Continit Hill (Săndulache Al., 1963). Initially, it seems to have been an endoreic basin, and then the lake began to be drained by the Continit Rivulet, a tributary of the Fânațelor Valley.

Comparing the measurements made by Săndulache Al. (1962) and by Șerban Gh., Fodorean I. (2003), we can notice the dwindling of all the morphometric elements and the withdrawal of the lake's borders following its invasion by vegetation, and its quite accelerated clogging.

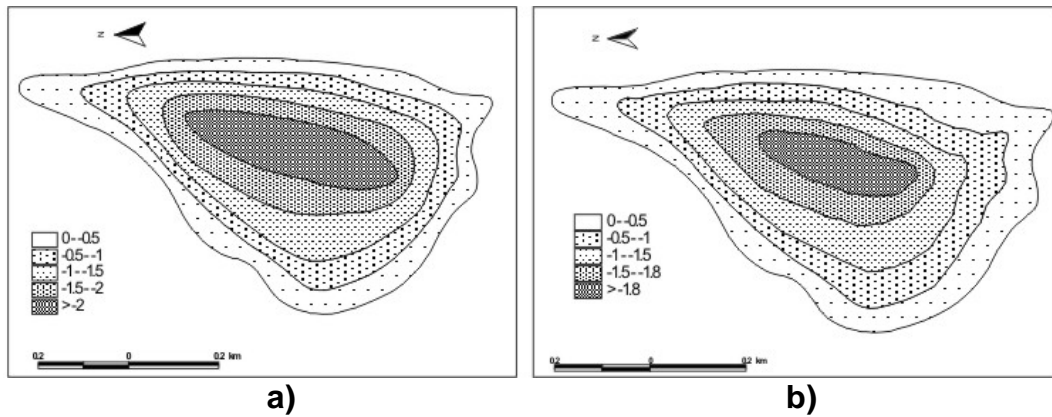


Fig. 3. Bathymetric maps of the Pogăceaua lake- 1963 (a) and 2003 (b)

Dătășeni Lake is situated in the southwest of the Transylvanian Plain, on the right side of the Mureș Corridor, upstream from the mouth of Ranta Rivulet, at a relative altitude of about 100 m reported to Mureș riverbed. After the 34 years period that elapsed between the two measurements (Pop Gr. in 1970 and Șerban Gh., Fodorean I. in 2003), the modifications of the morphometric elements and of the water volumes were not so intense as in the case of the Pogăceaua Lake (fig.4). Probably the lack of a surface network tributary to the lake (even a temporary one) made it harder for the lake to get clogged by alluvial deposits.

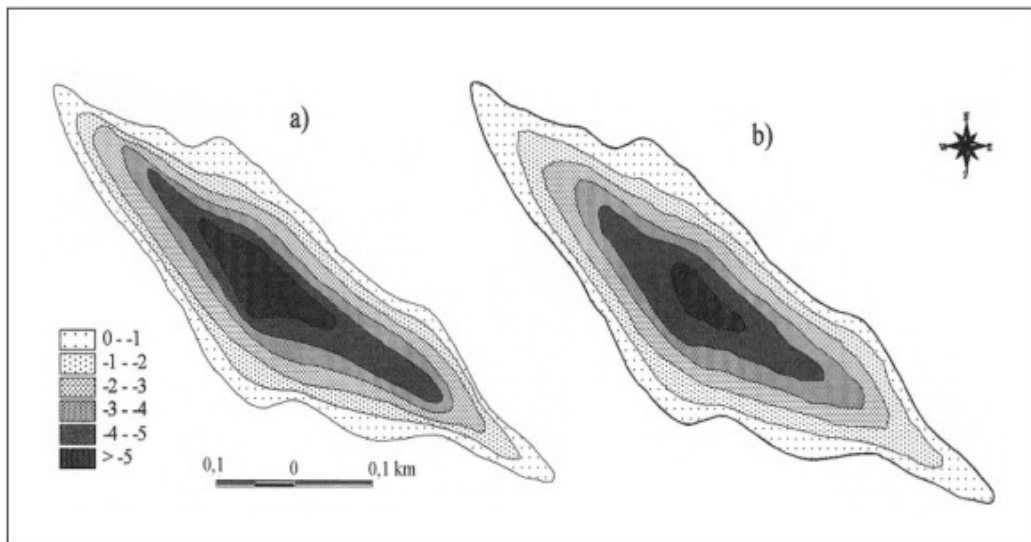


Fig. 4. Bathymetric maps of the Dătășeni lake 1970 (a) and 2003 (b)

Anthropic lakes

On the territory of the Transylvanian Plain there are numerous artificial or anthropic lakes, which can be grouped into two main kinds: artificial salt lakes and ponds.

Anthropic salt lakes. The presence of this genetic type is related to the millenary exploitation, by means of the “bell” or “trapezoidal” mine system, of the salt deposits situated in the diapiric area on the border of the Transylvanian Plateau. The accumulation of the water coming from precipitations and sources from the former salt mines occurred depending on the type of exploitation. The area of this type of lakes is related to the salt quality of the diapiric structure situated on the alignment of the localities Ocna Dej – Săcălaia – Sic – Gădălin - Cojocna - Turda, which determined its exploitation since Dacian and Roman times (Cojocna, Sic, Turda, etc.).

The lake complex from Cojocna is related to the presence of the former salt mines remained following the exploitation of the salt, which continued in a “bell” system, until the middle of the 19th century (1850-1852), when the mines were closed. The therapeutic valorization of the cold salty water from the holes formed in the salt massif began in the year 1883, when the bases of the Cojocna station are set. Until 1927, it functioned with just one lake, which was arranged as a spa, namely Băilor Lake. Later on, after the filling of the bassinets formed in this way, other lakes of different dimensions resulted, of which we can distinguish the Durgău (Dörgő) Lake.

Out of the 11 lakes signaled by T. Pânzaru in 1971 and grouped into two sectors: at present, in the precincts of the station, there are three salt water lakes (Durgău or Toroc, Băilor and Lake no. 2), and in its neighborhood, at the foot of Plop Hill, there are traces of salty or brackish basins which are in an advanced state of clogging, whose depths do not exceed 0.60 m. They provide the station with therapeutic mud.

Compared to the initial situation, there have been essential modifications because of the penetration into the lake of the landslide-induced waves. This led to the shrinking to just half of the surface of the plateau in the western compartment of the lake and a rearrangement of the whole basin. So, under the action of the landslide-induced waves, the basin from the northern sector of the basin was diminished, and now there are just some remains of it, an inclined plateau and a much-enlarged central hole.

The continuation of the salt dissolution process is attested both by the presence of the four holes, and by the accentuated lowering of the thresholds that separate them. So, we notice the unification of the two holes in the southern area of the basin and an extension of the central basin to the expense of the one from the northern area. Some morphometric elements such as length, maximum width and average depth have increased, which proves the fact that the salt melting process is still active.

The continuation of the salt melting process will probably determine the formation of a better-outlined central basin, yet much narrowed and elongated in the direction of the present longitudinal axis. The landslide-induced waves from the western slope of the lake will gradually advance towards the basin, determining its narrowing in the southern compartment.



Fig. 5. Bathymetric map of the Durgău lake (a. according to Pânzaru, T., 1971; b. according to Alexa, M., Șerban, Gh., Sorocovschi, V., 2001)

Băilor (Ștrand) Lake, situated in the northwestern extremity of the spa complex precincts, appeared following the downfall of a bell-shaped salt mine situated at the basis of the western slope of the micro-depression Cojocna. It is the oldest artificial salt lake, and has been arranged for cold baths even since the beginning of the last century (1913).

After the arrangement of the lake, its shape, which was initially that of an ovoid, became hexagonal.

During the interval that elapsed between the two depth measurements, the lake's basin suffered significant modifications (fig.6).

The disappearance of the clear basin outline and the lowering of the lake's water salinity represent an obvious evidence concerning the interruption or weak connection to the salt massif. The peripheral abrupt slope situated towards the southern edge was attenuated much, and the plateau from the northern and eastern margin was modified.

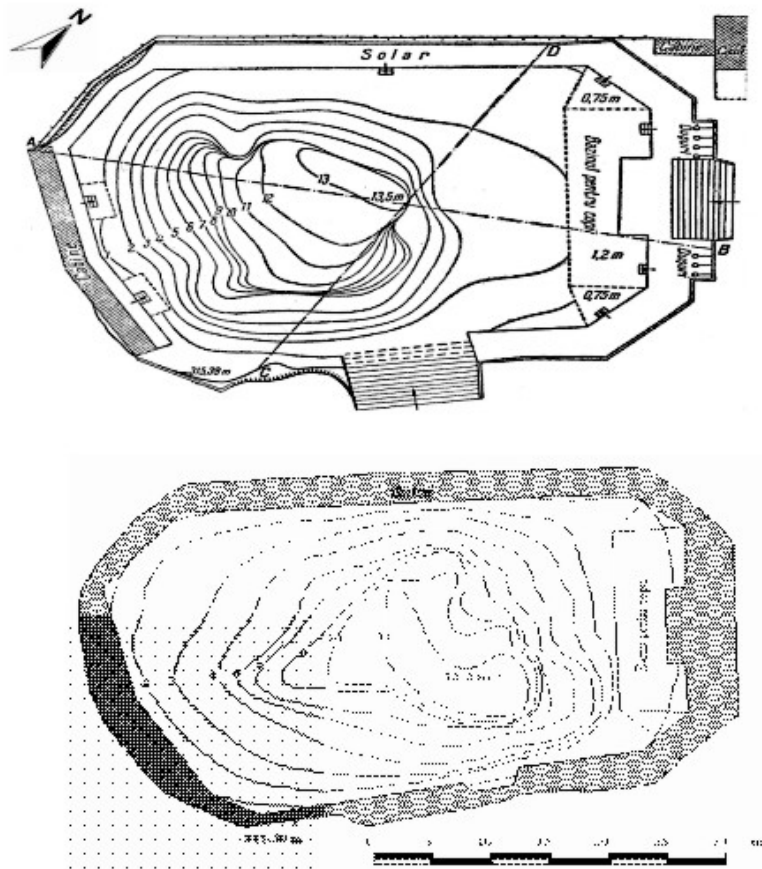


Fig. 6. Bathymetric map of the Băilor Lake (a. according to T.Pânzaru, 1969; b. according to Alexa, M., Șerban Gh., Sorocovschi, V., 2001)

Lake no. 2, situated behind the station hotel appeared in the small basin resulted following the downfall, in 1935, of the salt mine exploited in Cojocna. The lake's outline is almost circular, and the basin is shaped like a cone body.

Compared to the measurements of 1969, almost all of the lake's morphometric elements have higher values. An exception is the depth, reduced quite a lot, which indicates a slow clogging process. The development of the basin took place very much horizontally, a clear proof in this sense being the lake borders' aspect of very inclined slope.

Ponds. The ponds are a significant component of the natural landscape in this area, constituting one of the features that provide its geographic individuality compared to the other sub-divisions of the Transylvanian Plateau.

The ponds' territorial repartition is uneven, over half of them being encountered in

the hydrographic basin of Mureş (55.5 %), a third in the one of Someşul Mic (35.1 %) and only one tenth in that of Someşul Mare (9.4 %).

The explanation of the ponds' genesis took into account the following: the balanced longitudinal profile of the rivers; the narrowing of the valleys as they run across tougher petrographic formations (tuffs, grit stones), landslides and proluvial accumulations; the presence of impermeable deposits on the bottom of the valleys (clays, marls) that prevent the infiltration of the water; the evolution of the hydrographic network (Maxim, I. Al, 1940); the influence of the neo-tectonic structures and movements (Pop, Gh., 1966) and the anthropic activity. During the first stage, the individualization of the lake basins occurred following certain complex natural processes and only later on did the anthropic factor intervene.

In time, the lakes' number fluctuated. Compared to the several hundreds of lakes mentioned during the Middle Ages, in the 18th century only about 150 remained, of which, by the beginning of our century only 20 were mentioned (H. Sztripszki). So, we can notice their considerable decrease in number.

Following the evolution of the fishpond lakes from the Transylvanian Plain in the interval 1930-1990, we can distinguish several characteristic stages. The first corresponds to the period 1930-1950, when the surface arranged for fishponds was of 270.2 ha (19.3% of the existing total of 1989). The second stage corresponds to the interval 1951-1960, when a surface of 168.2 ha was arranged (12.1% out of the total). During the third stage (1961-1970), this surface increased by 430.9 ha (30.9%). The fourth stage begins with the year 1971, when most of the fishpond lakes are situated on the Fizeş and Luduş Valleys. During the second part of this stage, the ponds and fishponds situated on Chiochiş, Gădălin and Şar Valleys begin to be used. During this stage the fish arrangement increased by 525.5 ha, which represents 37.7 % of the existing total of 1989 (1396.8 ha).

The ponds of the hydrographic basin of Pârâul de Câmpie sum up a surface of 654 ha, which represents 46.8 % out of the total of the fishery arrangements of the Transylvanian Plain. The lake units unfold along the course of Pârâul de Câmpie, beginning from Miheşu de Câmpie to Sânger, on a 20 km distance, as well as on some of its left tributaries (Răzoare I and Răzoare II on Velcheriu Rivulet, Văleni Rivulet and Şăulia I-IV Rivulets on Şes Valley) .

Along the course of Pârâul de Câmpie, from upstream towards downstream, we can enumerate the ponds and fishponds from Miheşu de Câmpie, Bujor I, Bujor II, Zau de Câmpie, Tăureni and Sânger. A comparison of the two measurements (1966 and 1997) highlights a diminution of the values of the maximum depths by 0.27 – 0.52 m, which indicates a quite significant clogging degree for these ponds during the last three decennia.

On *Şesului Valley* in 1962 there was only the Şăulia IV Pond, the most extended of the 5 lake units present there. In the 7th decennium the pond arrangement in this area becomes more intense. The result was the appearance of four more ponds (Şăulia I – III and Văleni) and of the fish nursery from Văleni. The ponds with significant surfaces and

volumes have been built at the entrance in the system, and between them and the old pond Șăulia IV, a smaller, buffer-like accumulation was set in place (Șăulia III).

The ponds of Șar hydrographic basin occupy a surface of over 121 ha, representing about a quarter of the total fishponds arrangements made in Mureș Plain. In 1983-1984 began the use of the ponds from Glodeni II and Glodeni I and in 1985 started to be used those from Toldal, Păingeni I and Păingeni II. From upstream downwards, the ponds are: Ercea, Toldal (35 ha), Păingeni I (32 ha), Păingeni II, Glodeni I (23 ha) and Glodeni II (31 ha).

The ponds in the Fizeș hydrographic basin used to sum up 439 ha, namely 31.4% of the total fishponds arrangements in the Transylvanian Plain. The ponds in this area, from upstream downwards, are: Cătina, Tăul Popii, Sf. Florian, Geaca I, Geaca II, Geaca III, Sucutard I, Sucutard II, Țaga Mare, Țaga Mică and Ghiolț. A few more ponds and fishponds can be found on the tributaries of the Fizeș, like those from Ciortuș Valley (Roșieni), Suciuaș Valley (Năsal), Sic Valley (Borzaș and Sântejude) etc. (fig. 7).

The ponds of the upper basin of Fizeș are situated along the main course of the river, between the localities Cătina and Sucutard, as well as on some tributaries on the left side: Ciortuș (Roșieni), Mociu (Legii) and Chiriș (Chiriș).

In the fishpond arrangements from Fizeș hydrographic basin, after 1986 occur a series of modifications that influenced to some little extent the morphometric characteristics of the ponds. Modifications occurred as well following the fishpond arrangements made on Fizeș Valley, upstream Geaca I (Sf. Florian) and Ciortuș (Roșieni). The Sf. Florian and the Roșieni Ponds were arranged recently, respectively in 1986, and 1990.

The lake complex situated on the middle course of Fizeș River includes three ponds: Țaga Mare, Țaga Mică and Ghiolț. The natural origin of the micro-depression in which the ponds Țaga Mare and Țaga Mică lay today is related to the modifications of the valley following the neo-tectonic movements. The micro-depression used to have three compartments, separated by a narrowing and by the alluvial deposits transported by Suciuaș valley almost in the middle of the depression. In time, man intervened a few times and modified the initial parameters. So, by building of an earthen dam in the area of the above-mentioned narrowing, the ponds Țaga Mare and Țaga Mică were separated.

The Țaga Mică pond occupies the compartment downstream from the micro-depression. On the map elaborated by Erődi K. (1908) it does not appear separated from Țaga Mare, while on the map of Săndulache Al. (1962) the pond dam of Țaga Mare is already there. The hydrotopometric measurements made by Pandi G. (1997) show the existence of a land area between Țaga Mare dam and the upper limit of Țaga Mică dam.

Ghiolț Pond, situated downstream from Țaga Mică, was arranged in 1975 by building longitudinal dams, which delimited a part of Fizeș riverside.

The modifications occurred in the meantime are caused first of all by the numerous anthropic interventions and by the ponds' clogging process.

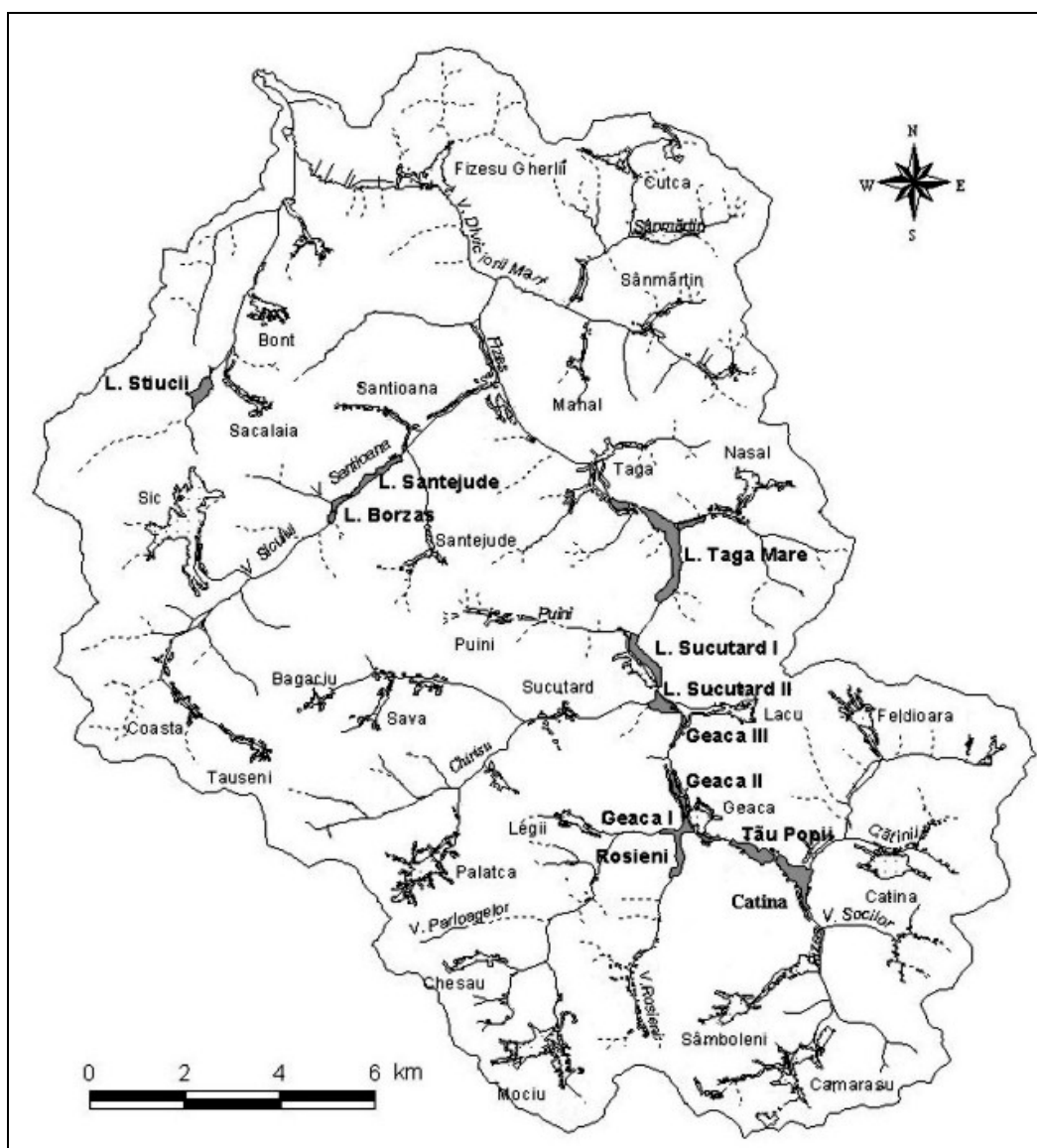


Fig. 7. The ponds in the Fizeș hydrographic basin

Between the measurements of 1962 and 1997, the ponds' length increased as the dam was made higher. The average and maximum widths increase in between the first two measurements, and then they remain constant.

The Țaga Mică pond evolved differently. So, the lake's length decreased continually, while the average width and depth increased significantly, probably because of the arrangement works. The arrangement works carried out in the interval 1952 - 1972 increased the accumulation's volume, which has remained almost constant since 1962.

The ponds of the Sic hydrographic basin (Borzaş and Sântejude) are situated on the lower course of the rivulet bearing the same name. The presence of the lakes from Sic Valley is mentioned in documents since the 14th century. In the past, Sic riverside, between Sic locality and the confluence with Sântejude Valley, was dominated by swamps and mires. This situation continues today between the locality of Sic and the confluence with Valea Sărată. The anthropic intervention made after 1970 determined the segmentation of the previous lake unit into two distinct sectors.

The Sântejude Lake was much more extended, on a 5.5 km length, between the confluence of Dorna Mare Rivulet and up to 2 km downstream from the confluence with Sântejude Rivulet. The old lake is divided into these two units. From the analysis of the transversal profiles made in the basin of the Sântejude pond becomes narrower and larger, it has been noticed that modifications occurred both concerning the borders and concerning the bottom of the basin.

The ponds of Gădălin hydrographic basin cover an area of 131.6 ha, which represents 10.8% of the total of the fishpond arrangements made in the Someş Plain. The ponds arranged in 1983 are those from Suatu, Aruncuta and Berchieş.

The ponds of the Meleş hydrographic basin, situated on the course of Chiochiş or Apatiu, were built in 1979 and cover an area of 131.6 ha, representing 27.7 % of the fishponds arranged in the Someş Plain. Larger are the ponds from Manic and Chiochiş. Concomitantly, there were arranged the fishponds from Manic I, Manic II, Buza and Strugureni (Pop, Gr.1986).

Out of the ponds from the Dipşa hydrographic network, which were much more numerous in the past, only a few are left on Archiud Valley (Budurleni) and Stupini Valley (Brăteni), a tributary of Lechinţa Rivulet. The lakes undergo an intense clogging process and just a little of the water's surface remained uninvasioned by vegetation. Brăteni Lake is bigger, with a surface of 18.3 ha and a maximum depth of 1.62 m (Săndulache, Al., 1970)

Bibliography

- Alexa, M., Şerban, Gh. Sorocovschi, V. (2006), *Lacurile sărate de la Cojocna (Câmpia Transilvaniei). Evoluţia morfologică şi morfometrică a cuvetelor*, SUBB, LI, 2, Cluj-Napoca.
- Buta, I., (1958), *Lacul Cătina*, Natura, Seria Geografie-Geologie, 2, Bucureşti.
- Buta, I., Săndulache, Al. (1961), *Lacurile din bazinul Luduşului*, Probleme de Geografie, VIII, Bucureşti.
- Erödi, K. (1908), *A Mezőség és tavai, (The Transylvanian Field and Your Lakes)*, Földrajzi közlemények, XXXVI, Budapest
- Gâştescu, P. (1963), *Lacurile din R.P.Română, Geneză şi regim hidrologic*, Editura Academiei R.P.R., Bucureşti
- Morariu, T., Gâştescu, P., Savu, Sl., Pişota, I. (1960), *Les types génétiques de lacs et leur délimitation sur la territoire de la R.P.Roumanie*, Recueil d'études géographiques concernant la territoire de la R.P.Roumaine, Edit. de l'Acad.R.S.R., Bucureşti.

- Pânzaru, T. (1971) *Complexul lacustru de la Cojocna*. SUBB, Series Geographia, 1, Cluj-Napoca.
- Pinczés, Z. (1998), *Az Erdélyi-medence természeti földrajza*, Kossuth egyetemi kiadó, Debrecen.
- Pop, P.Gr. (1970), *Lacul Dătășeni – aspecte morfo-hidrografice*, in vol. *Lucrările Colocviului Național de Limnologie Fizică "Geografia Lacurilor"*, București.
- Pop, Gh.(1966), *Influența structurilor și mișcărilor neotectonice asupra genezei bazinelor lacustre din Câmpia Transilvaniei*, SUBB, Geologie - Geografie, 2, Cluj-Napoca.
- Săndulache, Al. (1960), *Lacurile dulci de la Cătina-Geaca*, SUBB, Geologie-Geografie, II, 1, Cluj.
- Săndulache Al. (1963), *Lacul Pogăceaua*, SUBB, Geologie - Geografie, 1, Cluj.
- Săndulache, Al., Buta, I. (1963), *Câteva date hidrologice asupra lacurilor din bazinul inferior al Fizeșului (Câmpia Transilvaniei)*. Probleme de geografie, IX, București
- Săndulache, Al. (1970), *Lacurile dulci din Câmpia Transilvaniei*, Institutul Pedagogic, Oradea.
- Sorocovschi, V.(2005), *Câmpia Transilvaniei. Studiu hidrogeografic*, Edit. Casa Cărții de Știință, Cluj-Napoca.
- Sorocovschi V., Șerban Gh., Rus I. (1998). *Colmatarea iazurilor din bazinul superior al râului Fizeș, în vol. I "Apa și protecția mediului hidric în bazinul mijlociu al Dunării"*, Universitatea " Babeș-Bolyai", Facultatea de Geografie, IX., Cluj-Napoca.
- Sorocovschi, V., Șerban, Gh., Rus, I., Bătinaș, R.(1999), *Aspecte privind colmatarea iazurilor de pe valea Ludușului între Miheșu de Câmpie și Zau de Câmpie, în vol "Geographica Timisensis"*, Timișoara.
- Sztripszki, H. (1908), *Az erdelyi halaszat ismeretehez, (Contribuții la cunoașterea pescuitului din Ardeal)*, Cluj.
- Șerban,Gh.V.Sorocovschi, (2003), *Lacul Știucii-Câmpia Transilvaiei*, SUBB, Geogr., XLVIII, 1, Cluj-Napoca.
- Șerban, Gh., Sorocovschi, V., Horvat, C. (2006), *The ponds from Sar Valley – Transylvanian Plain, în vol. Lucrările Seminarului Geografic D. Cantemir, Univ. Al.I.Cuza, Facultatea de Geografie-Geologie, nr. 26, Edit. Univ. AL.I.Cuza, Iași.*