

Techirghiol Lake – Present, Past and Future

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Abstract

Paralittoral Techirghiol lake (Dobrogea Region, Romania) constitutes an ecosystem with a special structure and an interesting geological past.

Located at 15 km south-east of Constanta city, with a surface of 1270 ha and a maximum length of 11 m, Techirghiol lake has developed in a lacunal system after the communication suspension with the Black Sea 2-300 years ago (Tuculescu, 1965).

Techirghiol lake has a hiperhaline system, the salinity real value varies today between 57-61 g/l. The lake is not only a tourist attraction but also a balneary centre, the presence of sapropel mud of whom composition contribute the *Artemia salina* filopod and the *Cladophora* eurihaline algae – extracted from 3 places located at a distance of 4-6 m length from the central lake area, represents the remedy of rheumatism of who wishes to enjoy a holiday in these historical places.

The first documentary certification of the Techirghiol locality and lake was in year 1560, under the Ottoman Empire (A .Lapusan, Lapusan S., 1999a).

The Techirghiol lake constitutes an interest ecosystem for biologists through its special qualitative composition, characterized by the endemic species presence.

The strong antropical impact of last decades brought changes in abiotic factors values, especially the salinity, consequence being the changes in qualitative and quantitative composition of Techirghiol lake fauna. Nowadays solutions are necessary for the purpose of port water ecological equilibrium restoration.

Keywords: lake ecosystem, salinity water, abiotic factors, *Artemia salina*, *Cladophora*

The Techirghiol lake (Figure 1- the map http://maps.google.de/maps?hl=de&q=techirghiol+see&lr=lang_de&ie=UTF8&h) is a fluvial-maritime firth generated by the Sarmatian limestone tectonics and weak resistance in which it is quartered. Subsequent the formed bay has been barred by sediments through a barrier beach which created a lagoon environment (4-10 century c.e. Razim Transgression). (A Lapusan, Lapusan S., 1999a). The isolation of the lake from Black Sea, during the geologic eras, by the barrier beach appearance, followed by the water evaporation and the salinity growth in time, make the Techirghiol lake an aquatic ecosystem with a sole in the world hyperhaline regime. The intense peloid process has conducted to the mud appearance used successfully in the rheumatic affections treatment and not only.

The legends in which the Techirghiol lake is mentioned are many but the character most frequently being mentioned is the old turkish man Techir, who was blind, crippled or only drowsy, is taken by his donkey to the salty waters of the lake, where both of them find cure (A Lapusan, Lapusan S., 1999b).

The lake limitrophe areas are known from the oldest times, archeological digging disclosing traces of the neolithic civilization (the Hamangia culture). The Romans knew and were using the mud from the lake as a therapeutically agent as it is related in the writings of Plinius (23-79 A.D.), Discorides (50 A.D.) and later Galenus (131-201 A.D.)

The first setting documentary mention dates since 1560 when Tekur-Koy is mentioned in two firmans of the Magnificent sultan to Moldavia Ruler. (A. Lapusan, Lapusan S., 1999 c).

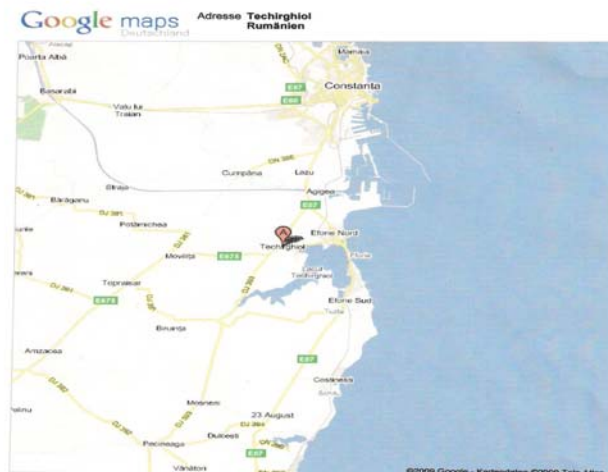


Figure 1 – the map of Techirghiol lake

What does Techirghiol lake to make it so special?

The lake hypersaline regime is owed to the sea water successive evaporation remained in its basin, after the tectonoerosive phase exhaustion which created a fluvial-marine firth and the communication closing with the sea. The water salts accumulation constitutes also the result of a semiarid climate with higher temperatures in summer when the drought is more pronounced.

The salts concentration has been executed as a consequence of the sea water continuous entrance through the barrier beach or over this during the most strongest storms (authors, 1999).

The waters with a higher salinity (in 1970 the salinity was about 83, 6 g/l, 63,6 g/l in 1980), in spite of the values diminution in time, have determined a rigorous selection of the lake animal and plant species.

The Techirghiol lake fauna is dominated by the protozoa; so in the 60' Tuculescu described 370 species from which 7 sorts and 140 new forms for the science (Tuculescu, 1965a). Among the protozoa, the ciliates occupy a special place through their species richness and density, as well through the role that they accomplish in the trophical chain; Tuculescu identified 78 species in the lake benthos and plankton, from which 37 new for the science; after more than 3 decades, we continued the investigations retrieving only 22 forms of the total of those cited by Tuculescu (Dumitrache - Kerkmann R., 2004).

At the mud development with important therapeutically properties from Techirghiol lake contributes a phyllopod crustacean characterized by population big biomasses: *Artemia salina*. From the taxonomic, biological and genetic studies of the species initiated in the 65' and renewed in the 90' by the Constanta "Gr. Antipa" Development-Research Romanian Institute, appear the fact that *Artemia salina* evoluated as an endemism. However, the fresh water massive share accompanied by the nutrients share decrease in the last decades, led to the decrease of the phyto- and zooplankton biomass, of the *Artemia* individuals implicitly; therefore in the 1999 the annual averages of the phytoplankton have been of 10881,3 mg/m³ respectively 1066,9 mg/m³ for the total zooplankton from which the *Artemia* share is of 99% (A. Lapusan, Lapusan S., 1999d).

Artemia salina individuals dead bodies next to other planktonic organisms constitutes an thanatocenosis hereupon special biogenesis are added composed of insect larva (especially dipteras), the picture being completed by special protozoocenosis (Tuculescu, 1965b).

A lake characteristic is constituted by the fact that due to the wind direction this tropholitic area is pushed towards the shore and it is not found at the aquatic basin basis like at the rest of the lakes.

Another vegetable mud basic component is represented by the *Cladophora vagabunda* algae; taking into account that the surface covered by the species sorts in the lake is of 100 ha, results a fresh substance production of 1514 tons and of dry substance of 225, 73 tons.

Especially the *Cladophora* fund and generally the macrophyte algae from the lake, diminished in the last years as a consequence of the antropical pressures at which their populations have been submitted (A.Lapusan, Lapusan S., 1999 d.)

In the Techirghiol lake exist many pelogen areas but the therapeutically mud is extracted from 3 islands situated in the central part, at over 4 m depth; the layer depth varies between 0,62 and 0,86 m. The lake mud therapeutically action has been tested on a major number of people, either under exclusively treatment forms, either associated with physiotherapeutic procedures and medicine. Is the case of:

- arthrosic diseases in various forms and stages
- various inflammatory and articulation rheumatic forms
- acquired sequelae after fracturing
- inflammatory processes in active or sclerofibrous state
- For this scope are functioning Balneary Sanatoriums in Eforie Nord (on the right bank of the lake) and in Techirghiol cities reprofiled on the balneo physiotherapeutic treatment of the locomotory deficiencies

(A.Lapusan, Lapusan S., 1999 e).

Some information of the acute problems which the Techirghiol lake is confronted with

The Techirghiol lake represents a special port water, some characteristics are found in Table 1 (http://www.referat-scoala.ro/citeste-referat-Lacul_Techirghiol-6953.html)

NO CR T	CHARACTERIST IC	VALUE	OBSERVATIONS
1	The lake area	1200 ha	-
2	The water volume	4,18 mil. m ³	Among the bigger dimension lakes of the Romanian littoral
3	The lake lenght	8 km	-
4	The maximum width	4,4 m	in front of the lido
5	The maximum depth	9,75 m	-
6	The medium depth	3,6 m	-
7	The water thermic regime	-	Close to the air one: because of the higher mineralization the temperature can lower under 0 degrees without the water to freeze
8	Transparency and color	<ul style="list-style-type: none"> • Blue metallic – higher salinity • Green – “water bloom” • Red – at the beginning of the autumn due to the <i>Artemia salina</i> dead specimens 	Depends of the mineral and organic particles content; bacterial loading; ilumination grade water layer
9	Salinity	Salinity variations	Frequently varies between 80-90 g/l; in 1931 110 g/l! In the last decades 70g/l; fresh water contribution and the level increase led to variations of 70 -50 g/l
	The pH	alkaline	In 2005 the medium value of 8,4
	Dissolved oxygen	In reverse correlation with the water temperature	6,82 mgO ₂ /l (1997); 104,04mgO ₂ /l (2002); 5.9mg O ₂ /l (2005);
	Mineralization	In time variations	55,40 g/l (1999); 65,32 g/l (2004); 61.49g/l(2005)
	Organic substance CCOMn	In time variation	15,52 mg/l (1991); 45,17mg/l (1995); 22,3mg/l(2005);
10	The water hydrochemical type	Pure sodium chloride	85 -90% chlorides, 77-84% sodium - indicate the genetic belonging to the marine environment

Table1 – Some characteristics of the Techirghiol lake

The water supply resources of the lake are represented by the underground water contribution, the waters proceeded from the neighboring fields irrigations and rain fallout.

Systematic observations of the lake water level are initiated in 1909 by Radu Pascu who assigned the level increase only because of the rain fallout. Beside the year 1909 the water level increased on an average of 0,8 cm / year until 1952. Between 1954-1966 the level increased with 6 cm/year, as between 1967-1970 to appear an outage, with a slowly decrease in 1968.

The lake water level increase has been accentuated after 1970 the average is of 9 cm/year until 1973, respectively of 11,6 cm until 1983. As a consequence of the irrigation stopping, the water level registered slowly decrease in the following years, in 1994 the quotation being of 90 cm. Since 1972/1973 it has been proposed and implemented a technical measure series having the purpose of the lake water contribution diminish, also the evacuation of the water excess in the sea.

The first stage consisted from the execution of some drillings at the end of the lake, equipped with pumps, for the purpose of the underground water contribution reduction. The proposed solution was not a success, the water level continuing to increase until 1980 when it has changed to the second stage.

This consisted from the execution of some drains which collect accumulated fresh water in the back of some barriers on the collector valleys from around the lake and their evacuation in the sea with the help of special designed pumping stations. Around the lake it has been realized a series of contour drillings for the interception of underground water contribution, the majority of these in front of the Techirghiol and Tuzla cities. The north lake bank and also the north/west in front of the Techirghiol city, affected by the earth slides, have been hardened with rock filling rocked.

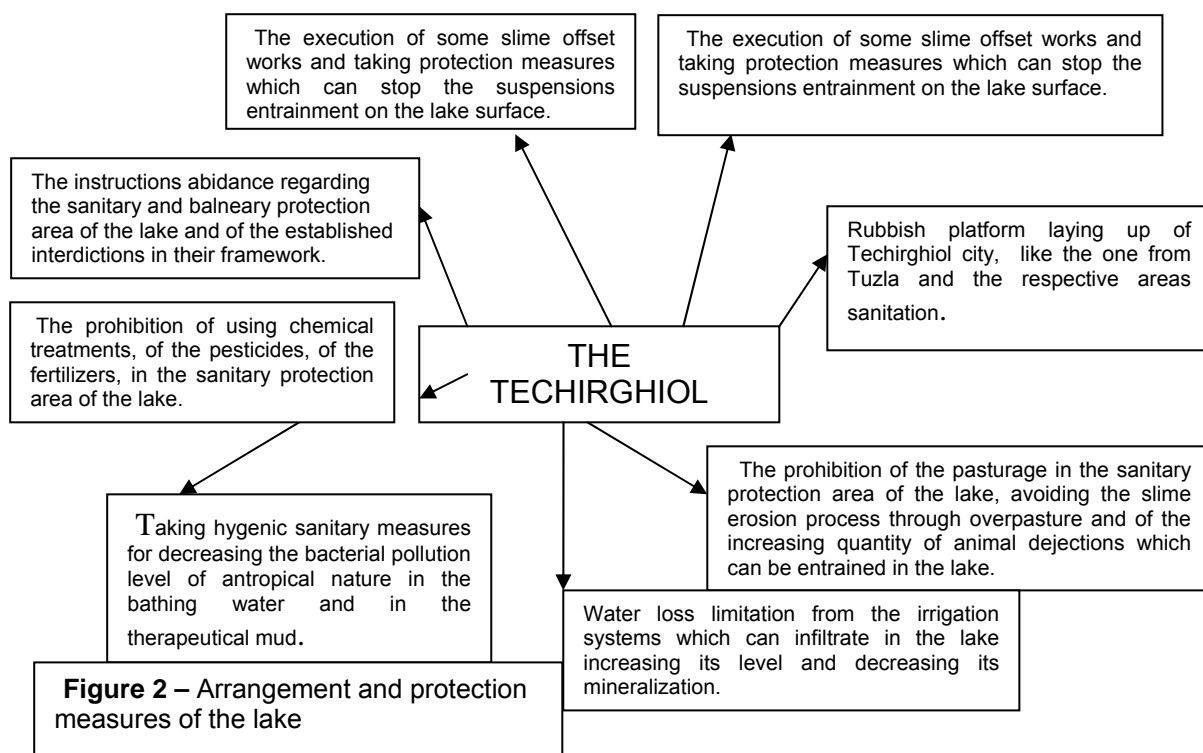
The arrangement results have been visible until 1994.

The third stage began in 1988 and consisted from a rock and ground barrier construction with the length of 800 m which separates the west area of the lake from the rest of the basin where stands the salty water. On the south bank of the lake it has been constructed a guard channel which leads the fresh water to the valleys junction to the behind barrier accumulation. From here the water flows through a armored concrete pipe (Sentab) with a 1400 mm diameter and a 9,2 km length, then through another with a 1600 mm diameter in the Belona paramarine lake area. In the case of a massive contribution of fresh water in the Techirghiol lake which can put in danger some important objectives on its margin, it has been provided another pipe with a diameter superior to those cited who opens in the barrier beach median line which separates the lake from the sea. (*A .Lapusan, Lapusan S., 1999 f.*).

The implemented technical measures did not succeed in maintaining under a fragile control the created situation, because the lake water level continued to increase; if in 1966 the average level increased with 1,65 m, on the abundant rain fallout, in 1997, this has situated with 45 mm over the anterior year.

The massive contribution of the waters from the irrigations starting with the year 1970 generated the water **salinity** diminish from 83,6 g/l at 63,6 g/l during a decade, then the decrease continued in 1997 the determined value being of 53,50 g/l. The determined value in 2000 has been of 60-61 g/l, with a slowly increase in 2003 – 61,83 g/l. For registering then a new significant decrease until 2005 – 53, 78 g/l. (<http://www.savebranta.ro/control/reports/ 2.pdf>).

One of the direct consequence of the water salinity decrease has been the lake biodiversity modification, at its turn generating a negative impact over the therapeutically mud quantity and quality. As a response to the problems that affect the Techighiol lake, alongside of technical solutions have been proposed and most of them have been implemented a series of protection measures of this. (Figure 2) (*A .Lapusan, Lapusan S., 1999g*).



The actual state of Techirghiol lake and future plans

In 2000 the Techirghiol lake has been declared protected area. The purpose of its declaration is maintaining the specific biodiversity and the natural resources of therapeutically mud type.

The declared protected area is passed through a legislative act (G.D.1266/2000) alongside of the afferent beaches, from the Ministry of Health into that of Ministry of Environment and Water Management, Dobrogea-Littoral Water Directorate.

Subsequently to the cited year take place many more legislative interventions, the most important being that of 2006 when the Lake is designated the fifth Ramsar place from Romania; G.D. 1526/2006 borders the lake in the humid area classification of international importance. In 2007 it is issued G.D. 1284 regarding the declaration of the avifauna special protection areas as an integrated part of the European ecological network 2000 Nature in Romania. (http://www.savebranta.ro/control/reports/_2.pdf)

Since 2008 it has been initiated a Management Plan of this protected area, the team being composed of Dobrogea-Littoral Water Directorate specialists alongside of the Birdlife Romania and the Techirghiol townhall. Its duration is until 2013. The Management Plan will be submitted to the Ministry of the Environment and Sustainable Development after the approbation of the Romanian Academy. The revision is made at each 5 years after its approbation.

The work plan will be elaborated annually taking into account the existent resources. The planned actions are multiple, varying from the lake flora and fauna detailed scientific research, the curative mud quality until technical measures of counteraction the increase of the lake water level by improving the executed works from the anterior stages. (http://www.savebranta.ro/control/reports/_2.pdf)

In conclusion, the Techirghiol lake represents an Europe unique ecosystem of which biodiversity must be preserved. Regarding the therapeutically mud are imposed preservation techniques of its quality and of attracting investment in the area for the potential touristic increase.

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