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PRELIMINARY DATA ON THE DIATOM COMMUNITIES FROM "LACUL SULFUROS" ("LAKE No. 6") NEAR TURDA (CLUJ COUNTY, ROMANIA)

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Abstract: This paper is the first one dealing with diatom communities of „Lacul Sulfuros", Turda, based on plankton and periphyton samples collected seasonally in 2005. It is important to emphasize that this aquatic ecosystem has not yet been investigated from algological point of view; therefore the present list of diatoms is the first one for this lake. Species composition, community structure and seasonal dynamics have been studied. There have been identified 94 diatom species belonging to 7 families (Thalassiosiraceae, Fragilariaceae, Achnanthaceae, Naviculaceae, Bacillariaceae, Surirellaceae, Epithemiaceae), occurring in both planktonic and periphytic communities.

Key words: diatoms, diversity, community structure, dynamics

Introduction

„Lacul Sulfuros" is located in the so called "Salt Valley" ("Valea Sărată"), North-West from the town Turda (Cluj County) (Fig. 1). It is the fifth lake of the series in this valley and it is located at the lowest altitude (353 m above sea level). It has been formed in a collapsed old salt mine, dating back to Roman or even Pre-Roman periods [5]. Although the salinity values measured near the water surface were not very high, it is considered a saline lake.

The present observations are a part of the monographic study regarding the biology of diatoms of nine freshwater and salt lakes located in the surroundings of Turda, and they intend to provide data concerning the diatom communities occurring in "Lacul Sulfuros".

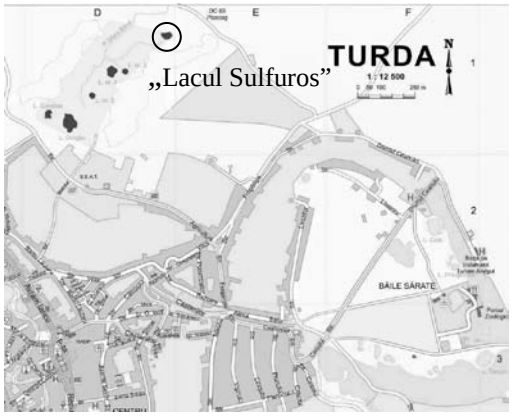

Fig. 1: Geographical location of „Lacul Sulfuros"

Material and Methods

The samples were collected seasonally in 2005, using standard sampling techniques and processing methods. Integrated samples were collected from the periphyton for the analysis of fixed diatom assemblages, and plankton ones from the surface water layers. The investigations were carried out by using common laboratory techniques employing both, an Nfpk Zeiss Jena and an Olympus CX 31 light microscopes and standard taxonomical key books for the identification of taxa [1, 2, 3, 4].

Parallel with the sampling process, some chemical and physical parameters were measured, such as: salinity (mg l^{-1}), TDS (mg l^{-1}), conductivity (µS cm^{-1}), pH, dissolved oxygen (%, mg l^{-1}), air and water temperatures (ºC). The changes of these parameters just below the water surface (where most periphytic community develops) were monitored through the year 2005.

Results and Discussions

The physical and chemical parameters of the water were measured in each season just below the surface, where the periphytic algal community of this lake was best represented. Salinity values were generally situated around 4000-4500 mg l^{-1} (Fig. 2). Low salinity level was observed during the winter period, when a thin layer of ice was also formed on the water surface. Conductivity values exhibited the same pattern during year 2005, like that shown by the two previous parameters.

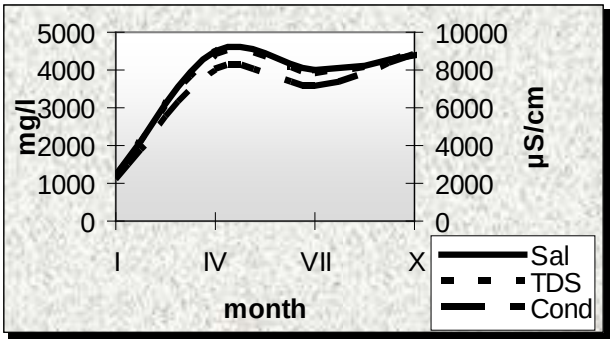

Fig. 2: Variations of salinity, TDS and conductivity

Dissolved oxygen level varied between 8 and 18 mg l^{-1}, but a decreasing tendency was observed from spring to autumn, accumulation and decomposition (an oxygen demanding process) of organic materials being at least partially responsible for this phenomenon. The pH did not vary too much during the studied period, generally ranging between 8.18 and 9.18.

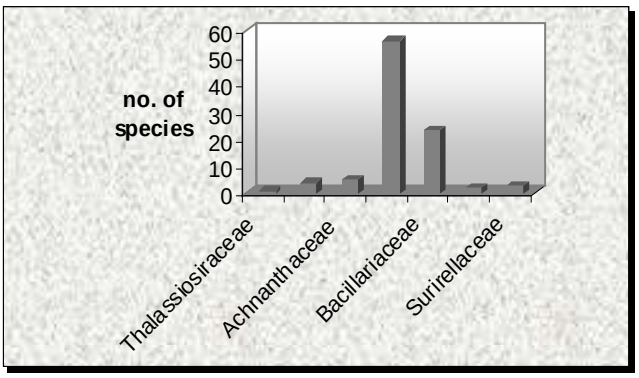

Fig. 3: Percentage distribution of diatom taxa

94 diatoms (Tab. 1) have been identified from both planktonic and periphytic samples, belonging to the following 7 families: Thalassiosiraceae, Fragilariaceae, Achnanthaceae, Naviculaceae, Bacillariaceae, Epithemiaceae and Surirellaceae (Fig. 3). The most frequent diatom in all samples was *Cocconeis placentula* var. *euglypta* (Ehrenberg) Grunow, abundantly distributed in all habitat types in every season. Other frequently detected species are *Fragilaria fasciculata* (Agardh) Lange-Bertalot, *F. pulchella* (Ralfs ex Kützing) Lange-Bertalot, and *Achnanthes brevipes* Agardh var. *intermedia* (Kützing) Cleve.

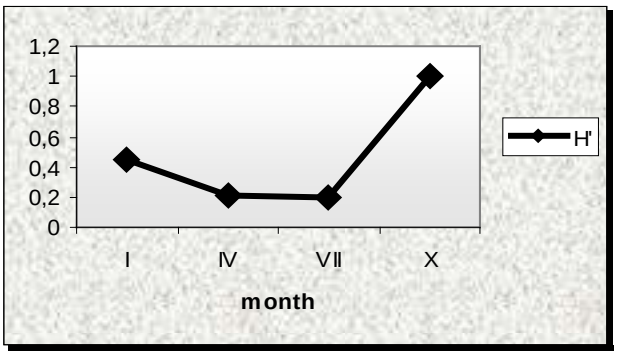

Fig. 4: Seasonal variations of Shannon – Wiener index (H')

A seasonal dynamics of planktonic and periphytic communities could be observed. Most of the identified species were found in samples collected in winter. It is possible, that due to the not very low water temperature, very thin ice layer, nutrient rich water, lack of grazing invertebrates and competition with other algal groups, the diatom communities developed very well in January. On the other hand, even if most diatoms were observed in January, the highest species diversity occurred in autumn (October), due to the lower relative abundance of *Cocconeis placentula* var. *euglypta* (Ehrenberg) Grunow (Fig. 4).

Table 1: Qualitative structure of periphytic and planktonic diatom communities in „Lacul Sulfuros"

DIATOM TAXA	JANUARY		APRIL		JULY		OCTOBER	
	PF	PL	PF	PL	PF	PL	PF	PL
Order CENTRALES								
Suborder Coscinodiscineae								
Family Thalassiosiraceae								
Cyclotella distinguenda Hustedt var. *distinguenda*						•		
Order PENNALES								
Suborder Araphidineae								
Family Fragilariaceae								
Aterionella formosa Hassall					•			
Fragilaria capucina var. *rumpens* (Kützing) Lange – Bertalot	•							
Fragilaria fasciculata (Agardh) Lange-Bertalot	•	•	•	•	•	•	•	•
Fragilaria pulchella (Ralfs ex Kützing) Lange-Bertalot	•	•	•	•	•	•	•	•
Suborder Raphidineae								
Family Achnanthaceae								
Achnanthes brevipes Agardh var. *intermedia* (Kützing) Cleve	•	•	•	•	•	•	•	•
Achnanthes lanceolata (Brébisson) Grunow	•						•	•
Achnanthes lanceolata ssp. *frequentissima* Lange-Bertalot		•	•		•			
Achnanthes minutissima Kützing	•				•		•	
Cocconeis placentula var. *euglypta* (Ehrenberg) Grunow	•	•	•	•	•	•	•	•
Family Naviculaceae								
Anomoeoneis sphaerophora f. *sculpta* (Ehrenberg) Krammer		•	•	•		•		•
Amphora coffeaeformis (Agardh) Kützing	•	•		•	•	•	•	•
Amphora commutata Grunow	•	•	•	•		•		•
Amphora holsatica Hustedt							•	
Amphora veneta Kützing	•							
Caloneis bacillum (Grunow) Cleve	•				•			
Cymbella pusilla Grunow	•				•			
Diploneis ovalis (Hilse) Cleve	•	•			•	•		•
Frustulia vulgaris (Thwaites) De Toni	•	•						

Gomphonema affine Kützing	•	•					•	
Gomphonema angustatum (Kützing) Rabenhorst	•	•	•		•			
Gomphonema clavatum Ehrenberg	•							•
Gomphonema gracile Ehrenberg							•	
Gomphonema minutum (C. Agardh) C. Agardh	•		•					•
Gomphonema parvulum (Kützing) Kützing	•	•	•		•		•	•
Gomphonema pseudoaugur Lange-Bertalot								•
Gyrosigma acuminatum (Kützing) Rabenhorst	•							
Gyrosigma peisonis (Grunow) Hustedt	•	•		•				
Gyrosigma spencerii (Quekett) Griffith & Henfrey	•		•	•		•		•
Mastogloia elliptica (Agardh) Cleve							•	
Mastogloia smithii Thwaites							•	•
Navicula absoluta Hustedt	•							
Navicula cari Ehrenberg	•	•				•	•	•
Navicula cincta (Ehrenberg) Ralfs	•	•	•		•	•	•	
Navicula cryptocephala Kützing	•			•	•		•	
Navicula cryptotenella Lange-Bertalot	•					•		
Navicula cuspidata (Kützing) Kützing								•
Navicula digitoradiata (Gregory) Ralfs	•							
Navicula eidrigiana Carter	•	•	•					
Navicula elginensis (Gregory) Ralfs		•						
Navicula erifuga Lange-Bertalot			•					
Navicula gregaria Donkin								•
Navicula halophila (Grunow) Cleve	•						•	•
Navicula lanceolata (C. Agardh) Ehrenberg	•							
Navicula laterostrata Hustedt	•		•					
Navicula margalithii Lange-Bertalot							•	
Navicula menisculus var. *upsaliensis* Grunow	•			•	•			•

Navicula oppugnata Hustedt	•							
Navicula phyllepta Kützing	•				•	•	•	
Navicula protracta (Grunow) Cleve	•							
Navicula pygmaea Kützing	•	•						
Navicula recens (Lange-Bertalot) Lange-Bertalot		•	•					•
Navicula salinarum Grunow var. *salinarum*	•	•	•	•	•	•		•
Navicula slesvicensis Grunow	•				•		•	
Navicula spicula (Hickie) Cleve	•	•						•
Navicula subrhynchocephala Hustedt		•						•
Navicula tripunctata (O.F. Müller) Bory							•	•
Navicula trivialis Lange-Bertalot							•	
Navicula veneta Kützing	•	•	•		•	•	•	•
Navicula viridula var. *linearis* Hustedt	•							
Pinnularia divergentissima (Grunow) Cleve							•	
Pinnularia interrupta W. Smith	•							
Pinnularia microstauron var. *brebissoni* (Kützing) Mayer	•	•	•					
Pinnularia viridis (Nitzsch) Ehrenberg	•	•				•	•	•
Pleurosigma salinarum Grunow	•							
Stauroneis anceps Ehrenberg	•							
Family Bacillariaceae								
Denticula subtilis Grunow					•			
Hantzschia amphioxys (Ehrenberg) Grunow	•				•		•	
Nitzschia agnita Hustedt	•							
Nitzschia angustiforaminata Lange-Bertalot							•	
Nitzschia clausii Hantzsch						•		
Nitzschia commutatoides Lange – Bertalot	•							
Nitzschia constricta (Kützing) Ralfs	•	•				•	•	
Nitzschia elegantula Grunow								•
Nitzschia flexa Schumann								•
Nitzschia fonticola Grunow	•				•			
Nitzschia fossilis Grunow						•		

Nitzschia frustulum (Kützing) Grunow var. *frustulum*					•			
Nitzschia frustulum var. *bulnheimiana* (Rabenhorst) Grunow							•	
Nitzschia hungarica Grunow	•	•		•	•	•	•	•
Nitzschia inconspicua Grunow	•	•	•		•			
Nitzschia lanceola Grunow		•						
Nitzschia linearis var. *subtilis* (Grunow) Hustedt	•	•						
Nitzschia palea (Kützing) W. Smith			•					•
Nitzschia pellucida Grunow	•							
Nitzschia perspicua Cholnoky	•							
Nitzschia sigma (Kützing) W. Smith	•							
Nitzschia subcohaerens var. *scotica* (Grunow) Van Heurck							•	
Nitzschia tryblionella Hantzsch	•	•		•				•
Family Epithemiaceae								
Epithemia adnata (Kützing) Brébisson	•							
Rhopalodia gibberula (Ehrenberg) O. Müller	•	•			•	•	•	•
Family Surirellaceae								
Surirella brebissonii var. *kuetzingii* Krammer & Lange-Bertalot	•	•		•				•
Surirella ovalis Brébisson						•		
Surirella striatula Turpin				•				

Legend: PF = periphyton, PL = plankton

Conclusions

The main importance of these results lies in the fact that this lake has not yet been studied for its algal communities. Therefore, all the identified diatoms are new records for the algal flora of this lake.

The plankton and periphyton samples collected seasonally from “Lacul Sulfuros” during 2005 revealed a relatively great number of diatom taxa (94) belonging to 7 families. Most of these diatoms (46%) occurred in both community types (plankton and periphyton). The most abundant diatom form was *Cocconeis placentula* var. *euglypta* (Ehrenberg) Grunow, this being dominant in each season.

The number of identified taxa, as well as the biodiversity index (Shannon-Wiener) varied within the studied period, their values were higher during winter and autumn. It seems, that under favorable circumstances (not very low temperature, very thin ice layer, absence of grazing invertebrates and lack of competition with other algal groups, higher nutrient levels), even in the cold winter period the diatom communities were very well developed.

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DATE PRELIMINARE PRIVIND COMUNITĂȚILE DE DIATOMEE DIN "LACUL SULFUROS" (LACUL NR. 6) DE LÂNGĂ TURDA (JUD. CLUJ, ROMÂNIA)

(Rezumat)

Această lucrare intenționează să aducă date noi privind flora de diatomee a unui lac nestudiat până acum din punct de vedere algologic, un lac format prin prăbușirea unei vechi mine de sare datând din perioada romană sau chiar pre-romană. În cursul anului 2005 s-au prelevat sezonier probe de plancton şi de perifiton pentru a evidenția structura, compoziția, respectiv dinamica sezonieră a comunităților de diatomee din lacul amintit. Numărul taxonilor identificați a fost relativ mare – 94, aparținând la 7 familii (Thalassiosiraceae, Fragilariaceae, Achnanthaceae, Naviculaceae, Bacillariaceae, Surirellaceae, Epithemiaceae). Specia care a dominat comunitățile în toate sezoanele a fost *Cocconeis placentula* var. *euglypta* (Ehrenberg) Grunow.

Majoritatea taxonilor (46%) s-au regăsit atât în plancton cât şi în perifiton, iar numărul acestora, respectiv valorile indicelui de diversitate Shannon-Wiener a cunoscut o variație semnificativă în cursul anului studiat. Cele mai multe forme de diatomeee s-au identificat în probele de iarnă şi de toamnă. Această dezvoltare a diatomeelor în perioada rece poate avea multiple explicații: temperaturile nu au fost exagerat de joase, stratul de gheață care s-a format pe suprafața apei a fost subțire, apa a fost saturată în nutrienți, au lipsit nevertebratele ierbivore şi fenomenul de competiție cu alte grupe de alge.

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