STRUCTURE AND DYNAMICS OF THE PHYTOPLANKTON FROM VÂLSAN LAKE

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Abstract. In the year 1967, the Vâlsan river had suffered important modifications by constructing upstream of Vâlsan Gorges and the confluence with its tributary, the Dobroneagu river, a reservoir whose water is led in Vidraru Lake, and also a hydroelectric–plant with an installed power of 5 MW. Vâlsan Lake affects a basinal surface of 83.3 km^3; the tributary Dobroneagu is also directed towards the reservoir, which has led to the reduction of the downstream flow rate, from the values beyond 2 m^3/s until 1967 to values smaller than 0.6m^3/s presently. The dam is built in arch shape, 24 m high, the lake having a surface of 3.5 ha, gathering a 174.000 m^{3}quantity of water. This paper presents the structure of the phytoplankton populations in Vâlsan Lake, from both qualitative and quantitative points of view. It should be mentioned that the study of Vâlsan Lake has not been done so far, there is virtually no literature data to track and compare the qualitative and quantitative composition and evolution of plankton populations in the ecosystem since the dam construction until now.

Keywords: Vâlsan Lake, phytoplankton, diversity.

Rezumat. Structura şi dinamica fitoplanctonului Lacului Vâlsan. În anul 1967, Râul Vâlsan a suferit modificări importante prin construirea în amonte de Cheile Vâlsanului şi de confluenţa cu afluentul Dobroneagu, a unui lac de acumulare ale cărui ape sunt transportate în Vidraru şi a unei hidrocentrale cu o putere instalată de 5 MW. Acumularea Vâlsan a afectat o suprafaţă bazinală de 83.3 km^3, aici fiind drenate şi apele afluentului Dobroneagu, ceea ce a dus la o scădere dramatică a debitului râului în aval de amenajarea hidrotehnică, de la valori de 2 m^3/s până în 1967, la valori mai mici de 0,6 m^3/s în present. Barajul este construit în arc, având o înălţime de 24 m, lacul având o suprafaţă de 3,5 ha, acumulând un volum de 174.000 m^3 de apă. Lucrarea de faţă prezintă structura populaţiei fitoplanctonice a lacului Vâlsan, atât din punct de vedere calitativ, cât şi cantitativ. Trebuie notat faptul că nu a mai fost făcut nici un alt studiu asupra lacului Vâlsan, practic nu există date bibliografice pentru a urmări şi compara structura şi evoluţia calitativă şi cantitativă a populaţiilor planctonice din acest ecosistem din momentul construirii barajului şi până în prezent.

Cuvinte cheie: Lacul Vâlsan, fitoplancton, diversitate.

INTRODUCTION

The Vâlsan river (surface - 358 km^2, length - 84.6 km) springs from the Făgăraş mountains (2,310 m), flows parallel with the Argeş river, crossing the same relief group up to the river mouth, at Merişani, situated approximately half the distance between Curtea de Argeş and Piteşti (UJVÁRI, 1972).

The special interest of the Vâlsan River is the presence of the fish species *Romanichthys valsanicola* DUMITRESCU, BĂNĂRESCU & STOICA, 1957 (sculpin-perch or Romanian darter), an endemic species to Romania and the Danube basin. It is considered the most endangered species of the European ichtyofauna because of its narrow range (only a sector of the Vâlsan) and small number of individuals.

In the year 1967, the Vâlsan river had suffered important modifications by constructing upstream of Vâlsan Gorges a storage lake and also a hydroelectric–plant. This reservoir has a basinal surface of 83.3 km^3; the tributary Dobroneagu is also directed towards the reservoir, which has led to the reduction of the downstream flow rate, from the values beyond 2 m^3/s until 1967 to values smaller than 0.6 m^3/s presently.

MATERIAL AND METHODS

The investigations were made in three sampling points - tail of the lake, middle lake and dam - taking into account the heterogeneous distribution of plankton in a water body as a reservoir (HÖTZEL & CROOME, 1999, after WETZEL, 1975), during August 2007 - April 2008, thus studying the dynamics of its seasonal variation. In the middle section of the lake, we took samples from four horizons - surface and depths of 1 m, 2 m and 3 m.

The samples were taken using a Patalas-Schindler device and preserved with glacial acetic acid: Lugol solution in proportion of 1 : 100 (HÖTZEL & CROOME, 1999, after SCHWOERBEL, 1970). Microscopic analysis was done using OPTIKA B-352 Ahal microscope, with 10, 20, 40 lenses and 10 and 15 oculars. To determine the species, we used the Romanian (FRANCISC & BARNA, 1998; IONESCU & PÉTERFI, 1979, 1981) and European tools (HINDÁK et al., 1975; HORTOBAGYI, 1973) representative for the study field and the saprobity index (MĂLĂCEA, 1969; VLĂDUŢU, 2005).

RESULTS AND DISCUSSIONS

After processing the samples, there were identified 55 species belonging to Cyanobacteria (4 species), Bacillariophyta (31 species), Chlorophyta (17 species), Cryptophyta (1 species) and Dinophyta (2 species) (Table 1).

In the samples from the tail of the lake there were identified 37 species (Table 2) belonging to Bacillariophyta (21), Chlorophyta (14) and Dinophyta (2).

Table 1. Taxonomic composition of the phytoplankton in Vâlsan Lake and saprobic value of taxa.
Tabel 1. Compoziția taxonomică a fitoplanctonului din Lacul Vâlsan şi valoarea saprobică a taxonilor.

No.	TAXA	SAPROBIC VALUE
	Phyllum Cyanobacteria	
1.	*Anabaena solitaria* BRUNNTHALER, 1903	o β
2.	*Anabaena spiroides* KLEBAHN, 1895	o β
3.	*Cylindrospermum stagnale* (KÜTZING) BORNET & FLAHAULT, 1888	β
4.	*Merismopedia glauca* (EHRENBERG) KÜTZING, 1845	β
	Phyllum Bacillariophyta	
5.	*Diatoma hiemale* (LYNGBYE) HEIBERG, 1863	o
6.	*Diatoma vulgare* BORY DE SAINT-VINCENT, 1824	βα
7.	*Centronella* sp. MAX VOIGT, 1902	β
8.	*Asterionella formosa* HASSALL, 1850	o β
9.	*Asterionella gracillima* HEIBERG, 1863	o
10.	*Synedra acus* KÜTZING, 1844	β
11.	*Synedra actinastroides* LEMMERMANN. 1898	o
12.	*Synedra ulna* (NITZSCH) EHRENBERG, 1832	β
13.	*Diatomella baljouriana* GREVILLE, 1855	β
14.	*Pinnularia viridis* ((NITZSCH) EHRENBERG, 1843	β
15.	*Pinnularia giba* EHRENBERG, 1843	o
16.	*Pinnularia subcapitata* GREGORY, 1856	o
17.	*Navicula cincta* (EHRENBERG) RALFS, 1861	β
18.	*Navicula bacillum* var. *gregoryana* GRUNOW, 1880	αβ
19.	*Navicula radiosa* KÜTZING, 1844	αβ
20.	*Navicula subtilissima* CLEVE, 1891	β
21.	*Cymbella augur* KÜTZING, 1844	o
22.	*Cymbella lanceolata* KIRCHNER, 1878	β
23.	*Cymbella prostrata* (BERKELEY) CLEVE, 1894	β
24.	*Cymbella ventricosa* AGARDH, 1830	o β
25.	*Gyrosigma acuminatum* (KÜTZING) RABENHORST, 1853	o β
26.	*Gyrosigma distortum* (SMITH) CLEVE, 1894	β
27.	*Gyrosigma spenceri* var. *nodiferum* (GRUNOW) REIMER, 1966	β
28.	*Gomphonema olivaceum* (HORNEMANN) BRÉBISSON, 1838	β
29.	*Diploneis ovalis* (HILSE) CLEVE, 1891	β
30.	*Amphora ovalis* KÜTZING, 1844	β
31.	*Bacillaria paradoxa* EHRENBERG, 1828	β
32.	*Nitzschia acicularis* (KÜTZING) SMITH, 1853	β
33.	*Nitzschia holsatica* HUSTEDT, 1930	α
34.	*Nitzschia subtilis* GRUNOW, 1880	α
35.	*Surirella ovalis* BRÉBISSON, 1838	β
36.	*Ankistrodesmus* sp. CORDA, 1838	β
	Phyllum Chlorophyta	
37.	*Chlorella* sp. BEIJERINCK, 1890	p-α
38.	*Pediastrum* sp. MEYEN, 1829	β
39.	*Pediastrum angulosum* EHRENBERG, 1840	β
40.	*Pediastrum duplex* MEYEN, 1829	β
41.	*Pediastrum simplex* MEYEN, 1829	β
42.	*Pediastrum tetras* (EHRENBERG) RALFS, 1844	β
43.	*Scenedesmus acuminatus* SMITH, 1916	β
44.	*Scenedesmus acutus* HORTOBÁGYI, 1954	β
45.	*Scenedesmus quadricauda* SMITH, 1916	β
46.	*Actinastrum aciculare* PLAYFAIR, 1917	β
47.	*Actinastrum hantzschii* LAGERHEIM, 1882	β
48.	*Closterium moniliferum* EHRENBERG, 1848	β
49.	*Cosmarium botrytis* MENEGHINI, 1848	o
50.	*Desmidium cilindricum* GREVILLE, 1861	o
51.	*Staurastrum* sp. MEYEN, 1848	o
52.	*Zygnema* sp. AGARDH, 1817	o
	Phyllum Cryptophyta	
53.	*Chilomonas* sp. EHRENBERG, 1831	α
	Phyllum Dinophyta	
54.	*Peridinium* sp. EHRENBERG, 1832	o
55.	*Ceratium hirudinella* var. *furcoides* (MÜLLER) DUJARDIN, 1841	β

Legend: (o = oligosaprobity; β = beta-mezosaprobity; α = alfa-mezosaprobity; p = polysaprobity).
Legendă: (o = oligosaprob; β = beta-mezosaprob; α = alfa-mezosaprob; p = polysaprob).

Table 2. Taxonomic composition and seasonal variation of the phytoplankton in the tail of the lake and dam sections.
Tabel 2. Compoziţia taxonomică şi variaţia sezonieră a fitoplanctonului din secţiunile coada lacului şi baraj.

DAM SECTION					TAIL OF THE LAKE SECTION				
No.	**TAXA**	**SU**	**A**	**SP**	**No.**	**TAXA**	**SU**	**A**	**SP**
1.	*Anabaena solitaria*	+	+	-	1.	*Diatoma hiemale*	-	+	+
2.	*Anabaena spiroides*	+	+	-	2.	*Centronella* sp.	-	-	+
3.	*Cylindrospermum stagnale*	+	+	-	3.	*Asterionella formosa*	+	+	+
4.	*Merismopedia glauca*	-	+	-	4.	*Asterionella gracillima*	+	+	+
5.	*Diatoma hiemale*	-	+	+	5.	*Synedra actinastroides*	-	+	+
6.	*Diatoma vulgare*	-	+	+	6.	*Synedra ulna*	-	+	+
7.	*Centronella* sp.	-	+	+	7.	*Pinnularia viridis*	-	-	+
8.	*Asterionella formosa*	+	+	+	8.	*Pinnularia giba*	-	-	+
9.	*Asterionella gracillima*	+	+	+	9.	*Pinnularia subcapitata*	-	-	+
10.	*Synedra acus*	-	+	+	10.	*Navicula cincta*	-	+	+
11.	*Synedra ulna*	-	+	+	11.	*Navicula bacillum* var. *gregoryana*	-	+	-
12.	*Diatomella baljouriana*	+	+	+	12.	*Navicula radiosa*	-	+	+
13.	*Pinnularia viridis*	-	-	+	13.	*Navicula subtilisima*	+	+	+
14.	*Pinnularia giba*	-	-	+	14.	*Cymbella augur*	+	+	+
15.	*Pinnularia subcapitata*	-	-	+	15.	*Cymbella lanceolata*	-	+	+
16.	*Navicula cincta*	-	+	+	16.	*Cymbella prostrata*	-	-	+
17.	*Navicula bacillum* var. *gregoryana*	-	+	+	17.	*Cymbella ventricosa*	-	+	-
18.	*Navicula radiosa*	-	+	+	18.	*Gyrosigma acuminatum*	-	+	+
19.	*Navicula subtilisima*	+	+	+	19.	*Amphora ovalis*	-	+	+
20.	*Cymbella lanceolata*	+	+	+	20.	*Bacillaria paradoxa*	-	-	+
21.	*Cymbella prostrata*	+	-	+	21.	*Surirella ovata*	-	-	+
22.	*Cymbella ventricosa*	-	+	-	22.	*Chlorella* sp.	+	-	-
23.	*Gyrosigma acuminatum*	-	+	+	23.	*Pediastrum* sp.	+	+	-
24.	*Gyrosigma spenceri* var. *nodiferum*	-	+	+	24.	*Pediastrum angulosum*	+	+	-
25.	*Amphora ovalis*	-	+	-	25.	*Pediastrum duplex*	+	+	-
26.	*Bacillaria paradoxa*	-	-	+	26.	*Pediastrum simplex*	+	+	-
27.	*Nitzschia acicularis*	-	-	-	27.	*Scenedesmus acuminatus*	+	+	+
28.	*Nitzschia holsatica*	+	+	+	28.	*Scenedesmus acutus*	+	-	-
29.	*Nitzschia subtilis*	-	-	-	29.	*Scenedesmus quadricauda*	+	-	+
30.	*Surirella ovata*	-	-	+	30.	*Actinastrum aciculare*	+	+	-
31.	*Chlorella* sp.	+	+	+	31.	*Actinastrum hantzschii*	+	-	-
32.	*Pediastrum angulosum*	+	-	-	32.	*Closterium moniliferum*	+	+	+
33.	*Pediastrum duplex*	+	+	-	33.	*Cosmarium botrytis*	+	+	-
34.	*Pediastrum simplex*	+	+	-	34.	*Desmidium cilindricum*	+	-	-
35.	*Pediastrum tetras*	+	-	-	35.	*Staurastrum* sp.	+	+	-
36.	*Scenedesmus acuminatus*	+	+	-	36.	*Peridinium* sp.	+	-	-
37.	*Scenedesmus acutus*	+	-	-	37.	*Ceratium hirudinella* var. *furcoides*	+	-	-
38.	*Scenedesmus quadricauda*	+	+	-					
39.	*Actinastrum aciculare*	+	-	-					
40.	*Actinastrum hantzschii*	+	-	-					
41.	*Closterium moniliferum*	-	-	+					
42.	*Desmidium cilindricum*	+	-	-					
43.	*Staurastrum* sp.	-	+	-					
44.	*Chilomonas* sp.	+	+	+					
45.	*Peridinium* sp.	+	-	-					
46.	*Ceratium hirudinella* var. *furcoides*	+	-	-					

Legend: (SU – summer, A – autumn, SP - spring).
Legendă: (SU – vară, A – toamnă, SP - primăvară).

Seasonal variation in the total number of species in this section is small, the most numerous being identified in autumn (22) and the fewest in summer (20).

Qualitatively, the phytoplankton is dominated by Chlorophyta in summer (14 species), while Bacillariophyta prevails in spring (19 species) and autumn (14), as shown in figure 1.

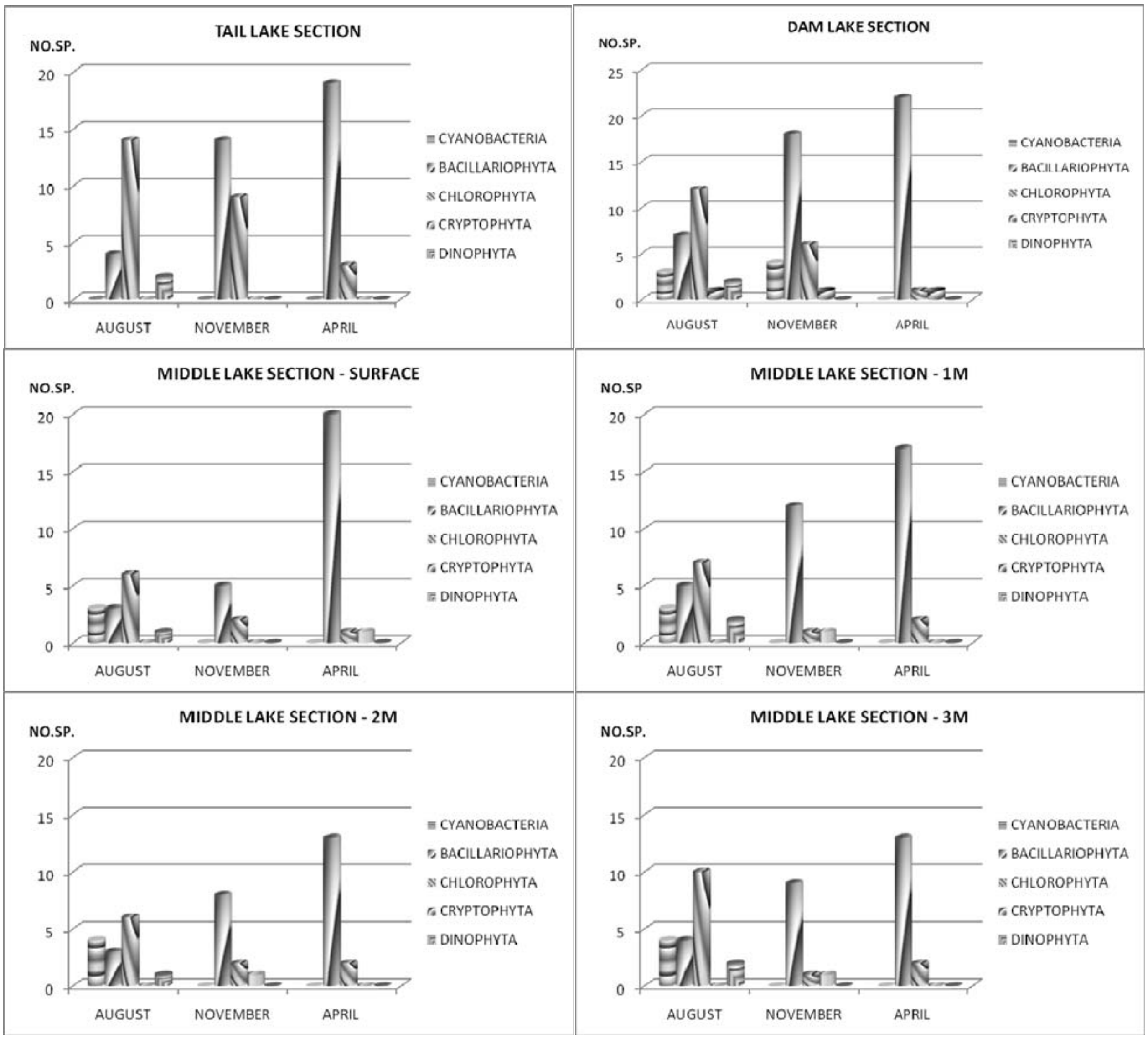

Figure 1. Number of species distribution and its seasonal variation in Vâlsan Lake.
Figura 1. Distribuția numărului de specii și variația sezonieră a acestuia în Lacul Vâlsan.

In the samples taken from the middle section of the lake there have been identified all the 55 species belonging to Cyanobacteria, Bacillariophyta, Chlorophyta, Cryptophyta and Dinophyta (Table 3).

As the total number of species identified in all seasons (Fig. 1), diatoms are clearly the most numerous, the maximum being recorded in surface samples (21 species) and the minimum in samples from 2 m depth (13 species).

For Chlorophyta, the maximum number of species was identified in samples from the depths of 1 m and 3 m (about 10 species), the number being equal to other horizons, 6 species.

As a seasonal distribution, the green algae have the greatest number of species in summer, especially in the horizon of 3 m, which is explained by their tendency to defend against destruction of chloroplasts by exposure to strong sunlight, and in other seasons, specific diversity is very low, between 1 and 2 species per sampling.

In autumn and spring, the spectrum of the species is dominated by the algae from Bacillariophyta types, with a significant increase in the samples from April, when 20 species were identified on the water surface, but the number is ŧ high also in the horizons 1-3 m.

Blue algae and the dinophyta have been identified only in summer samples.

The only genera of Cryptophyta identified, *Chilomonas* is absent in samples from August, being present in November in the horizons 1-3 m, and in spring, only in surface water samples.

In the dam section, the number of identified species (Table 2) is 46, of which more than half are diatoms (26).

Table 3. Taxonomic composition and seasonal variation of the phytoplankton in the middle lake section.
Tabel 3. Compoziţia taxonomică şi variaţia sezonieră a fitoplanctonului din secţiunea mijloc lac.

No.	TAXA	SURFACE			1M			2M			3M		
		SU	A	SP	SU	A	SP	SU	A	SP	SU	A	SP
1.	*Anabaena solitaria*	+	-	-	+	-	-	+	-	-	+	-	-
2.	*Anabaena spiroides*	+	-	-	+	-	-	+	-	-	+	-	-
3.	*Cylindrospermum stagnale*	+	-	-	+	-	-	+	-	-	+	-	-
4.	*Merismopedia glauca*	-	-	-	-	-	-	+	-	-	+	-	-
5.	*Diatoma hiemale*	-	-	+	-	+	+	-	-	-	-	-	+
6.	*Diatoma vulgare*	-	-	+	-	+	+	-	-	-	-	-	+
7.	*Centronella* sp.	-	-	-	-	-	+	-	-	-	-	-	-
8.	*Asterionella formosa*	-	-	-	+	-	+	+	-	+	+	-	+
9.	*Asterionella gracillima*	-	-	+	+	+	+	-	-	-	-	-	-
10.	*Synedra acus*	-	-	-	-	-	-	-	-	+	-	-	-
11.	*Synedra actinastroides*	-	-	-	-	-	-	-	-	+	-	-	-
12.	*Synedra ulna*	-	-	+	-	+	+	-	+	+	-	+	+
13.	*Diatomella baljouriana*	+	-	+	+	-	-	+	+	+	+	+	-
14.	*Pinnularia viridis*	-	-	+	-	-	+	-	-	-	-	-	-
15.	*Pinnularia gіba*	-	-	+	-	-	+	-	-	-	-	-	-
16.	*Pinnularia subcapitata*	-	-	+	-	-	+	-	-	-	-	-	-
17.	*Navicula cincta*	-	+	+	-	+	+	-	+	+	-	+	+
18.	*Navicula bacillum* var. *gregoryana*	-	-	+	-	+	-	-	-	+	-	-	+
19.	*Navicula radiosa*	-	-	+	-	+	+	-	-	-	-	+	+
20.	*Navicula subtilisima*	-	-	+	+	+	+	-	+	+	-	+	+
21.	*Cymbella augur*	-	-	+	-	-	-	-	+	-	-	-	-
22.	*Cymbella lanceolata*	-	-	+	-	+	+	-	-	+	-	-	+
23.	*Cymbella prostrata*	-	+	-	-	-	+	-	-	+	-	-	-
24.	*Cymbella ventricosa*	-	-	+	-	+	-	-	+	-	-	+	+
25.	*Gyrosigma acuminatum*	-	+	+	-	+	+	-	+	+	-	+	+
26.	*Gyrosigma distortum*	-	+	+	-	-	-	-	-	-	-	-	-
27.	*Gyrosigma spenceri* var. *nodiferum*	-	-	+	-	-	-	-	-	-	-	-	-
28.	*Gomphonema olivaceum*	+	-	-	-	-	-	-	-	-	-	-	-
29.	*Diploneis ovalis*	-	-	-	-	-	-	-	-	-	-	+	-
30.	*Amphora ovalis*	-	-	-	-	+	-	-	+	-	-	+	-
31.	*Bacillaria paradoxa*	-	-	-	-	-	+	-	-	-	-	-	-
32.	*Nitzschia acicularis*	-	+	+	-	-	-	-	-	-	+	-	+
33.	*Nitzschia holsatica*	+	-	-	+	-	-	+	-	-	+	-	-
34.	*Nitzschia subtilis*	-	-	+	-	-	-	-	-	+	-	-	-
35.	*Surirella ovata*	-	-	-	-	-	+	-	-	+	-	-	+
36.	*Ankistrodesmus* sp.	-	+	-	-	-	-	-	-	+	-	-	-
37.	*Chlorella* sp.	+	-	-	-	-	+	-	-	-	-	-	-
38.	*Pediastrum* sp.	-	-	-	-	-	-	+	-	-	-	-	-
39.	*Pediastrum angulosum*	-	-	-	+	-	-	-	-	-	-	-	-
40.	*Pediastrum duplex*	-	-	-	+	-	-	-	-	-	+	-	-
41.	*Pediastrum simplex*	+	-	-	+	-	-	+	-	-	+	-	-
42.	*Pediastrum tetras*	-	-	-	-	-	-	-	-	-	+	-	-
43.	*Scenedesmus acuminatus*	+	-	-	-	-	-	-	-	-	+	-	-
44.	*Scenedesmus acutus*	-	-	-	+	-	-	+	-	-	+	-	-
45.	*Scenedesmus quadricauda*	-	-	-	-	-	-	-	-	-	+	-	-
46.	*Actinastrum aciculare*	+	-	-	+	-	-	+	-	-	+	-	-
47.	*Actinastrum hantzschii*	+	-	-	+	-	-	+	-	-	+	-	-
48.	*Closterium moniliferum*	-	-	-	-	-	+	-	-	+	-	-	+
49.	*Cosmarium botrytis*	-	-	-	-	-	-	-	-	-	-	-	-
50.	*Desmidium cilindricum*	+	+	+	+	-	-	+	+	-	+	+	+
51.	*Staurastrum* sp.	-	-	-	-	+	-	-	+	-	+	-	-
52.	*Zygnema* sp.	-	-	-	-	-	-	-	-	-	-	-	-
53.	*Chilomonas* sp.	-	-	+	-	+	-	-	+	-	-	+	-
54.	*Peridinium* sp.	-	-	-	+	-	-	-	-	-	+	-	-
55.	*Ceratium hirudinella* var. *furcoides*	+	-	-	+	-	-	+	-	-	+	-	-

Legend: (SU – summer, A – autumn, SP - spring) / **Legendă**: (SU – vară, A – toamnă, SP - primăvară).

Cyanobacteria are absent in spring, but all four species - *Anabaena solitaria, A. spiroides, Cylindrospermum stagnale* and *Merismopedia glauca* - are present in summer samples. Dinophyta are present only in samples taken in August, both genera being identified, *Peridinium* and *Ceratium*.

Seasonal variation in the number of species in each group did not differ significantly from other sections reference, with clear dominance of green algae, and in autumn and especially in spring diatoms are almost exclusively.

Quantitatively, the numerical density of phytoplankton in the tail section of the lake (Fig. 2) falls between 894 and 1,028 thousands ind./l, with an average of 971 thousands ind./l. Diatoms represented 74% of the algae of this section and in spring and autumn they are almost exclusive species (99%, respectively 94%).

In summer, the highest density is recorded in green algae (583 thousands ind./l), with a rate of 57%. Dinophyta, during this period, is represented by only two taxa – *Peridinium* sp. and *Ceratium hirundinella* var. *furcoides*, but is has a high numerical density (120 thousands ind./l), representing 12% of the total density (Fig. 3).

The quantitative analysis of the phytoplankton samples in the middle section of the lake shows that the maximum number density is recorded for diatoms in spring samples (1,116 thousands ind./l) at a depth of 1m; then, it decreases to 532 thousands ind./l at 2 meter depth and increases again to 859 thousands ind./l at 3 m (Fig. 2).

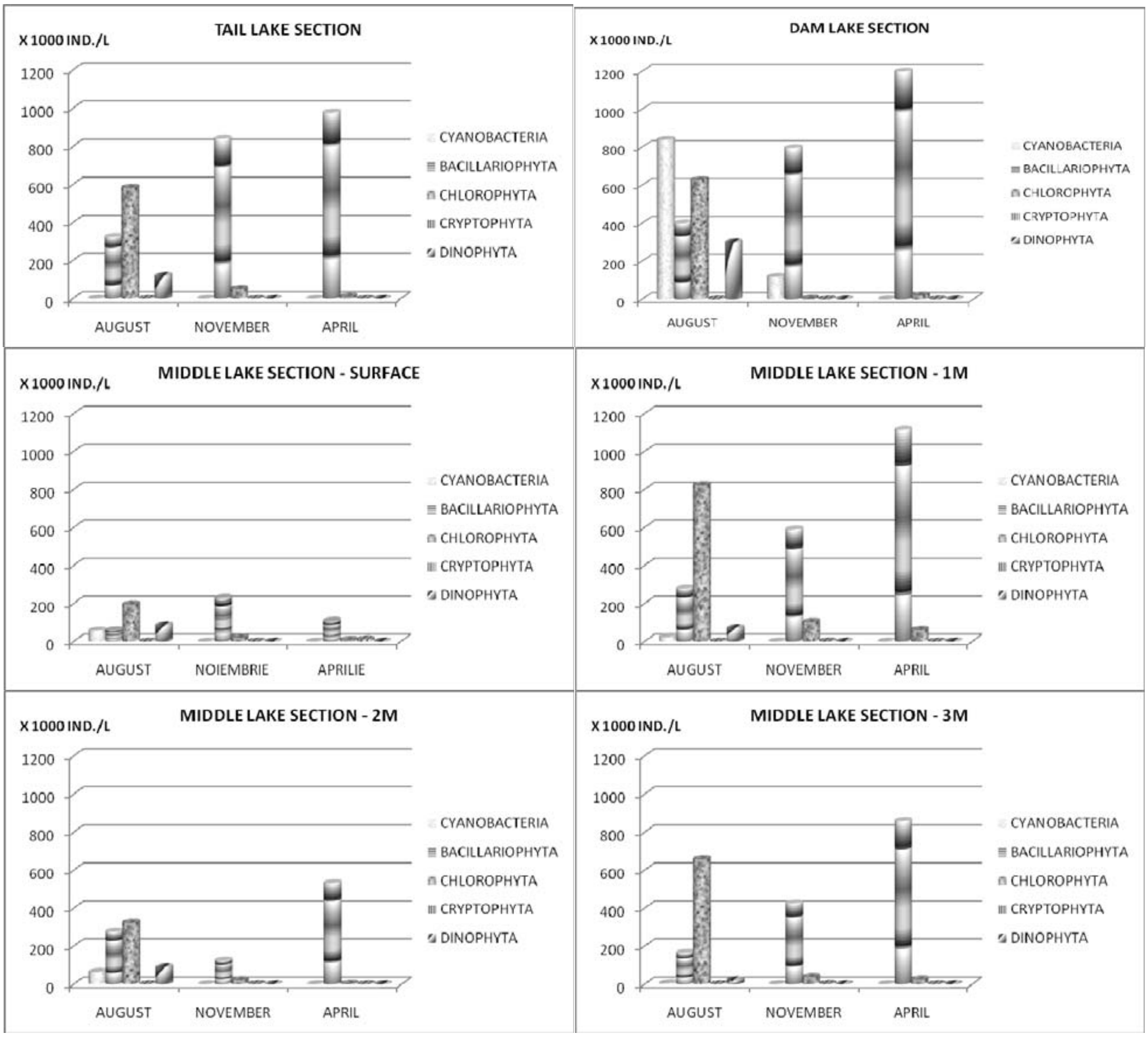

Figure 2. Numerical density and its seasonal variation in Vâlsan Lake.
Figura 2. Densitatea numerică şi variația sezonieră a acesteia în Lacul Vâlsan.

Green algae have the maximum number density in the 1 m samples from August (824 thousand ind. / l), and the minimum value is recorded throughout the summer in the samples from the surface of the water (195 thousand ind. / l).

The proportion of each group (Fig. 3) on the surface is relatively balanced in phytoplankton, being present all five groups, but diatoms clearly registered the largest proportion (51% - 66%).

Just as in other sampling sections, for de dam section, the structure of the phytoplankton in summer is the most balanced, with representatives from all groups in comparable proportions (Figs. 2; 3).

It is worth mentioning that Dinophyta, although it is represented only by a single species, *Ceratium hirudinella* var. *furcoides,* has a very high density, over 200 thousand ind. / l.

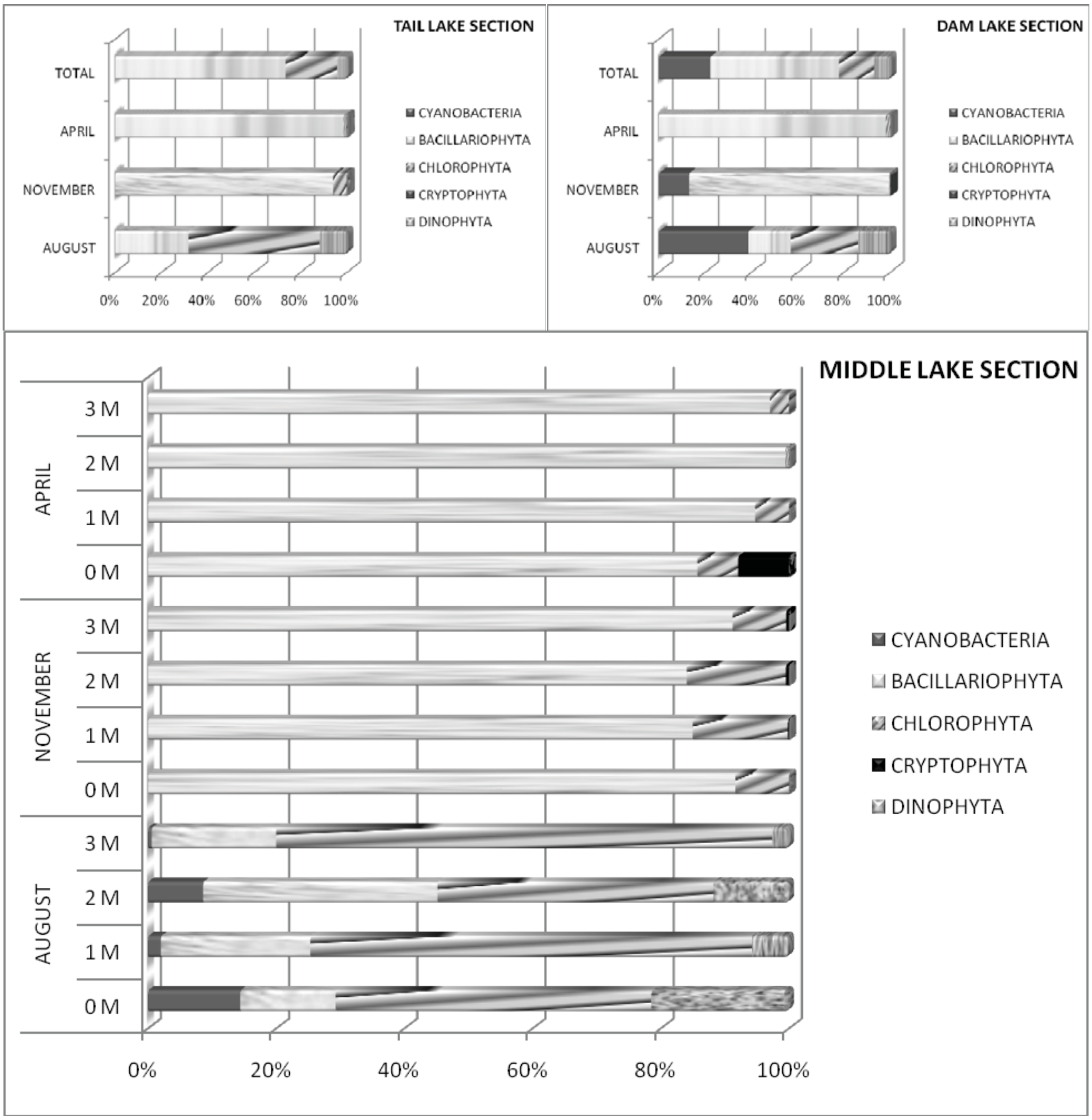

Figure 3. Phytoplankton composition and its seasonal variation in Vâlsan Lake.
Figura 3. Compoziția fitoplanctonului şi variația sezonieră a acesteia în Lacul Vâlsan.

In terms of ecological quality status, analysing the corresponding saprobity index for each species (Table 1) determined from Vâlsan lake, it results that it is a mezosaprobic lake (the medium contaminated zone) and, especially from subzone β-mezosaprobic (β-m), where the oxidation processes are predominant compared to those of reduction, the water being considered slightly polluted.

CONCLUSIONS

Vâlsan Lake phytoplankton is relatively poor, represented mainly by diatoms and a lower proportion of green algae. These two groups make up a specific phytoplankton association, characteristic for lakes located at high altitudes.

Biological diversity is reduced in Vâlsan Lake; there were found 55 phytoplankton species belonging to various systematic groups: Cyanobacteria, Dinophyta, Chrysophyta, Bacillariophyta, Chlorophyta.

Regarding the distribution of the number of taxa in longitudinal profile, the phytoplankton quality is poor in the upper section, at the bottom of the lake, due to abiotic conditions close to those of the river, becoming more diverse in species in the middle and lower sections of the lake.

REFERENCES

FRANCISC N. T. & BARNA A. 1998. *Alge verzi unicelulare (Chlorococcales) – Determinator.* Presa Universitară Clujeană. Cluj-Napoca. 200 pp.

HINDÁK F., KOMÁREK J., MARVAN P., RŮŽIČKA J. 1975. *Kľúč na určovanie výtrusných rastlín.* SPN Bratislava. 400 pp.

HORTOBAGYI T. 1973. *The microflora in the settling and subsoil water enriching basins of the Budapest waterworks – A comparative study in ecology, limnology and sistematics.* Akademiai Kiado Budapest. 340 pp.

HÖTZEL G. & CROOME R. 1999. *A phytoplankton methods manual for Australian freshwaters*. Land and Water Resources Research and Development Corporation. Canberra. 58 pp.

IONESCU AL. & PÉTERFI L. ŞT. 1979. *Tratat de algologie.* Edit. Academiei R.S.R., Bucureşti. **3**. 374 pp.

IONESCU AL. & PETERFI L. ŞT. 1981. *Tratat de algologie.* Edit. Academiei R.S.R., Bucureşti. **4**. 447 pp.

MĂLĂCEA I. 1969. *Biologia apelor impurificate – Bazele biologice ale protecției apelor.* Edit. Academiei R.S.R., Bucureşti. 237 pp.

UJVÁRI I. 1972. *Geografia apelor României*. Edit. Ştiințifică, Bucureşti. 592 pp.

VLĂDUȚU ALINA–MIHAELA 2005. *Elemente de limnologie – Ecologia apelor curgătoare.* Edit. Universității din Piteşti. 136 pp.

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Received: March 29, 2011
Accepted: August 8, 2011