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PLANKTONIC ALGAL COMMUNITIES OF THE "ŢAGA MARE" FISHPOND (CLUJ COUNTY, ROMANIA)

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Abstract: Planktonic algal communities of the "Ţaga Mare" fishpond (Cluj County, Romania). Investigations on the composition and structure of algal communities, carried out seasonally in 2004, revealed the occurrence of 69 taxa belonging to Cyanoprokaryota, Euglenophyta, Bacillariophyta and Chlorophyta. Dominants are qualitatively the green algae in all seasons investigated (spring, summer and fall). Quantitatively the blue-greens dominate the plankton community: different *Oscillatoria* species in spring, whereas *Anabaena*, *Anabaenopsis* or *Aphanizomenon* blooms are frequent during summer and autumn. The comparison of the present results with earlier findings (1977, 1978, 1979; unpublished) revealed marked multi-annual changes, showing the decrease of taxa due to the progressive nutrient input and eutrophication of the pond caused by human activity (fish breeding).

According to the indicator values of the algal species, corroborated with bibliographic data, the "Ţaga Mare" fishpond is strongly eutrophic – zeta-eutrophic, almost hypertrophic, overloaded with organic matter (74% of the indicator species are β-α, α- or polysaprobic) the organic pollution index calculated for the pond being very high.

Keywords: fishpond, phytoplankton, dynamics, blue-green blooms, Romania.

Introduction

The present paper deals with the structure and seasonal changes of the phytoplankton communities of the "Ţaga Mare" fishpond, based on samplings carried out in 2004, as well as with the multi-annual changes based on earlier (1977, 1978, 1979; unpublished) findings. These results might serve as useful tool for the rapid warning in case of blue-greens blooms, and in the restoration of these aquatic ecosystems, many algal taxa being excellent water quality indicators.

The "Ţaga Mare" fishpond is located in the Fizeş rivulet catchment basin (one of the tributaries of the Someşu Mic river); Câmpia Fizeşului being part of the Transylvanian Plain (Câmpia Transilvaniei) [7]. The relief is rather uniform, altitudes varying between 300 and 500 m a.s.l., rarely higher, fragmented and strongly affected by erosion. The barren hills are mostly cultivated, the large meadows being swampy, used as pasture or hayfield. There are many fishponds arranged for fish breeding in the Fizeş valley.

The lacustrian units, mostly wetlands, are characteristic for the landscape of the Transylvanian Plain, natural like the "Ştiucii Lake" or manmade ponds, the later type being widespread in the whole area. At present in the Fizeş Valley there exist the following fishponds: "Ţaga Mică" I and II, "Ţaga Mare", Sucutard I, II and III, Cătina, Lacul Popii I and II, Geaca I, II and III [1]. Archeological investigations of the dams of various ponds from the Fizeş valley strengthen their early presence, namely in Daco-Roman times.The Middle Ages documents mentioned about 250 fishponds in the area. The extensive agriculture diminished drastically their number; at the beginning of the 20th century only about 20 had been left [1]. After 1970 took place the comeback of fish breeding, their number and their surfaces increased again and some of the fish breeding farms were modernized [7]. As a result the surface of the arranged fishponds reached 1624.3 ha in 1990. About 31.4% of their total surface is located in the Fizeş Valley [2].

"Ţaga Mare" and "Ţaga Mică" fishponds (Fig. 1) are the last downstream elements of the fishpond chain of the Fizeş Valley.

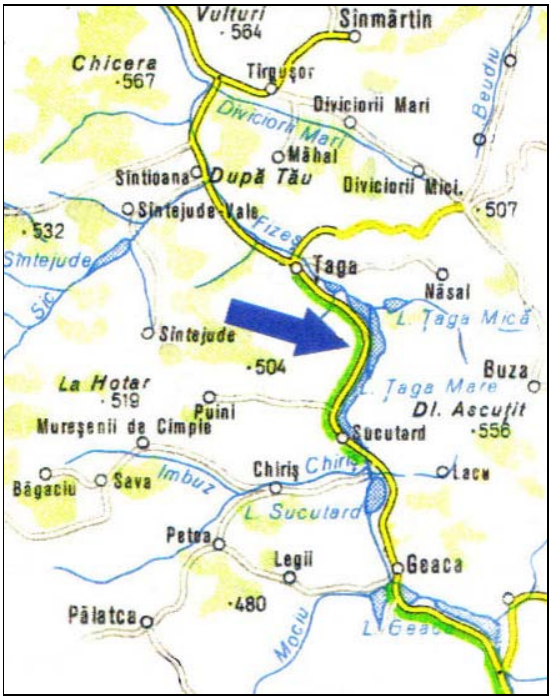

Fig. 1: The "Ţaga Mare" fishpond, situated in the Transylvanian Plain (the exact location is pointed out with the black arrow).

The wide depression in which both of these are located has natural origin, namely early neotectonic movements. Later, human interventions changed and gave its present configuration, the larger pond having 2.5 m maximum depth and a surface of 1.03 km^2. Due to social changes which took place after 1990, the silting process became more active, the shallow "tail" of the pond (500 m) and partly the right lakeside has been completely invaded and overgrown by common reed and other water plants. In the last time the silting is more accelerated due to the short hydric balance of the pond, the quantity of the water lost by evaporation exceeds the supply by inflow (precipitations). Its former underground springs have been closed by impermeable clay and marl during subsequent neotectonic events. Moreover, the pond is partly emptied in every year during autumn fishing.

Materials and Methods

Net plankton (mesh size 20 µm) samples were collected in March, July and September 2004 and preserved in 4% formalin. The algae were identified by light microscopy (Nikon, Eclipse E400), based on the commonly used key books. There were also measured some of the physico-chemical parameters of the pond water, like temperature, transparency, conductivity, salinity, dissolved oxygen and pH. Based on community composition the following indices have been computed: index of zeta-eutrophy [3], Jaccard's floristic similarity index, organic pollution index [9] and the saprobity index, based on indicator species [8].

Results and Discussion

The physico-chemical parameters of the water are given in table 1.

Due to the shallowness of the pond, the changes in water temperature are controlled directly by air temperature (6.3°C in March, 21.2°C in July, and 18.29°C in September). Its vertical thermal structure is somewhat similar with that of dimictic temperate lakes, with a spring mixing, summer stratification and autumn circulation (Table 1). There are marked changes in the oxygen supply, correlated with temperature, but also with the summer photosynthetic activity of the phytoplankton (Table 1). During summer the lack of oxygen is evident (anoxia) in the lowest strata, the amount of dissolved oxygen drops below 1 mg.l^{-1}. This might be due to various causes: heavy blue-green algal blooms, accumulation of organic matter (the later originates in fish fodder) etc. The conductivity and salinity values suggest strong eutrophic conditions, nutrient rich waters with alkaline pH (Table 1).

Table 1: Physico-chemical parameters of the "Țaga Mare" fishpond in 2004. March – III, July – VII, September – IX.

Depth m	Temperature ^{O}C			Conductivity µS.cm^{-1}			Salinity mg.l^{-1}			Dissolved oxygen mg.l^{-1} (%)			pH			Transparency Secchi disc m		
Month	III	VII	IX	III	VII	IX	III	VII	IX	III	VII	IX	III	VII	IX	III	VII	IX
0.1	8.7	29.8	16.9	697	1183	1037	371	631	563	8.93 (76.8)	6.31 (83.3)	6.52 (67.7)	8.86	10.24	10.34	0.61	0.42	0.23
1	8.7	26.8	16.9	697	1185	1057	371	631	563	9.00 (77.4)	3.2 (40)	6.54 (66.8)	9.06	9.76	10.17			
2	8.7	25	16.9	697	1186	1057	371	632	563	8.93 (76.7)	0.44 (5.3)	6.27 (64.7)	9.0	9.76	10.14			

Quantitative structure of algal communities. There have been recorded 69 algal taxa so far (Table 2), belonging to *Cyanoprokaryota* (15 taxa, 21.73%), *Euglenophyta* (7 taxa, 10.11%), *Bacillariophyta* (3 taxa, 4.34%) and *Chlorophyta* (44 taxa, 63.76%). The green algae dominate qualitatively the phytoplankton, 88% of these are members of the *Chlorococcales* – 39 species, and 5 belong to the *Volvocales*, 2 taxa to the *Gracilariales* and a singe taxon to the *Chlorellales* orders. The blue-greens with only 15 species are very important qualitatively – are dominants in the phytoplankton during the whole investigated period. Such situation is typical for strongly eutrophic waters [3].

Table 2: The qualitative structure of planktonic algal communities from Țaga Mare fishpound.

Taxa	1977	1978	1979	2004 III	2004 VII	2004 IX
CYANOPROKARIOTA						
Anabaena flos-aquae f. aptekariana	-	-	-	-	+	-
Anabaena sphaerica	-	-	-	-	+	-
Anabaenopsis elenkinii	-	-	-	-	+	-
Anabaenopsis raciborskii	-	-	-	-	+	-
Aphanizomenon flos-aquae	+	+	+	-	+	-
Gomphosphaeria aponina	+	+	+	-	-	-
Merismopedia tenuissima	-	-	-	-	+	-
Microcystis aeruginosa	+	+	+	-	+	-
Microcystis pulverea	+	+	+	-	+	-
Oscillatoria amphibia	-	-	-	-	+	+
Oscillatoria lacustris	-	-	-	+	+	+
Oscillatoria limnetica	-	-	-	+	+	+
Oscillatoria planctonica	-	-	-	+	+	+
Oscillatoria putrida	-	-	+	-	+	-
Oscillatoria redekei	-	-	-	+	+	+
Oscillatoria tenuis	-	-	-	-	+	-
Synechococcus elongatus	-	-	+	-	-	-
EUGLENOPHYTA						
Colacium sideropus	+	+	+	-	-	-
Colacium simplex	+	-	-	-	-	-
Euglena acus	+	+	-	-	-	-
Euglena deses	+	+	+	-	-	-
Euglena ehrenbergii	+	+	-	-	-	-
Euglena geniculata	-	-	-	-	+	-
Euglena gracilis	-	-	-	-	+	+
Euglena granulata	+	+	+	-	-	-
Euglena laciniata	+	+	-	-	-	-
Euglena oxyuris	-	+	+	-	-	-
Euglena pisciformis	-	-	-	-	+	+
Euglena polymorpha	-	-	+	-	-	-

Euglena spathirhyncha	+	+	+	-	-	-
Euglena spirogyra	+	+	+	-	-	-
Euglena tripteris	+	+	+	-	-	-
Lepocinclis ovum	-	-	-	-	+	-
Lepocinclis texta	+	-	-	-	+	-
Phacus helicoides	-	+	-	-	-	-
Phacus longicauda	-	-	+	-	-	-
Phacus megalopsis	+	+	+	-	-	-
Phacus orbicularis	-	+	-	-	-	-
Phacus platyaulax	+	-	-	-	-	-
Phacus pleuronectes	-	-	+	-	-	-
Phacus pseudonordstedtii	-	-	-	-	+	-
Phacus pyrum	+	-	-	-	-	-
Phacus rudicula	+	+	+	-	-	-
Phacus tortus	+	-	-	-	-	-
Phacus turgidulus	+	+	+	-	-	-
Strombomonas gibberosa	+	-	-	-	-	-
Strombomonas verrucosa	+	+	+	-	-	-
Trachelomonas hisipida	+	+	+	-	-	-
Trachelomonas verrucosa	+	+	+	-	-	-
Trachelomonas volvocina	+	+	+	-	+	-
Trachelomonas volvocinopsis	+	-	-	-	-	-
DINOPHYTA						
Ceratium hirundinella	+	+	+	-	-	-
Peridinium cinctum	-	+	-	-	-	-
Peridinium volzii	+	-	+	-	-	-
CRYPTOPHYTA						
Cryptomonas marssonii	+	+	+	-	-	-
Cryptomonas obovata	+	-	-	-	-	-
Cryptomonas rostratiformis	+	+	+	-	-	-
CHRYSOPHYTA						
Chrysococcus rufescens	+	+	+	-	-	-
Mallomonas tonsurata	+	+	-	-	-	-
Synura petersenii	-	-	+	-	-	-
BACILLARIOPHYTA						
Cyclotella meneghiniana	+	+	+	+	+	+
Cyclotella quadriipuncta	+	-	-	-	-	-
Diatoma elongatum f. actinastroides	+	-	-	-	-	-
Melosira granulata	+	+	+	-	-	-
Nitzschia acicularis	-	-	-	+	+	+
Nitzschia reversa	-	-	-	+	+	+
Rhizosolenia longiseta	+	-	-	-	-	-
Stephanodiscus hantzschii	-	-	+	-	-	-
Stephanodiscus subsalsus	+	-	-	-	-	-
Synedra acus	+	+	-	-	-	-
XANTHOPYHTA						
Goniochloris mutica	+	+	-	-	-	-
Ophiocytium capitatum	+	-	-	-	-	-
Ophiocytium cochleare	-	-	+	-	-	-
CHLOROPHYTA						
Akanthosphaera zachariasii	-	-	-	-	+	-
Ankistrodesmus gracilis	+	+	+	-	-	-
Ankistrodesmus longissimus	-	+	-	-	-	-
Ankistrodesmus rotundus	+	-	-	-	-	-
Ankyra judayi	-	-	-	-	+	-
Botryococcus braunii	+	-	-	-	-	-
Carteria crucifera	-	-	+	-	-	-
Carteria multifilis	-	-	-	-	+	-
Chlamydomonas globosa	-	+	-	-	-	-
Chlorangiopsis epizootica	-	-	+	-	-	-
Closteriopsis longissimus	-	-	-	-	-	+
Closterium ehrenbergii	-	-	+	-	-	-
Closterium limneticum	-	-	+	-	-	-
Coelastrum cubicum	-	+	-	-	-	-
Coelastrum microporum	+	+	+	-	-	-
Coelastrum sphaericum	-	+	+	-	-	-
Coenochloris pyrenoidosa	+	+	-	-	-	-
Crucigenia apiculata	+	+	+	+	+	+
Crucigenia quadrata	+	+	+	-	-	-
Crucigenia rectangularis	-	+	+	-	-	-
Crucigenia tetrapedia	+	-	+	-	-	-
Dicellula planctonica	-	-	-	+	-	-
Dictyochloris reniformis	-	+	-	-	-	-
Dictyococcus mucosus	-	-	+	-	-	-
Dictyosphaerium pulchellum	+	+	-	-	+	+
Dictyosphaerium subsolitarium	-	-	-	+	+	+

Didymocystis planctonica	+	-	+	-	+	+
Dimorphococcus variabilis	+	+	+	-	-	-
Elakatothrix gelationsa	+	+	-	-	-	-
Elakatothrix subacuta	-	-	+	-	-	-
Eudorina elegans	+	+	+	-	+	-
Franceia echidna	-	-	+	-	-	-
Franceia tenuispina	-	+	-	-	-	-
Golenkinia radiala	+	+	-	-	-	-
Golenkiniopsis solitaria v. mucosa	-	-	+	-	-	-
Keratococcus bicaudalis	-	-	+	-	-	-
Kirchneriella contorta	-	-	-	-	+	+
Kirchneriella cornuta	+	+	-	-	-	-
Kirchneriella irregularis	+	+	+	-	-	+
Kirchneriella lunaris	+	+	-	-	-	+
Kirchneriella subcapitata	-	-	-	+	+	+
Kirchneriella obesa	+	+	+	-	-	-
Korshikoviella limnetica	-	-	-	-	-	+
Lagerheimia ciliata	-	-	+	-	-	-
Lagerheimia citriformis	+	+	+	-	-	-
Lambertia ocellata	+	+	+	-	-	-
Monoraphidium arcuatum	-	-	-	-	+	+
Monoraphidium contortum	-	-	-	+	-	+
Monoraphidium convolutum	-	-	-	+	+	+
Monoraphidium griffithii	-	-	-	-	+	+
Monoraphidium irregulare	+	+	-	+	+	+
Monoraphidium minutum	-	-	+	-	-	-
Monoraphidium obtusum	+	-	-	-	-	-
Monoraphidium setiforme	+	+	+	-	-	-
Nephrochlamys willeana	+	-	-	-	-	-
Nephrocytium agardhianum	+	+	+	-	-	-
Nephrocytium obesum	-	+	+	-	-	-
Oocystis borgei	+	+	+	-	-	-
Oocystis elliptica	+	+	-	-	-	-
Oocystis lacustris	+	-	+	-	-	-
Oocystis parva	+	+	-	+	-	+
Oocystis pseudocoronata	+	-	+	-	-	-
Oocystis submarina	+	+	+	-	-	-
Palmellocystis planctonica	+	+	+	-	-	-
Pandorina morun	+	+	-	-	-	-
Pediastrum angulosum	-	-	+	-	-	-
Pediastrum boryanum	-	+	+	-	+	-
Pediastrum duplex	+	+	-	-	+	-
Pediastrum simplex	-	-	+	-	-	-
Pediastrum tetras	+	+	-	-	+	+
Scenedesmus acuminatus	+	-	+	+	+	+
Scenedesmus acutus	+	+	+	+	-	+
Scenedesmus alternans	+	-	-	-	-	-
Scenedesmus arcuatus	+	+	-	-	-	-
Scenedesmus armatus	+	+	+	-	-	-
Scenedesmus bicellularis	-	+	-	-	-	-
Scenedesmus denticulatus	+	-	+	-	-	-
Scenedesmus disciformis	-	-	-	-	+	-
Scenedesmus dispar	+	+	-	-	-	-
Scenedesmus ecornis	-	+	+	-	-	+
Scenedesmus falcatus	-	-	+	-	-	-
Scenedesmus granulatus	+	+	+	-	-	-
Scenedesmus intermedius	+	-	-	-	-	+
Scenedesmus opoliensis	+	+	-	-	+	+
Scenedesmus ovalternus	-	-	-	-	-	+
Scenedesmus quadricauda	+	-	+	+	+	+
Scenedesmus spinosus	+	+	-	+	+	+
Schroederia setigera	-	-	-	+	+	+
Schroederia spiralis	-	-	-	-	+	+
Schroederiella papillata	+	-	+	-	-	-
Selenastrum westii	+	-	+	-	-	-
Siderocelis ornata	-	-	-	-	+	+
Sphaerocystis polycocca	-	-	+	-	-	-
Staurastrum paradoxum	+	+	+	-	-	-
Staurastrum tetracerum	+	+	-	-	-	-
Tetraëdron caudatum	+	-	+	+	+	+
Tetraëdron hastatum	+	+	-	-	-	-
Tetraëdron incus	+	+	-	-	-	-
Tetraëdron limneticum	+	+	+	-	-	-
Tetraëdron minimum	-	-	+	+	+	+
Tetraëdron triangulare	-	+	+	+	+	+
Tetrastrum glabrum	+	-	+	-	-	-

Tetrastrum punctatum	+	-	+	+	-	-
Tetrastrum staurogeniaeforme	+	+	-	-	-	+
Tetrastrum triangularis	-	-	-	-	+	+
Treubaria euryacantha	-	-	+	-	-	-
Treubaria planctonica	-	+	-	-	-	-
Treubaria schmidlei	-	-	-	-	+	-
Treubaria varia	-	-	+	-	-	-
Westella botryoides	+	+	+	-	-	-

When the present data are compared with earlier findings (1977, 1978, 1979; table 2 and 3), a multi-annual dynamics of phytoplankton is quite evident, showing the decrease of both diversity and number of algal species (with 25 less). In the period 1979-2004 disappeared completely the members of Chrysophyta, Xanthophyta, Cryptophyta and Dinophyta. The green algae have been present in the same proportions in the plankton: 58.42% in 1977, 62.07% in 1978, 63.63% in 1979 and 63.77% in 2004 (Table 3). Decreased the number of euglenophytes too (Table 3), paralleled with the increase of blue-green taxa. The qualitative changes in the period 1977-2004 are suggested by the dendrogram too (Fig. 2).

Table 3: Numerical and percentage distribution of taxa according to algal divisions (1977-2004).

Algal divisions	Observation period							
	2004		1979		1978		1977	
	No.	%	No.	%	No.	%	No	%
Cyanoprokaryota	15	21.74	6	6.82	4	4.59	4	3.96
Euglenophyta	7	10.14	17	19.58	19	21.84	22	21.78
Dinophyta	0	0	2	2.37	2	2.3	2	1.98
Cryptophyta	0	0	2	2.37	2	2.3	3	2.97
Chrysophyta	0	0	2	2.37	2	2.3	2	1.98
Bacillariophyta	3	4.35	3	3.4	3	3.45	7	6.93
Xanthophyta	0	0	1	1.1	1	1.15	2	1.98
Chlorophyta	44	63.77	55	61.99	54	62.07	59	58.54
Total algal taxa	69		101		87		88	

The progress of blue-greens is due to their high competitive capacity, becoming in 2004 quantitatively dominant from spring to autumn. Their efficiency results from their higher thermal optimum, comparatively with members of other groups, lower light requirement (see transparency values in table 1), lower saturation constant to use efficiently CO_2, peculiar phosphorous storage strategies, and last but not least, due to the fact that they are not preferred as food by zooplankton (blue-greens are usually rejected). They develop high density populations, causing heavy blooms, eliminate the competitors from the phytoplankton, producing baneful results on the whole biomass. Changes in the composition of plankton algal communities, the disappearance of some species and the massive development of others, are also strengthen by the fact that in the period of 1977-2004, the number of recorded taxa was 183 (Table 2). The differences in community composition are illustrated by a dendrogram too (Fig. 2).

The main reason of these changes is eutrophication as the consequence of human intervention which accelerates the natural evolution of the aquatic ecosystems shifting from the original oligotrophy towards higher trophicity levels [3]. Based on the composition of plankton communities in standing waters and considering the capacity of phytoplankton to tiger water blooms as turning points in estimate of trophic levels, Oltean [3] proposed a trophicity scale on the occurrence and duration of water blooms and algal groups involved. "Ţaga Mare" fishpond was quantitatively dominated in 2004 by blue-greens, *Oscillatoria* species in spring (*O. lacustris, O. limnetica, O. planctonica and O. redekei*), and their presence lasting during the whole observation period. In summer and autumn the bloom was mainly sustained by *Anabaena* (*A. flos-aquae*, *A. sphaerica*), *Anabaenopsis* (*A. elenkinii, A. raciborkii*) and *Aphanizomenon flos-aquae*. From this point of view "Ţaga Mare" fishpond in 2004 is more similar with those located in the Romanian Western Lowland (Câmpia de Vest), namely the Cefa, Homorog, Banloc fishponds [6], than with the other fishponds of the Fizeş Valley in the same period [4, 5].

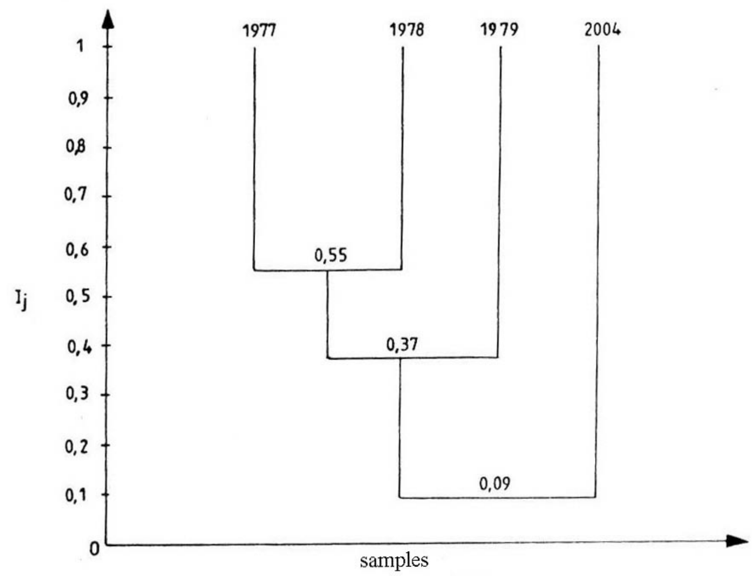

Fig. 2: Floristic similarity of phytoplankton communities occurring in the period 1977-2004

According to Olteanu's statements [3] concerning the trophic levels of standing waters, the "Țaga Mare" fishpond is zeta-eutrophic. The values of this index calculated in April, July and September 2004 are: 30.36, 90.46 and 62.07 respectively, the eutrophication level being directly proportional with the index value. The increase of this index from spring towards summer is positively correlated with the high values of conductivity and salinity (Table 1), the main nutrient source being the high amount of fish fodder. The decrease of the index value in autumn might be due to the fact that the fish feeding ceased and started the fishing period. In the same time the heavy blooms caused the accumulation of large amount of organic matter and the slow down of mineralization process, due to the decrease of dissolved oxygen.

Seasonal changes of the algal communities in 2004. Sampling carried out in spring, summer and autumn, allowed a preliminary estimate on algal community dynamics, namely to note the qualitative and quantitative changes on community level in the "Țaga Mare" fishpond. There were identified 24 taxa in spring, 55 taxa in summer and 43 in autumn, a usual evolution for aquatic ecosystems situated in temperate climatic zone. The green algae, according to the general model have their numerical maxima in the warmest period – summer and beginning of autumn (30-34 taxa). The same is valid for blue-greens (15 taxa in summer) and euglenophytes (7 taxa). The seasonal changes of phytoplankton in the "Țaga Mare" fishpond are suggested by the dendrogram too (Fig. 3), showing the floristic similarities among stand samples. The highest value of similarity index (0.46) was calculated between the summer and autumn communities, the spring ones are less similar (0.31). Seasonal changes in the structure of communities and the appearance of summer–autumn blooms cause the changes of the zeta-eutrophic index values.

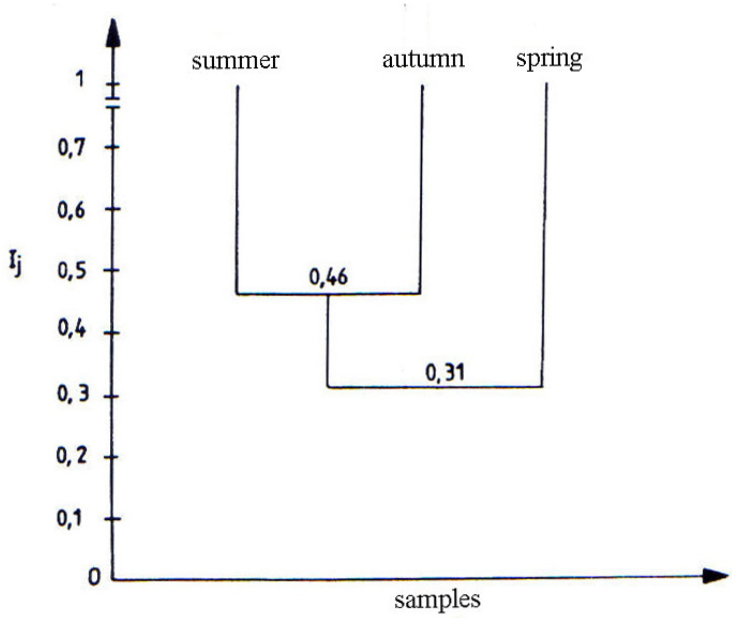

Fig. 3: Floristic similarity among phytoplankton communities occurring in 2004 (spring, summer, autumn)

Considerations on the water quality of the "Ţaga Mare" fishpond, based on phytoplankton. Algae are generally known as proper water quality indicators being present in all types of aquatic habitats, have high sensitivity towards the physico-chemical changes of the water, they have well defined tolerance and requirements, short life cycles with high colonization capacity of new habitats. Therefore, modifications in the species composition of algal communities are rapid reactions to environmental changes. These attributes make algae to be used, more and more, as indicators in monitoring processes of water basins.

Considering the distribution pattern and ecological preferences of the taxa identified in the "Ţaga Mare" fishpond in 2004, is evident that 50 taxa (72.46%) inhabit eutrophic waters. Half of these – 25 species (36.23%) are included in the check list of Heinonen (1980) as indicators of eutrophy (ex. *Cyclotella meneghiniana*, *Euglena pisciformis*, *Kirchneriella contorta*, *Lepocinclis ovum*, *Microcystis aeruginosa*, *Pediastrum boryanum*, *Scenedesmus opoliensis*, *Tetraëdron minimum* etc.). But, comparing our list with the indicator algal check lists of Jännefeldt (1952, 1956) and Rosen (1981) as well (see [9]), 43% in 1977, 45.56% in 1978, 41.66% in 1979 and 40.57% in 2004 of the algal species recorded in "Ţaga Mare" fishpond are indicators of eutrophic conditions. There are also present in the pond many cosmopolite, eurytopic forms (*Trachelomonas volvocina, Microcystis pulverea, Kirchneriella regularis, Scenedesmus acutus* etc.), as well as several basiphilous ones (*Carteria multifilis, Scenedesmus quadricauda*, *Monoraphidium griffithii*, *Anabaena sphaerica*).

Palmer's organic pollution index = 21, calculated according to Willen [9], indicates the high organic loading of the pond. As concerning the saprobity level of the water, the values given in table 4, were calculated with Sladeček's method [8] separately for all the investigated years.

Table 4: Yearly variations of saprobity level in "Ţaga Mare" fishpond.

Years	Saprobity levels													
	o		o-β		β		β-α; α-β		α		o-p		p	
	Nr. Sp.	%	Nr. Sp.	%	Nr. Sp.	%	Nr. Sp.	%	Nr. Sp.	%	Nr. Sp.	%	Nr. Sp.	%
1977	1	4.76	3	14.28	14	66.66	4	4.76	2	9.52	0	0	0	0
1978	0	0	1	5.26	13	68.42	2	10.52	3	15.78	0	0	0	0
1979	0	0	3	13.63	12	54.54	3	16.63	4	18.18	0	0	0	0
2004	0	0	1	2.72	11	23.4	21	44.68	5	10.63	7	14.89	2	4.2

In the period 1977-1979 the β-mesosaprobic elements form the majority, over 50 per cent of the indicator species of saprobity levels. There have been recorded in 2004, 35 indicator species of critical saprobity level (β-α, α-, α-polysaprobic), that means 74% of all indicator species identified: 11 taxa (23%) indicate β-mesosaprobic level, a single one (2.12%) is o-β mesosaprobic. Therefore, it is obvious that during the period dealt with (1977-2004) the "Țaga Mare" fishpond had an increasing tendency as concerning its saprobity level. This fact is sustained by the occurrence of some H_2S indicators, like *Oscillatoria putrida*, an indicator of anaerobic decaying processes.

Conclusions

The analysis of the phytoplankton communities occurring in the "Țaga Mare" fishpond revealed the occurrence of 69 algal taxa, belonging to four divisions: *Cyanoprokaryota*, *Euglenophyta*, *Bacillariophyta* and *Chlorophyta*, the later are the dominant group.

The seasonal dynamics of phytoplankton follows the usual model of dimictic, eutrophic lakes from the temperate zone. The green algae are numerically the dominants during all investigated seasons, but quantitatively dominate the blue-greens.

Based on the occurrence of indicator algae, corroborated with literature data, it became evident that the "Țaga Mare" fishpond is highly eutrophic (zeta-eutrophic).

There have been detected multi annual changes during the period 1977-2004, marked by the decrease in number of taxa, due to the increase in nutrient loading caused by human impact.

As concerning the saprobity level of the fishpond, 74% of the taxa inhabiting it are β-α, α-mesotrophic and polysaprobic elements, denoting a massive organic loading of the water, shown also by the value of the organic pollution index.

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COMUNITĂȚI ALGALE PLANCTONICE DIN IAZUL ȚAGA MARE (JUD. CLUJ)

(Rezumat)

Studiile efectuate sezonier asupra structurii calitative a comunităților algale planctonice din iazul Țaga Mare în anul 2004 s-au finalizat cu identificarea a 69 taxoni aparținând la patru încrengături: *Chlorophyta, Cyanoprokaryota, Euglenophyta* şi *Bacillariophyta,* grupul dominant fiind cel al algelor verzi în cele trei sezoane: primăvară, vară şi toamnă. Sub aspect cantitativ, cianoprokariotele domină comunitatea fitoplanctonică începând din primăvară, prin specii de *Oscillatoria* şi continuând în vară-toamnă cu specii de *Anabaena, Anabaenopsis* şi *Aphanizomenon,* producând înflorirea apei. Comparând rezultatele din anul 2004 cu cele din anii 1977, 1978 şi 1979 (date nepublicate) s-a constatat o dinamică multianuală accentuată, marcată de scăderea numărului de taxoni pe fondul accentuării procesului de eutrofizare din cauze antropice a apei din iazul Țaga Mare. Pe baza valorii indicatoare a numeroase specii de alge din fitoplancton, coroborate şi cu datele din literatura de specialitate, a rezultat că iazul Țaga Mare este un bazin puternic eutrof (indice de zeta eutrofie), având şi o încărcătură organică excesivă (74% dintre speciile indicatoare sunt β -α, α sau polisaprobe), valoarea indicelui de poluare organică fiind foarte mare.