Contribuţii Botanice, *XL*, **2005**
Grădina Botanică "Alexandru Borza"
Cluj-Napoca

STRUCTURE AND DYNAMICS OF ALGAL COMMUNITIES FROM THE SÂNTEJUDE WETLAND (CLUJ COUNTY, ROMANIA)

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Abstract: The species composition and structure of planktonic and benthic algal communities in the wetland of Sântejude (Cluj County, Romania) were studied based on samples collected in 2003. Previous results of our studies in 2002 on this wetland were also used for comparisons. 140 algal species were identified, many of them halobionts or halophilous. A significant percentage of the species represented those characteristic for waters in an advanced degree of eutrophisation.

Intoduction

Recent studies show a great impact of human civilisation on natural resources and biodiversity all over the world. The member states of United Nations agreed at the 2004 meeting on biological diversity in Kuala Lumpur, that there is a great need for sustainability and biodiversity conservation. In order to do this, one of the first steps is to improve our knowledge on the structure, dynamics and function of natural ecosystems.

The present work continues our previous investigations regarding the structure of algal communities from the Sântejude wetland. The wetland is located in the catchment area of the Fizeş brook (Fig. 1), a tributary of the Someşu Mic river, and it is situated at 285 m altitude, at 23˚58'24" longitude and 46˚57'02" latitude. It has an average water depth of about 0.8 m, but it varies in accordance with the amount of precipitation.

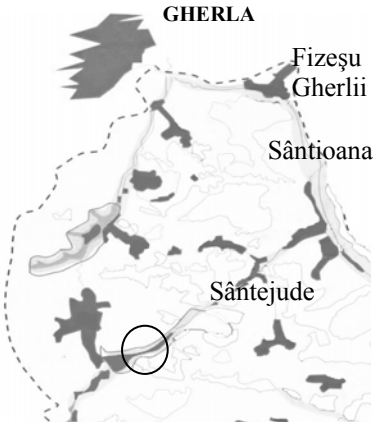

Fig. 1: Geographical location of the wetland from Sântejude

Materials and Methods

The planctonic and benthic samples were collected in the summer and autumn of 2003 using standard sampling and processing methods. For comparisons we also used the results from our preliminary study from 2002 (Nagy and Momeu, 2004). In both cases the investigation was carried out in the Ecology Laboratory of the Department of Taxonomy and Ecology, Faculty of Biology and Geology, "Babeş-Bolyai" University, Cluj-Napoca, by using common laboratory techniques employing a Nikon Eclipse E 400 microscope and taxonomical key books (e.g. Gollerbah et al., 1953; Nagy-Tóth and Barna, 1999; Starmach, 1985; Zebelina et al., 1951).

Results and Discussions

Some physical and chemical parameters (salinity, conductivity, pH, oxygen (O_2 (%), O_2 (mg/l)), water and air temperature) were measured *in situ*, parallel with the sampling process. The salinity and conductivity values exhibited relatively high values suggesting oligohaline waters, while the pH values suggested alkaline waters. There have been identified 140 algal species (Tab.1), belonging to 8 phyla (Cyanophyta (20), Euglenophyta (21), Bacillariophyta (84), Xanthophyta (2), Chlorophyta (9), Chrysophyta (1), Cryptophyta (1) and Dinophyta (2)). Dominants are the diatoms (60%), while Euglenophyta and Cyanophyta were represented by 15% respectively 14,29%. Algae belonging to the other phyla are poorly represented, with around 11% all together (Fig. 2).

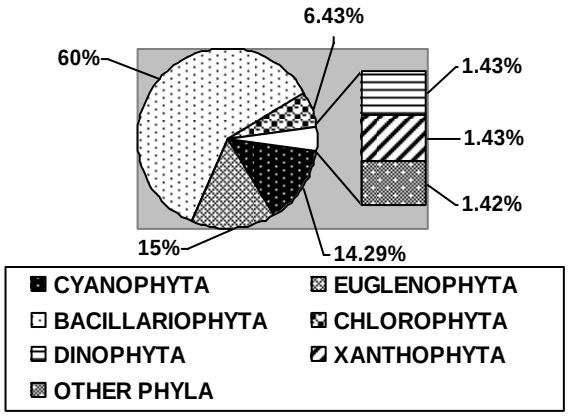

Fig. 2: Percentage distribution of taxa in the main algal groups

One of the important aspects is the presence of halophylous and halobiont species (71% of Bacillariophyta, and a few species of Cyanophyta, Chlorophyta and Euglenophyta). In other words, almost half of the identified species belong to this category. Another important trait of the community is the significant number of the species characteristic for waters in an advanced stage of eutrophisation process. This suggests that this wetland is endangered by rapid eutrophisation, the possible cause of this being certain anthropic factors that affects the area. Such elements might be: soil erosion due to agriculture, fertilisers used in agriculture, excrements of domestic animals that are watering in the studied area.

There were also identified cenoxene species, that are specific for deep water plankton, but are usually not found in shallow wetlands, like in our case. Such species are *Asterionella formosa* and *Fragilaria crotonensis*. These species were probably transported in the investigated area by water fowl and domestic animals (horned cattles, sheep).

Regarding the variation of species composition between the summer and autumn of 2003, both benthic and planktonic communities showed a higher number of species in summer period. The factors that condition algal development were more propitious during this period, producing an increase in species number present in the algal communities.

The comparisons between our results from 2002 and 2003 showed that there were present more benthic species in 2003 than in 2002, many of those found only in 2003 being specific for nutrient rich waters. On the other hand, the number of planctonic species declined from 2002 to 2003 (Fig. 3), probably due to the fact that the water depth and surface was reduced after a long period of draught.

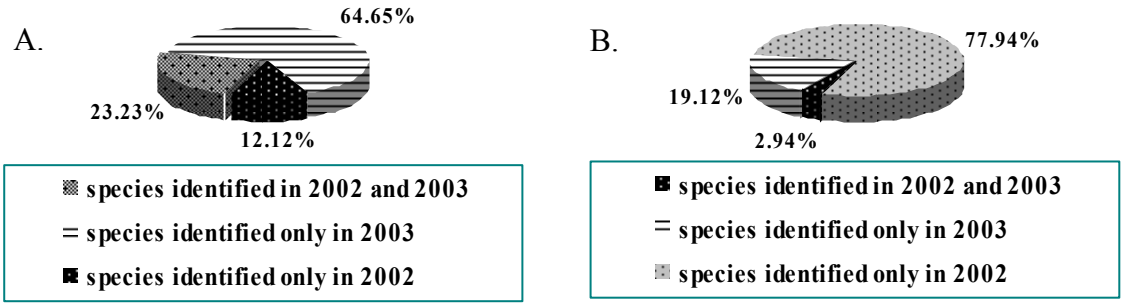

Fig. 3: Annual variation of species number in benthos (A) and plankton (B)

Table 1: Qualitative structure of benthic and planktonic algal communities from the wetland of Sântejude

TAXA	SUMMER 2003		AUTUMN 2003		AUTUMN 2002	
	B	P	B	P	B	P
CYANOPHYTA						
Anabaena constricta	+	+	-	-	+	-
Anabaena oscillatorioides	-	-	+	+	-	-
Anabaena variabilis	+	-	-	-	-	-
Aulosira implexa	-	-	-	-	+	-
Calothrix gypsophila	+	-	-	-	-	-
Lyngbia aestuarii	+	-	+	-	+	-
Merismopedia glauca	+	-	-	-	-	-
Nostoc coeruleum	+	-	-	-	-	-
Oscillatoria agardhii	+	-	-	-	-	-
Oscillatoria amphibia	-	+	+	-	-	-
Oscillatoria brevis	-	-	-	-	+	-
Oscillatoria chlorina	-	-	+	-	-	-
Oscillatoria coerulescens	-	-	-	+	-	-
Oscillatoria deflexoides	-	-	-	+	-	-
Oscillatoria irrigua	-	+	-	-	-	-
Oscillatoria limosa	-	-	-	-	+	-
Oscillatoria nitida	-	+	-	-	-	-
Oscillatoria planctonica	-	+	-	-	-	+
Oscillatoria putrida	-	-	-	+	-	-
Oscillatoria simplicissima	+	-	-	-	-	-
Phormidium fragile	-	-	+	-	-	-
Pseudanabaena crassa	-	-	+	-	+	-
Schizothrix fragilis	+	-	+	-	-	-
EUGLENOPHYTA						
Colacium vesiculosum	-	+	-	-	-	-
Euglena acus	+	-	-	-	-	-
Euglena ehrenbergii	-	+	-	-	-	-
Euglena geniculata	-	-	-	+	-	-
Euglena gracilis	-	-	+	-	-	-
Euglena oxyuris	+	+	+	-	+	+
Euglena spirogyra	-	+	-	-	-	-
Euglena tripteris	+	-	+	-	-	-
Euglena variabilis	-	-	-	+	-	-
Euglena viridis	+	+	-	-	-	-
Khawkinea ocellata	-	-	+	-	-	-
Lepocinclis ovum	-	+	-	-	-	-
Lepocinclis texta	+	+	+	-	-	-
Phacus acuminatus	-	+	-	-	-	-
Phacus orbicularis	+	-	-	-	-	-
Phacus pleuronectes	-	-	-	+	-	-
Trachelomonas hispida	+	+	-	-	-	-
Trachelomonas pulcherrina	+	-	-	-	-	-
Trachelomonas scabra	+	-	-	-	-	-
Trachelomonas verrucosa	+	+	-	-	-	-
Trachelomonas volvocina	+	-	-	-	-	-
BACILLARIOPHYTA						
Achnanthes brevipes	+	-	+	-	-	-
Achnanthes delicatula	+	+	+	-	-	-
Achnanthes lanceolata	-	-	+	-	-	-
Achnanthes hungarica	+	-	+	-	-	-
Achnanthes marginulata	+	-	-	-	-	-

Amphora coffeaeformis	+	+	+	-	+	-
Amphora commutata	+	-	+	-	+	-
Amphora ovalis	+	-	+	-	+	
Amphora veneta	-	-	+	-	+	+
Anomoeoneis sphaerophora	+	-	+	-	-	+
Asterionella formosa	+	+	+	+	-	-
Bacillaria paradoxa	-	+	+	-	-	-
Caloneis amphisbaena	+	-	+	-	-	-
Caloneis silicula	+	-	+	-	-	+
Cocconeis pediculus	-	-	-	-	+	-
Cyclotella meneghineana	+	+	+	-	-	-
Entomoneis alata	+	-	+	+	-	-
Entomoneis paludosa var. subsalina	+	+	+	-	-	-
Epithemia turgida	+	+	+	-	+	+
Epithemia sorex	-	-	+	-	-	-
Fragilaria capucina	-	-	+	-	-	-
Fragilaria crotonensis	-	-	+	-	-	-
Fragilaria fasciculata	+	+	+	-	-	-
Fragilaria pulchella	-	+	+	-	-	-
Fragilaria ulna	+	-	+	-	-	-
Gomphonema clavatum	+	-	-	-	-	-
Gomphonema gracile	-	-	+	+	-	-
Gomphonema olivaceum	+	-	+	-	-	-
Gomphonema parvulum	+	-	+	-	+	-
Gomphonema subsalinarum	+	+	+	-	-	+
Gomphonema truncatum	+	-	+	-	-	-
Gyrosigma acuminatum	-	-	-	-	-	+
Gyrosigma spencerii	-	-	+	-	-	-
Hantzschia amphioxys	+	-	+	-	+	+
Mastogloea smithii	+	+	+	-	-	-
Mastogloea elliptica	-	-	+	-	-	-
Navicula cincta	+	+	+	-	+	+
Navicula costulata var. linearis	-	-	-	-	+	-
Navicula cryptocephala	+	-	-	-	+	+
Navicula crucicula	-	-	+	-	-	-
Navicula cuspidata	+	-	+	-	-	+
Navicula elginensis	+	-	-	-	-	-
Navicula exigua	+	-	-	-	-	-
Navicula gracilis	-	-	-	-	+	-
Navicula gregaria	+	+	+	-	-	+
Navicula halophila	+	+	+	-	+	+
Navicula hungarica	-	-	+	-	-	-
Navicula lanceolata	+	-	+	-	+	-
Navicula menisculus	+	-	+	+	+	+
Navicula oblonga	+	-	+	-	-	+
Navicula peregrina	+	-	+	-	+	+
Navicula pupula	-	-	-	-	+	-
Navicula pygmaea	+	+	+	-	+	-
Navicula radiosa	+	-	+	-	-	-
Navicula rotunda	-	-	+	-	-	-
Navicula rhynchocephala	+	-	+	-	-	-
Navicula salinarum	-	+	+	-	+	+
Navicula schoenfeldii	+	-	-	-	-	-
Navicula spicula	-	-	+	+	-	-
Navicula tripunctata	+	-	-	-	-	-
Nitzschia acuminata	-	+	+	-	-	-
Nitzschia amphibia	+	+	+	-	+	+
Nitzschia apiculata	+	-	+	-	-	-

Nitzschia calida	+	+	+	-	-	-
Nitzschia closterium	+	-	-	-	-	-
Nitzschia commutata	-	-	-	-	+	-
Nitzschia dubia	+	-	-	-	+	-
Nitzschia filiformis	+	+	+	-	-	-
Nitzschia fonticola	+	-	-	-	-	-
Nitzschia frustulum	+	+	+	-	-	-
Nitzschia hungarica	+	+	+	-	-	-
Nitzschia hybrida	+	-	-	-	+	-
Nitzschia levidensis	+	-	+	-	-	-
Nitzschia obtusa	+	-	-	-	-	-
Nitzschia palea	+	+	+	-	+	-
Nitzschia sigma	+	+	+		+	+
Nitzschia sigmoidea	+	-	+	-	-	+
Nitzschia spectabilis	+	+	+	-	-	-
Nitzschia thermalis	-	-	+	-	+	+
Nitzschia tryblionella	+	+	+	-	+	+
Nitzschia vermicularis	+	+	+	-	-	+
Nitzschia vitrea	+	+	+	-	-	
Pinnularia cardinalis	+	-	-	-	-	-
Pinnularia major	-	-	+	-	-	-
Pinnularia viridis	+	-	+	-	-	-
Pleurosigma elongatum	-	+	-	-	-	-
Pleurosigma salinarum	+	+	-	-	-	-
Rhoicosphaenia abbreviata	+	-	+	-	-	
Rhopalodia gibba	+	+	+	-	-	-
Rhopalodia gibberula	+	+	+	-	-	-
Surirella ovalis	-	-	-	-	-	+
XANTHOPHYTA						
Ophiocytium gracilipes	+	+	+	+	-	-
Vaucheria geminata	-	-	+	-	+	+
CHLOROPHYTA						
Closterium acerosum	+	+	-	-	-	-
Closterium moniliferum	+	+	-	-	-	-
Coleochaete orbicularis	-	+	-	-	-	-
Hormidiopsis ellipsoideum	-	-	+		-	-
Hormidium tribonematoideum	-	-	-	+	-	-
Pandorina morum	-	+	-	-	-	-
Pseudodendoclonium brasiliensis	-	-	+	-	-	-
Ulothrix subtilis	-	-	+	-	-	-
Ulothrix tenuissima	-	-	+	-	-	-
CHRYSOPHYTA						
Bicosoeca epiphytica	-	+	-	-	-	-
CRYPTOPHYTA						
Cryptomonas marssonii	-	-	-	+	-	-
DINOPHYTA						
Gymnodium paradoxum	+	+	-	-	-	-
Peridinium umbonatum	-	+	-	-	-	-

Conclusions

The analysis of the samples from 2003 revealed a great diversity of the algal community, with 140 species, belonging to 8 phyla. The number of species, however, was greater in the benthos than in the plancton (118 *vs.* 68). There was also documented a significant seasonal and yearly dynamics (2002-2003) regarding the benthic and planctonic algae from the wetland of Sântejude.

Almost half of the identified species are halophilous or halobionts, suggesting like the physical and chimical parameters, that the wetland is oligohalobe.

It also seems, that there is an important process of eutrophisation, probably due to the increasing anthropic impact on this wetland area.

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STRUCTURA ŞI DINAMICA COMUNITĂŢILOR ALGALE DIN ZONA UMEDĂ DE LA SÂNTEJUDE (JUD. CLUJ, ROMÂNIA)

(Rezumat)

Cunoaşterea biodiversităţii diferitelor ecosisteme naturale este un lucru deosebit de important în vederea păstrării acestora în condiţii nealterate. Ţinând cont de acest lucru, lucrarea de faţă doreşte să aducă o contribuţie semnificativă la cunoaşterea diversităţii florei algale a unei zone umede nestudiate până în prezent. Sunt prezentate aspecte legate de structura şi dinamica algoflorei bentonice şi planctonice din zona umedă de la Sântejude.

Prelevarea probelor în vederea analizării aspectelor mai sus menţionate a fost efectuată în două sezoane: în vara şi în toamna anului 2003. În scopul efectuării unui studiu preliminar al dinamicii anuale s-au utilizat şi probele colectate în 2002. Numărul total de taxoni identificaţi în probele din 2003 s-a ridicat la 140, aparţinând la 8 încrengături: Cyanophyta (20 specii), Euglenophyta (21 specii), Bacillariophyta (84 specii), Xanthophyta (2 specii), Chlorophyta (9 specii), Chrysophyta (o specie), Cryptophyta (o specie) şi Dinophyta (2 specii).

Rezultatele ne-au sugerat atât o diversitate ridicată, cât şi o dinamică sezonieră şi anuală semnificativă în cadrul comunităţilor studiate. De asemenea, preferinţele ecologice ale speciilor prezente sugerează valori relativ ridicate ale salinităţii apei din această zonă umedă, respectiv existenţa unui proces de eutrofizare.