PRELIMINARY DATA ON THE PHYTOPLANCTON COMMUNITY AND SAPROBIOLOGICAL CHARACTERISTICS OF RIVER STARI BEGEJ

D. Brankovic

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Abstract. This paper contains results on preliminary examinations of phytoplankton comunity and saprobiological characteristics of the protected part of river Stari Begej, within the period from April to November 1990. 274 species, varieties and forms of Cyanophyta, Pyrrophyta, Xantophyta, Chrysophyta, Bacillariophyta, Euglenophyta and Chlorophyta were collected. The phytoplankton community was characterized by domination of Chlorophyta and a sporadic occurrence of Xantophyta. Density of phytoplankton community was changeable and varied from $4.8x10^3$ ind/cm^3 to $11.2x10^3$ ind/dm^3. Index of saprobity varied from 2.0 to 2.4 which corresponds to the beta-mesosaprobic (second category) waters.

Key words: Stari Begej, phytoplankton, bioindicators, saprobity.

D. Brankovic, Institute for Nature Protection of Serbia, Department in Novi Sad, Petrovaradinska tvrdjava 3, 21000 Novi Sad, Yugoslavia.

Introduction

"Stari Begej" is a protected area located in the central part of Vojvodina province - the north of Serbia, in the aluvion of rivers Begej and Tisza. This area includes the old riverbed of river Begej (within 10 km), Tiganjica, Carska bara, Perleska bara. Present character of this area was completed with the digging of a new riverbed of river Begej. The old riverbed of river Begej is supplied with the waters from nearby fishpond and from the river Tisza.

Because no data on former examinations of the phytoplankton community and saprobiological characteristics of the protected part of river Stari Begej exist, these examinations are preliminary and baseline information for further examinations.

Material and methods

Sampling took place from April to November 1990, and was performed monthly on three sampling sites: on 15th km-I, 10th km-II, 5th km-III of river Stari Begej. Standard limnological methods for sampling, qualitative and quantitative analyses were used (Hribar, 1978). The index of saprobity was calculated after Pantle and Buck (1955) on the basis of phytoplankton indicator species.

Results

274 species, varieties and forms of Cyanophyta, Pyrrophyta, Xantophyta, Chrysophyta, Bacillariophyta, Euglenophyta and Chlorophyta were recorded in the protected part of river Stari Begej in the course of the examination period. Chlorophyta were represented with 117 taxa (42.7%), Bacillariophyta with 64 (23.3%), Euglenophyta with 40 (14.6%), Cyanophyta with 24 (8.7%), Pyrrophyta with 21 (7.6%), Xantophyta with 5 (1.8%) and Chrysophyta with 3 (1.1%) taxa.

From the division Chlorophyta which was represented with the highest number of taxa, *Scenedesmus abundans* (Kirch.) Chod., *S. acutus* (Meyen) Chod., *S. denticulatus* Lagerh., *S. falcatus* Chod., *S. opoliensis* Richter, *S. quadricauda* (Turp.) Breb., *Chlorella vulgaris* Beyerinck, *Crucigenia tetrapedia* (Kirch.) W. et G.S. West, *C. quadrata* Morren, *Dicdyospherium pulchellum* Wood, *Golenkinia radiata* Chod., *Pediastrum duplex* Meyen, *P. simplex* Meyen, *P. tetras* (Ehr.) Ralfs., *Tetraedron minimum* (Al.Braun) Hansg., *T. trigonum* (Nag.) Hansg., *Tetrastrum staurogeniaeforme* (Schro.) Lemm., *Staurastrum paradoxum*

Meyen were the species with the highest frequency.

From the division Bacillariophyta, the species *Cyclotella meneghiniana* Kutz., *Melosira granulata* (Ehr.) Ralfs., *Stephanodiscus hantzschii* Grunow, *Nitzschia palea* (Kutz.) W.Smith, *Synedra acus* Kutz., *S. ulna* (Nitzsch.) Ehr. were with the highest frequency.

From the division Euglenophyta, the species *Euglena acus* Ehr., *E. oxyuris* Schmarda, *E. viridis* Ehr., *Lepocinclis ovum* (Ehr.) Lemm., *Trachelomonas hispida* (Perty) Stein, *T. volvocina* Ehr. were of highest frequency.

From the division Cyanophyta, the species *Anabaena spiroides* Klebahn, *Aphanisomenon flos-aquae* (L.) Ralfs., *Microcystis aeruginosa* Kutz., *M. flos-aquae* (Wittr.) Kirchn. were the most abundant.

The frequency of representatives of Pyrrophyta and Chrysophyta was considerably lower and the representatives of Xantophyta were recorded only sporadically.

The monthly variation in qualitative composition of the phytoplankton community is given on Fig. 1.

The density of phytoplankton community was changeable and varied from $4.8x10^3$ ind/cm^3 to $11.2x10^3$ ind/dm^3 (Table 1.). The minimal number was recorded in April on the sampling site III, and maximal one in September, also on the sampling site III.

The recorded phytoplankton indicator species of the polysaprob level are *Anabaena constricta* (Szafer) Geitler, *Spirulina jenneri* (Hass.) Kutz., *Euglena viridis* Ehr., and the species from genus *Carteria*. Those of alpha-mesosaprob level are *Oscillatoria formosa* Bory., *O. princeps* Vauch., *O. tenuis* Agardh, *Cryptomonas erosa* Ehr., *Cyclotella menenghiniana* Kutz., *Hantzschia amphioxys* (Ehr.) Grunow, *Navicula cryptocephala* Kutz., *Nitzschia acicularis* W. Smith, *N. palea* (Kutz.) Smith, *Stephanodiscus hatzschii* Grunow, *Chlamydomonas ehrenbergii* Gorosch., *Gonium pectorale* Muller. Beta mesosaprob species are *Anabaena spiroides* Klebahn, *Aphanisomenon flos-aquae* (L.) Ralfs., *Microcystis aeruginosa* Kutz., *M. flos-aquae* (Wittr.) Kirchn., *Merismopedia tenuissima* Lemm., *Peridinium aciculiferum* Lemm., *Synura uvella* Ehr., *Achnantes lanceolata* (Breb.) Grun., *Amphora ovalis* Kutz., *Cymatopleura solea* (Breb.) W. Sm., *Cymbella lanceolata* (Ehr.) v. Heurck, *C. ventricosa* Kutz., *Diatoma tenue* var. *elongatum* Lyng., *Epithemia turgida* (Ehr.) Kutz., the species of the genus *Gomphonema*, *Melosira granulata* (Ehr.) Ralfs., *Nitzschia vermicularis* (Kutz.) Grun., *Rhoicospheria curvata* Grun., *Synedra acus* Kutz., *S. ulna* (Nitzsch.) Ehr., *Phacus pleuronectes* (O.F.M.) Duj., *Trachelomonas volvocina* Ehr., *Eudorina elegans* Ehr., *Pandorina morum* Bory., *Actinastrum hantzschii* Lagerh., *Coelasrum microporum* Nag., *Dictyosphaerium pulchellum* Wood, *Micratrinium pusillum* Fres., the species of genera *Pediastrum* and *Scenedesmus*. Oligosaprob species are *Ceratium hirundinella* O.F.M., *Dynobrion sertularia* Ehr., *Nitzschia linearis* W. Sm., *Synedra acus* var. *angustissima* Grun. In general the indicators of beta-mesosaprob level were dominant.

Table 1. Dynamics of density of phytoplankton community (Nx1000 ind/cm^3).

Sampling site	Month						
	IV	VI	VII	VIII	IX	X	XI
I	5.0	8.1	7.7	6.8	6.4	8.5	7.4
II	5.2	8.6	8.1	7.2	7.7	8.0	6.5
III	4.8	8.8	8.6	8.5	11.2	7.9	9.1

Index of saprobity (Pantle and Buck, 1955) is given in Table 2.

Discussion

274 species, varieties and forms of algae were recorded in the protected part of river Stari Begej in the course of examinations. This differs from data on algal taxa recorded in Carska bara swamp (Pujin et al., 1987) which is a part of this protected area

Table 2. Dynamics of saprobity index

Sampling site	Month							
	IV	V	VI	VII	VIII	IX	X	XI
I	2.3	2.3	2.2	2.0	2.2	2.2	2.1	2.2
II	2.3	2.2	2.1	2.0	2.1	2.2	2.2	2.2
III	2.3	2.2	2.2	2.0	2.1	2.4	2.0	2.2

and is supplied with water from river Stari Begej. 103 algal taxa altogether were recorded in Carska bara swamp. However, there were nonsignificant differences in the qualitative composition of phytoplankton community in the protected part of river Stari Begej and in Carska bara swamp (Pujin et al., 1987). Namely, in Carska bara swamp Chlorophyta were also represented with the highest number of taxa. Bacillariophyta were the second in rank and were followed by Euglenophyta and Cyanophyta. Pyrrophyta, Xantophyta and Chrysophyta were represented with significantly lower number of taxa.

With regard to some rivers of this region, the differences in qualitative composition of phytoplankton community were noticed.

The examination of river Ponjavica (Obuškovic, 1991) showed that Euglenophyta and Chlorophyta were the dominant groups of algae and were followed by Bacillariophyta and Cyanophyta. The other groups of algae were represented with significantly lower number of taxa.

Obuškovic (1982) found that in river Bosut the representatives of Bacillariophyta were dominant and Clorophyta, Cyanophyta and Euglenophyta taxa were subdominant. Number of taxa of other groups of algae was low.

It can be pointed out that the qualitative composition of phytoplankton community of this protected habitat was almost similar to that in Ludaš lake (Seleši, 1981) which is a protected area as well. Namely, in Ludaš lake Chlorophyta were also the dominant group of algae with the highest number of taxa. Bacillariophyta were the second and then came Euglenophyta, Cyanophyta and Pyrrophyta. Xantophyta and Chrysophyta were represented with only one taxon, respectively.

Regarding the monthly variation in the qualitative composition (Fig. 1), it can be concluded that the principal features of phytoplankton community of the protected part of river Stari Begej were the dominance of Chlorophyta and a sporadic occurrence of Xantophyta.

In the variation of density of phytoplankton community no regularity can be noticed.

The index of saprobity after Pantle and Buck (1955) varied from 2.0 to 2.4 but no regularity could be noticed in its variation, as well. On the basis of saprobity index, the waters of the protected part of river Stari Begej can be ranked as beta-mesosaprob (second category) ones.

From these examinations, it could be concluded that such qualitative composition of the phytoplankton community is often associated with eutrophic conditions.

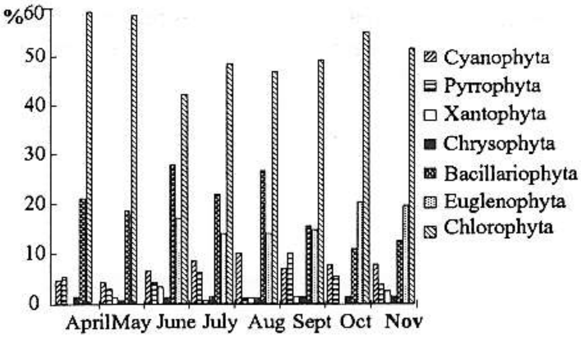

Fig. 1. Variation in phytoplankton community in Stari Begej waters during 1990.

Apart from nutrient loading, the phytoplankton community composition depends on climate and other ecological conditions. Many authors pointed out the influence of temperature and pH. Saphiro (1973) demonstrated that the phytoplankton dominance in a nutrient rich pond could be switched from dominance of blue-green algae to dominance of chlorococcal green algae by adding free carbon dioxide and lowering pH of water. Vincent and Silvester (1979) demonstrated that temperature and pH optima for *Anabaena* and *Chlorella* are divergent, 28-35 ^{o}C and 23-28 ^{o}C, respectively, and pH 9-10 and pH 7-8, respectively. So, possible explanation of Chlorophyta domination in the protected part of river Stari Begej is that carbon is never limiting factor for phytoplankton growth and, therefore, pH has not been so high that Cyanophyta growth has been selectively promoted.

Another hypothesis for Chlorophyta dominance could be that these algae oust representatives of other groups of algae by means of some growth inhibiting factors, although Vicent and Silvester (1979) demonstrated the opposite case. Namely, these authors recorded that extracellular products from *Chlorella vulgaris* promote the growth of *Microcystis* and *Anabaena* while extracellular products from *Microcystis* and *Anabaena* inhibit the growth of *Chlorella*.

Several authors (Andersson et al., 1978; Brooks and Dodson, 1965; Cronberg, 1980) recorded influence of fish stock on the phytoplankton community. Andersson et al. (1978) and Cronberg (1980) demonstrated that abundance of bream and roach in the waters affected the phytoplankton community. These fish species are very abundant in the protected part of river Stari Begej (Budakov, 1989) and so obviously have an effect on the phytoplankton community.

Taking all these facts into consideration, it could be concluded that the phytoplankton community composition and its variation in the protected part of river Stari Begej was dependent, among other factors, and apart from nutrient loadings, on temperature, pH, allelopathic factors and fish stock.

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