

ANALYSIS OF THE VARIATION IN DIVERSITY OF DIATOMS FROM THE DANUBE DELTA'S LAKES

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INTRODUCTION

The concept of diversity has a lot of meanings and there are different methods to estimate the diversity. One of these methods combines the species richness and the abundance of species (Shannon-Wiener index) providing a good evaluation of the diversity (MAGURAN, 1983). The present work describes the general model of the variation of the diatoms diversity index in the lakes of the Danube Delta.

METHODS

A total number of 140 diatom samples (28 samples / lake) were prelevated during five years of investigation from lakes Isac, Uzlina, Roșu, Merhei and Nebunu.

The Shannon-Wiener index was used to evaluate the diatom's diversity.

In order to establish the variability of the index in diatom's population there were estimated the mean, average and variance of the diversity index, the homogeneity of variance (F_{max} = largest lake variance divided by the smallest variance) and the differences between means (FOWLER et al., 1998).

RESULTS

The investigations carried out in lakes Isac, Uzlina, Roșu, Merhei and Nebunu show that the highest number of species was recorded in lake Isac (TÖRÖK, 2004; 2005), but the value of diversity index indicates that lake Isac do not have the biggest diatom-diversity (Table1).

Table 1. The recorded value of the Shannon-Weaver index

	Roșu	Merhei	Isac	Uzlina	Nebunu
H'	2.21	2.25	2.45	2.87	3.46

The value of Shannon-Weaver index ranges between 1.5 and 3.5 and outstanding rich the 4.5 value (MAGURAN, 1983). There is a positive correlation between the diversity of the ecosystem and the Shannon-Weaver index.

The results show that lake Nebunu has the bigger diatoms diversity.

The number of recorded species and the diversity index vary in time and there are differences among the lakes regarding the fluctuation of diatom diversity.

The analysis of the average value of diversity indexes (Fig. 1) shows that the lowest value generally occurs in summer period.

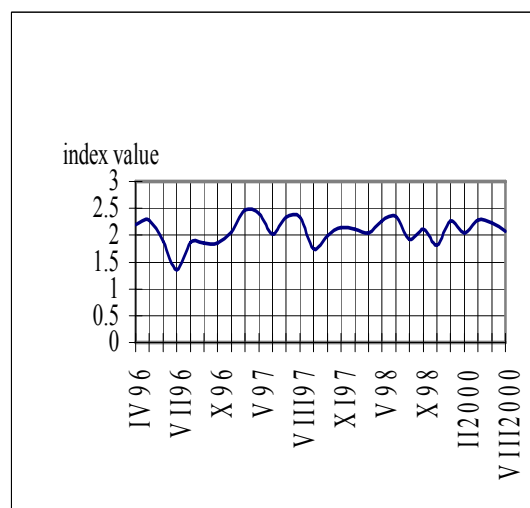


Fig. 1. The general model of the variation of diatoms diversity index from the Danube Delta's lakes.

The mass development of macroscopic green-algae *Hydrodictyon reticulatum* induced a light-attenuation effect. The low transparency of water and the low nutrient availability inhibited the development of the diatom population from lake Nebunu.

In case of lakes Roșu and Merhei, the summer bloom of blue-green algae is responsible to the inhibition of diatom-development.

Sometimes there was recorded a decline in diversity index of diatoms population in spring and early autumn, probably due to the "wash effect" generated by flood.

The highest stability in diatom population was recorded in case of Uzlina lake especially after the linkage between the lake and Danube river was interrupted.

The results of the homogeneity of variance are shown in table 2.

The calculated value of F_{max} is 1.92. The critical value of F_{max} (FOWLER et.al., 1998) for five ($a = 5$) samples (lakes) and $df (n-1) = 27$ is 3.35. F calculated is less then the critical value. Comparing these two values lead to the conclusion that variances are homogeneous.

Table 2. Homogeneity of variance

Lakes	Samples	Average	Variance
Uzlina	28	2.25	0.20
Rosu	28	1.71	0.28
Nebunu	28	2.48	0.38
Isac	28	1.88	0.25
Merhei	28	2.05	0.32

The statistical test (ANOVA test) shows the variability around and between the recorded value of the diversity index (Table 3).

Table 3. Analysis of variance

Source of Variation	SS	df	MS
Between Lakes	10.19	4	2.54
Within Lakes	39.23	135	0.29
Total	49.43	139	

Analysis of the table related to the one-tailed distribution of F shows that the calculated value (8.77) at 4 and 135 df exceeds the critical value of 2.43. Therefore, the difference in mean mass of the five lakes, where $n = 28$ in each case is statistically significant ($F_{4,135} = 8.77$, $P < 0.005$)

CONCLUSION

Although the composition in diatom species show an obvious homogeneity, the results of the statistical analysis of the variation in time of the diversity index revealed the fact that there is a significant difference among the lakes from the Danube Delta.

REZUMAT

Lucrarea prezintă evaluarea diversității diatomeelor din Delta Dunării făcută pe baza analizei indicelui Shannon-Weaver. Pentru a sublinia deosebirile sau asemănările dintre

lacuri s-a efectuat două teste statistice: testul de omogenitate al varianțelor și testul de analiză a varianțelor – ANOVA.

Rezultatele obținute au dus la concluzia că deși din punct de vedere al numărului de specii de diatomee lacurile din Delta Dunării prezintă un grad ridicat de omogenitate, variația în timp a diversității populațiilor de diatomee exprimate prin variația indicelui de diversitate Shannon-Weaver diferă semnificativ.

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