10. Preliminary Results on Phytoplankton in Zaghen Polder, Danube Delta Biosphere Reserve

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Abstract: Zaghen polder is a wetland of faunistic, landscape and recreational area for Tulcea town and the surrounding turism attraction. The phytoplankton analisys consisted in sample prelevation and measurements in four points in polder area. Measurements on phytoplankton amount were made with submersible spectrofluorometer, wich uses light intensity to differentiate the main algal groups and quantifying their biomass. Qualitative analysis of phytoplankton from samples taken from the Zaghen polder was done using the Leitz Laborlux S microscope. The analyses have identified chlorophyll values ranging from 12.41 µg/L in sample point 1 (14.06.2017), and 457.97 µg/L in sample point 3 (27.07.2017). According to Order 161 / 16.02.2006 issued by Ministry of Environment and Water Management it shows that the average grade class was the third, having a mesotrophic degree, with values between 50-100 µg/L. The qualitative analisys reveal 39 genus belonging to 4 taxonomic groups as follow: 17 Chlorophceae, 3 Cyanophyceae, 16 Diatoms and 3 Euglenophyceae. The lowest number of individuals per liter was identified in 14.06.2017 respectively 154,958 ind/L in sample point 1, and the highest number of individuals per liter in 28.08.2017, in sample point 2, respectively 3,388,430 ind/L.
The data presented above represent a preliminary analisys on phytoplankton in first year after the ecological rehabilitation of the area.
Keywords: polder, phytoplankton, spectrofluorometer, microscope.

INTRODUCTION

The importance of knowing the degree of phytoplankton development is determined by the fact that it represents the first link in the food chain and it is the most important in aquatic ecosystem. It can have quantitative and qualitative variations (biomass, algal groups and number of individuals).
This study represents phytoplankton analysis from quantitative and qualitative point of view after ecological reconstruction of a wetland, by identification of ecologycal state and water quality.

MATERIALS AND METHODS

Zaghen polder is situated in the flooding area of Danube river West of Tulcea branch. The area was functionally and structurally modified after enbankment of Danube river to improve the naval circulation, thus, being interrupted the floods in spring and at high flows (Sangdao, 2012).
Studied area present a role as deposition area for washed materials caused by heavy rains in Eastern part of Tulcea city. Also, before reconstruction project started a few families were living here.
After a reabilitation project the area became, first of all, a high biodiversity and turistic atraction area and secondly a buffer for floods from East part of Tulcea city (Figure. 1)
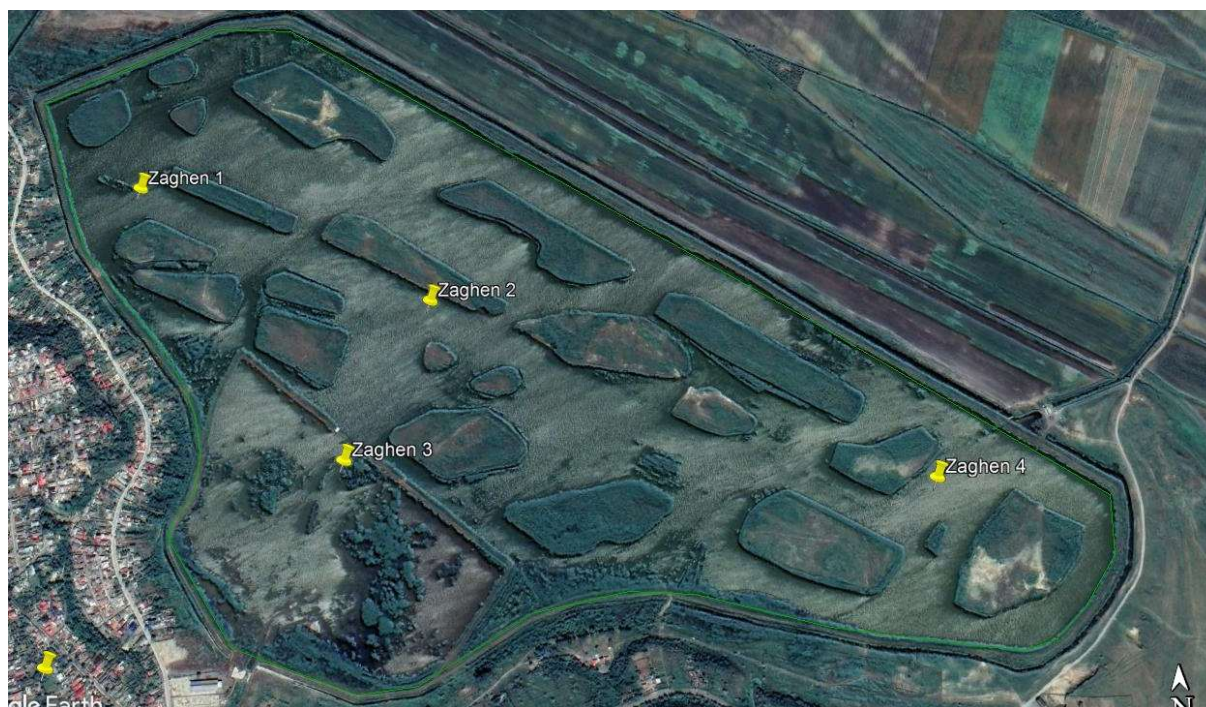
Figure 1.Location of the Zaghen Polder, subject of the study (acc. Map Google 2017; amended)

For phytoplankton analisys, field and laboratory measurements were made. Phytoplankton was sampled from four points in different parts of the polder. First point is situated in West, closest to the city. Second point is located in the center of the main chanel that crosses the polder. Third point is situated in a depositional area, formed after the floods. Fourth point is located at a distance of approximately 200 meters from the pomping station that regulates the water level, in eastern part of the polder.

Quantitative measurements of chlorophyll "a" concentrations were made with submersible Spectroflorometer, wich uses light intensity to distinguish the most important algal groups and quantify them. (Tudor et al, 2015)

For specimen identification a Leitz Laborlux microscope was used. At most cases a magnification of x40 was sufficient for determinations at genus level using appropriate identification keys.

RESULTS AND DISCUSSIONS

This study present phytoplankton development after ecological restoration works in Zaghen polder. The maximum and minimum values of chlorophyl "a" concentrations were 12.41 µg/L measured in June (point 1), and 457 µg/L in July (point 3) (Tabel 1).

Table 1. Biomass of main phytoplanktonic groups and the ecological status in sampled points

| Date	Station	Chlorophyta (µg/L)	Cyanobacteria (µg/L)	Diatoms (µg/L)	Cryptophyta (µg/L)	Chl-a (µg/L)	Ecological Status
14.06.2017	Zaghen 1	0.30	5.37	6.36	0.38	12.41	I
14.06.2017	Zaghen 2	81.06	8.57	32.11	0.00	121.74	IV
14.06.2017	Zaghen 3	91.21	26.46	71.62	0.00	189.29	IV
14.06.2017	Zaghen 4	32.48	5.41	23.01	0.00	60.91	III
27.07.2017	Zaghen 1	0.00	43.30	10.02	0.12	53.44	III
27.07.2017	Zaghen 2	6.49	55.93	12.57	0.00	74.98	III
27.07.2017	Zaghen 3	281.08	100.95	75.94	0.00	457.97	V
27.07.2017	Zaghen 4	7.27	13.17	8.55	0.00	28.98	II
28.08.2017	Zaghen 1	19.50	28.94	10.23	1.80	60.46	III

28.08.2017	Zaghen 2	26.08	48.21	11.77	0.45	86.51	III
28.08.2017	Zaghen 3	89.00	71.03	18.45	0.00	178.47	IV
28.08.2017	Zaghen 4	33.08	15.65	13.57	1.62	63.92	III
28.09.2017	Zaghen 1	27.23	18.04	13.83	1.91	61.02	III
28.09.2017	Zaghen 2	34.30	23.72	16.14	2.25	76.41	III
28.09.2017	Zaghen 4	16.14	10.97	13.40	0.64	41.15	II
19.12.2017	Zaghen 1	26.456	0.675	25.661	0.663	53.457	III
19.12.2017	Zaghen 2	31.849	1.198	20.011	1.219	54.277	III
19.12.2017	Zaghen 3	122.622	0	77.498	7.983	208.104	IV
19.12.2017	Zaghen 4	4.308	3.616	0.426	1.632	9.987	I

Average values are allocated to III-rd quality class according to Order 161/16.02.2006 (*****, 2006), with values between 50-100 µg/L. (Figure. 2).
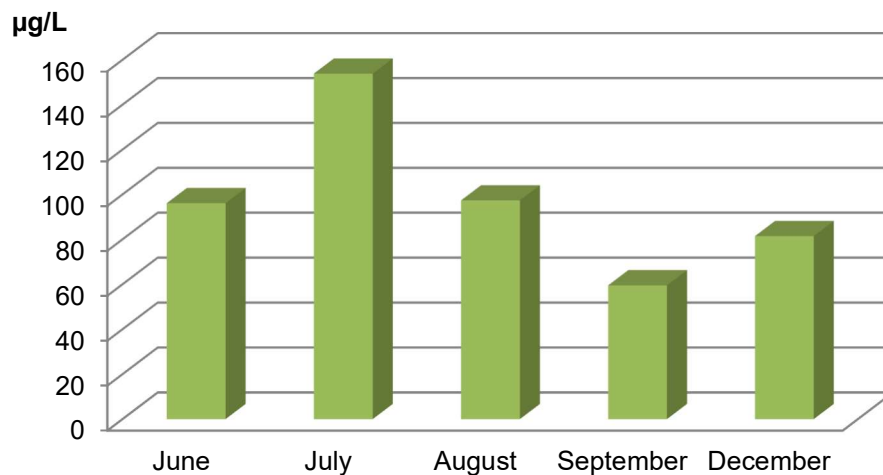
Figure 2. Dinamics of chlorophyll "a" concentration in 2017

The variations of taxonomical groups presented a dominance of Chlorophyta in all samples followed by Cyanobacteria, Diatomeea and Cryptophyta. The only group that presented a growing trend was cryptophyta, Chlorophyta, Cyanobacteria and Diatomeea presenting lower values as the temperature droped (Figure. 3).
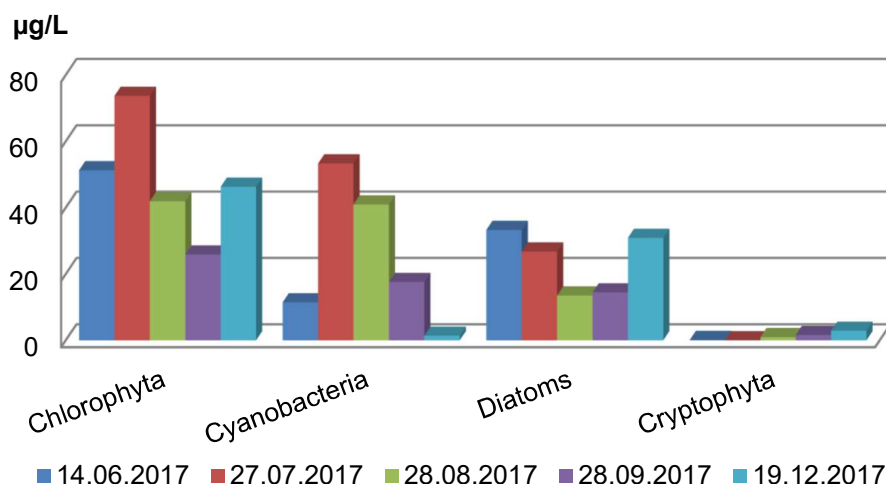
**Figura 3.** Dinamics variation of taxonomic groups in 2017

A list of phytoplanktonic genus was made 39 being identified , belonging to 4 taxonomic groups as follow: 17 chlorophyta, 16 diatoms, 3 cyanophyta and 3 euglenophyta (Table 2).

Table 2. List of phytoplankton genus inhabiting Zaghen Polder

|		Sampling date			
Taxonomic group	Genus	14.06.2017	28.08.2017	28.09.2017	19.12.2017
CHLO	*Chlamydomonas*	1	1		1
CHLO	*Chlorella*	1	1	1	1
CHLO	*Chlorococcum*	1	1		
CHLO	*Coelastrum*	1	1	1	1
CHLO	*Cosmarium*	1	1	1	
CHLO	*Crucigenia*	1	1		
CHLO	*Dictyosphaerium*	1	1	1	1
CHLO	*Golenkinia*			1	
CHLO	*Kirchneriella*	1	1	1	1
CHLO	*Lagerheimia*				1
CHLO	*Monoraphidium*	1	1	1	1
CHLO	*Oocystis*	1	1		
CHLO	*Pediastrum*			1	
CHLO	*Scenedesmus*	1	1	1	1
CHLO	*Staurastrum*	1	1		
CHLO	*Tetraedron*	1	1	1	1
CHLO	*Tetrastrum*	1	1		1
CYAN	*Anabaena*	1	1		
CYAN	*Merismopedia*			1	
CYAN	*Oscillatoria*	1	1	1	1
DIAT	*Amphora*			1	1
DIAT	*Amphiprora*	1	1		
DIAT	*Cocconeis*			1	1
DIAT	*Cyclotella*	1	1	1	1

DIAT	*Cymbella*			1	
DIAT	*Diatoma*				1
DIAT	*Fragilaria*			1	1
DIAT	*Gomphonema*			1	
DIAT	*Gyrosigma*			1	
DIAT	*Melosira*				1
DIAT	*Navicula*	1	1	1	1
DIAT	*Nitzschia*	1	1	1	1
DIAT	*Stauroneis*	1	1		
DIAT	*Surirella*		1		
DIAT	*Stephanodiscus*	1	1	1	
DIAT	*Synedra*	1	1		
EUGL	*Euglena*				1
EUGL	*Trachelomonas*	1	1	1	1
EUGL	*Phacus*		1		

The lowest abundance of phytoplankton identified in this area was in sample site Zaghen 1 in 14.06.2017 and accounted for 154,850 ind/L. The largest abundance was 3,388,430 ind/L, identified in Zaghen 2 in 28.08.2017 (Figure 4).
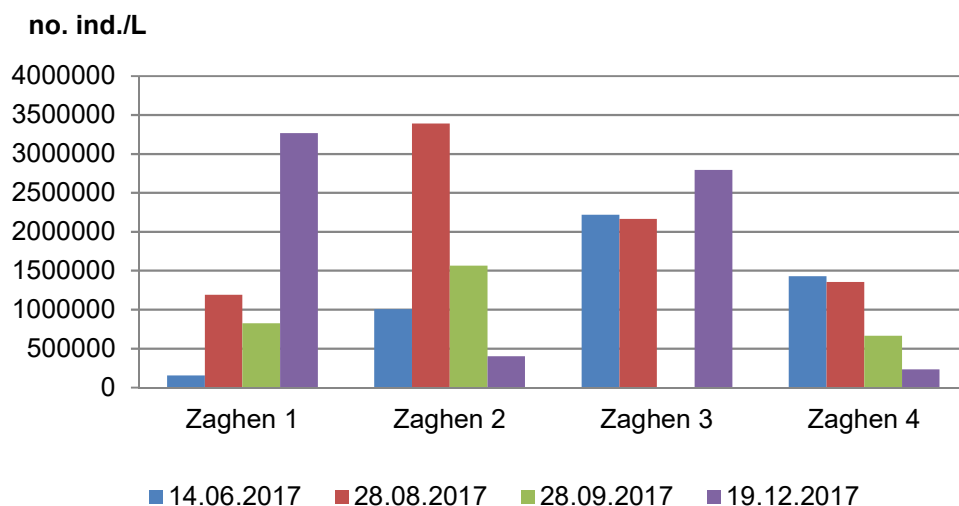
Figure 4. Phytoplankton abundance dinamics in 2017

The distribution of algal groups in the studied area according to total biomass concentration revealed the domination of Chlorophyta (49 %), followed by Cyanobacteria (26 %), Diatomeea (24 %), and Cryptophyta (only 1 %) (Figure 5).
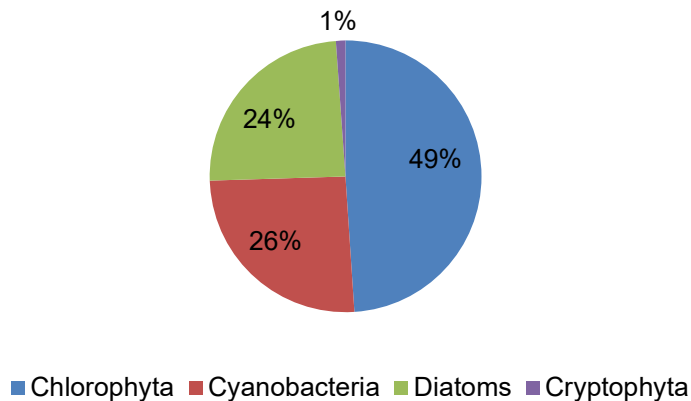
Figure 5. Algal groups distribution in the studied area in 2017

At the time of sampling, measurements of depth and transparency (Secchi disc) were performed. For every sample station was calculated the averages of depth and transparency. According to this in **Zaghen 1** the depth was 185 cm and the transparency 95 cm in **Zaghen 2**, depth was 200 cm and transparency 80, in **Zaghen 3**, depth was 45 cm and transparency 20 cm, in **Zaghen 4** depth was 115 cm and transparency 80 cm. During the investigated period the pemperature recorded values between 25-27°C, except for December when the temperature dropped at values between 3.4-7.3°C

CONCLUSIONS

As the structure and functionality of the ecosistem was changed results showed a beneficial role of ecological reconstruction by improving hidrological conditions and a rise of biodiversity.
Phytoplankton distribution show a good background for development of food chain. Cianobacteria development in july is normal taking into account its ability to grow in large amounts of biomass, due to warm water and nutrient accumulation from floods and snow melting in spring.

REFERENCES

*****, 2006 Ordinul nr. 161 din 16 februarie 2006 al ministrului mediului şi gospodăririi apelor pentru aprobarea Normativului privind clasificarea calităţii apelor de suprafaţă în vederea stabilirii stării ecologice a corpurilor de apă. Monitorul Oficial al României, no. 511 (publicat în 13 iunie 2006), Bucureşti.
Cărăuş I., 2002. Algae of Romania. A distributional checklist of actual algae. Stud.Cerc.Biol., Univ.Bacău; 7; version 2.4 – fouth revision, 2017, pages 1-1002
Parpală L., Zinevici V., Ionică D., Moldoveanu M., Sandu C., 2008. Modificări ale parametrilor ecologici ai comunităţii planctonice în ecosisteme de tip lacustru din Delta Dunării sub impactul eutrofizării. Protecţia şi restaurarea bio şi ecodiversităţii.IN: Lucr. Conf. Naţ.de Ecologie, Mamaia 2007, pp. 61-63, Ed. Ars Docendi
Sangdao W., 2012. Correlation between phytoplankton distribution and land use/land cover in Phuket reservoirs, The 33rd Asian Conference on Remote Sensing, Pattaya, Thailand
Tudor I.M., Ibram O., Török L., Covaliov S., Doroftei M., Tudor M., Năstase A., Năvodaru I., 2015. Metode de monitorizare a indicatorilor biologici în ecosistemele acvatice ale Deltei Dunării, cap. 3, pag. 95-123, in: Tudor I.-M. (ed.), Ghid metodologic de monitorizare a factorilor hidromorfologici, chimici şi biologici pentru apele de suprafaţă din Rezervaţia Biosferei Delta Dunării, 143 pag. ISBN: 978-606-93721-8-0, Editura Centrul de Informare Tehnologică Delta Dunării, Tulcea.