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www.across-journal.com
ISSN 2602-1463
Vol. 8 (6) 2024 Engineering Across Borders



# THE STRUCTURE OF ALGAL COMMUNITIES IN THE PARCHES AQUATIC ECOSYSTEM, TULCEA COUNTY (ROMANIA)

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**Abstract**

Phytoplankton represents one of the most important communities of organisms for life in aquatic environments. It is a type of autotrophic pelagic organism that is unable to oppose the action of currents and is therefore widespread in all types of aquatic ecosystems. They are important for the development of ecosystems and biodiversity because they are primary producers. This means that they form the basis of food webs in aquatic environments.

The present paper presents information about the phytoplankton structure in the Parches aquatic ecosystem, Tulcea County (Romania). Phytoplankton samples were taken in September 2021, at the end of the vegetative season, from 4 stations. Phytoplankton was present in all the stations we analysed. By processing the phytoplankton samples taken, four taxonomic groups were highlighted, namely: Baccilariophyceae, Euglenophyceae, Chlorophyceae and Cyanophytes. A total of 58 species belonging to the four taxonomic groups were identified. The dominant species are *Cymatopleura solea, Cocconeis placentula, Melosira granulate*.

In the samples taken in September 2021, the abundance of Bacillariophyceae varies between 52-69%, followed by Chlorophyceae between 14 and 28%, and Euglenophycin between 9 and 14%. Cyanophytes had the lowest abundance between 0 and 10%.

The number of taxa and specimens identified in the phytoplankton structure shows a good diversity of the phytoplankton community during the study period.

**Keywords:** phytoplankton, taxonomic groups, stations, species

## 1. Introduction

Phytoplankton ('phyto' = plant; 'planktos' = made to wander) is a group of photosynthetic microorganisms (single-celled algae), adapted to live partly or continuously in open water, some of which are capable of movement through the use of flagella while others drift with currents.

One of the most important components of natural aquatic systems is phytoplankton. It is the foundation of the aquatic food web, being the primary producer (Vargas C.A. et al., 2006). A common characteristic of phytoplankton is that they contain chlorophyll-a, but some species also contain other pigments such as chlorophyll-b and chlorophyll-c, as well as photosynthetic carotenoids (Kirk J.T.O., 1994, Barlow R. et al., 2008).

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Vol. 8 (6) 2024 Engineering Across Borders



## 2. Methodology

### ➢ Study area

*The Somova – Parcheș Lake complex* is in the western part of the Danube Delta Biosphere Reserve (RBDD), near the border between Romania and Ukraine. It is bounded to the south and west by the edge of the North-Dobruja Plateau, to the east by the edge of the urban area of Tulcea, to the north by the banks of the Danube and the Tulcea Branch (Török Z., 2006).

The Somova - Parcheș lake complex includes the following waters: Lake Gorgonel, Lake Rotundu, Gârla Somova, Lake Parcheș, Morun Ghiol, Lake Ciorciovata, Lake Babele, Lake Petica, Lake Somova, Lake Câșla, Lake Gâsca (species protection area for freshwater).

Due to the hydro-morphological conditions, this complex presents a great diversity of habitats, which makes the biodiversity similar to that of the Delta, being considered a small delta.

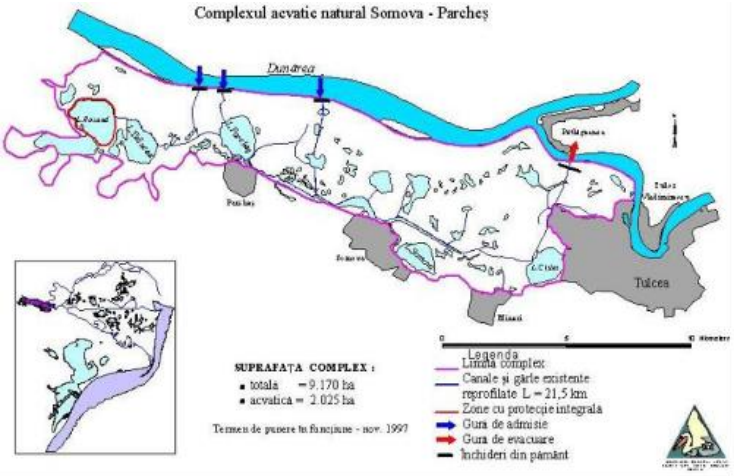


Figure 1. The Somova-Parches Lake complex (Török Zsolt, 2006)

### ➢ Methodology

The biological samples were collected at the end of September 2021, during the autumn period. The sampling of biological samples was done in 4 sampling stations, marked S1, S2, S3 and S4, stations that tried to capture the heterogeneity of the species (Figure 2). The stations were established in advance with the help of a GPS on the mobile phone (Table 1).

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ISSN 2602-1463
Vol. 8 (6) 2024 Engineering Across Borders



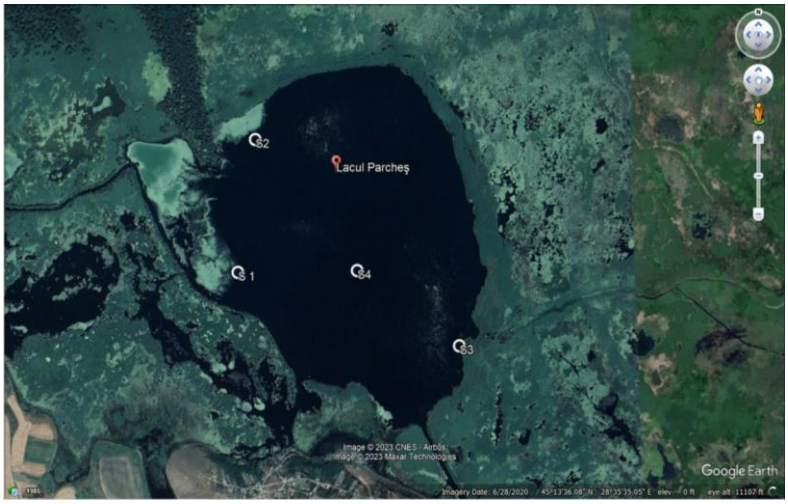


Figure 2. Sampling stations, Parcheș Lake

Table 1. GPS coordinates corresponding to the related stations

| Station | Latitude | Longitude |
|---|---|---|
| **S1** | 45°13'32.88"N | 28°34'58.95"E |
| **S2** | 45°13'53.45"N | 28°35'2.79"E |
| **S3** | 45°13'21.59"N | 28°35'49.81"E |
| **S4** | 45°13'33.16"N | 28°35'26.37"E |

Phytoplankton identification in water samples is usually best done by studying under an optical microscope, this involves identifying all species of algae and drawing up a list of species by systematic groups. For this, the algal concentrate sample obtained after the sedimentation operation is subjected to microscopic analysis of microscopic preparations using different optical combinations.

The identification of phytoplankton species was carried out according to the Algology Treatise edited by the academician Petterfi Șt., 1979 and according to the determinant illustrated by Dussart B. from Luiza Florea's Hydrobiology Laboratory Notebook, 2007.

## 3. Results and discussion

- ***Qualitative structure of phytoplankton in the Parcheș Lake aquatic ecosystem***

Through the qualitative processing of phytoplankton samples taken from the surface of the water (approximately 0.5 m thick) in September 2021, 58 phytoplankton species were identified. Phytoplankton community structure is mainly composed of Baccilariophyceae (35 species), Euglenophyceae (5 species), Chlorophyceae (14 species) and Cyanophyceae (4 species). The diatoms were represented by 23 genres, the 2 genres eugens, the 6 genres chlorophylls and the 3 genres cyanopites.

The study of phytoplanktonic biocenosis involving the qualitative analysis of the samples was concentrated in a table with the presence or absence of species (Table 2).

Table 2. List of taxa identified in Parches Lake

| Nr.crt | Taxonomic group | Species | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|
| 1 | | *Achnantes lanceolata* | 1 | 0 | 0 | 0 |
| 2 | | *Amphora ovalis v gracialis* | 1 | 1 | 1 | 1 |
| 3 | | *Asterionella garcilima* | 1 | 1 | 1 | 1 |
| 4 | | *Cocconeis placentula* | 1 | 1 | 1 | 1 |
| 5 | | *Coloneis amphisaenta* | 1 | 0 | 0 | 0 |
| 6 | | *Cyclotella comta* | 1 | 0 | 0 | 0 |
| 7 | | *Cymatopleura elliptica* | 1 | 1 | 1 | 1 |
| 8 | | *Cymatopleura solea* | 1 | 1 | 1 | 1 |
| 9 | | *Cymbella lanceolata* | 1 | 1 | 1 | 1 |
| 10 | | *Cymbella ventricosa* | 1 | 1 | 1 | 0 |
| 11 | | *Coelosphaerium k-tzingianum* | 0 | 1 | 0 | 0 |
| 12 | | *Diatoma vulgare* | 0 | 0 | 1 | 0 |
| 13 | | *Ephitemia sorex* | 1 | 1 | 1 | 0 |
| 14 | | *Gromia fluviatilis* | 1 | 0 | 0 | 0 |
| 15 | | *Gomphonema olivaceum* | 1 | 0 | 1 | 0 |
| 16 | | *Gyrosigma acuminatum* | 1 | 1 | 1 | 1 |
| 17 | | *Melosira granulata* | 1 | 1 | 1 | 1 |
| 18 | | *Melosira italica* | 1 | 1 | 1 | 1 |
| 19 | | *Melosira varians* | 1 | 1 | 1 | 1 |
| 20 | | *Navicula cuspidata* | 1 | 1 | 1 | 1 |
| 21 | | *Navicula viridula* | 1 | 0 | 0 | 1 |
| 22 | | *Nitzschia holsatica* | 1 | 0 | 1 | 0 |
| 23 | | *Nitzschia palea* | 1 | 1 | 1 | 1 |
| 24 | | *Nitzschia sigmoidea* | 0 | 0 | 1 | 0 |
| 25 | | *Nitzschia acicularis* | 0 | 0 | 1 | 0 |
| 27 | | *Neidium productum* | 0 | 1 | 0 | 0 |
| 28 | | *Pinnularia viridis* | 1 | 1 | 1 | 1 |
| 29 | | *Surirella biseriata* | 1 | 0 | 1 | 0 |
| 30 | | *Synedra actinastriodis* | 1 | 0 | 0 | 0 |
| 31 | | *Synedra acus* | 1 | 0 | 0 | 0 |
| 32 | | *Synedra berolinensis* | 1 | 1 | 1 | 1 |
| 33 | | *Synedra ulna* | 1 | 0 | 0 | 0 |
| 34 | | *Tabellaria flocculosa* | 1 | 0 | 1 | 0 |
| 35 | Baccilariophyceae | *Rhoicosphaeria curvata* | 1 | 0 | 0 | 0 |
| 36 | | *Euglena oxyuris* | 1 | 1 | 0 | 1 |
| 37 | | *Trachelomonas armata* | 0 | 0 | 1 | 0 |
| 38 | Euglenophyceae | *Trachelomonas plantonica* | 1 | 1 | 1 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 39 | | *Trachelomonas regulosa* | 1 | 1 | 0 | 0 |
| 40 | | *Trachelomonas verrucosa* | 1 | 1 | 1 | 1 |
| 41 | | *Ankistrodesmus falcatus* | 0 | 0 | 0 | 1 |
| 42 | | *Closterium venus* | 0 | 0 | 0 | 1 |
| 43 | | *Crucigenia fenestrata* | 0 | 0 | 1 | 0 |
| 44 | | *Crucigenia tetrapedia* | 0 | 0 | 1 | 0 |
| 45 | | *Pediastrum boryanum* | 1 | 1 | 1 | 1 |
| 46 | | *Pediastrum duplex* | 1 | 0 | 0 | 1 |
| 47 | | *Pediastrum tetras* | 0 | 1 | 1 | 1 |
| 48 | | *Scenedesmus acuminatum* | 1 | 0 | 1 | 1 |
| 49 | | *Scenedesmus armatus* | 1 | 0 | 0 | 0 |
| 50 | | *Scenedesmus dimorphus* | 1 | 0 | 0 | 0 |
| 51 | | *Scenedesmus longues* | 1 | 0 | 0 | 0 |
| 52 | | *Scenedesmus quadricauda* | 1 | 1 | 1 | 1 |
| 53 | | *Tetraedron caudatum* | 1 | 0 | 1 | 1 |
| 54 | Clorophyceae | *Tetraedron regulare* | 1 | 1 | 1 | 0 |
| 55 | | *Aphanocapsa stagnina* | 0 | 0 | 0 | 1 |
| 56 | | *Gloecapsa dispersa* | 0 | 1 | 0 | 0 |
| 57 | | *Gloecapsa magma* | 0 | 1 | 0 | 1 |
| 58 | Cyanophyceae | *Gomphosphaeria lacustris* | 0 | 0 | 0 | 1 |

Notes: 1=present form; 0=absent form

- ***Relative abundance***

Following the analysis of the samples, the highest relative abundance was the Bacilliorphyceae (52-69%), followed by the Chlorophyceae (14-28%), the Euglenophyceae (9-14%), and the lowest abundance was o cyanophytes between 0-10% (figure 3). In terms of relative abundance, diatoms dominated in phytoplankton samples at all sampling stations (table 3).

Table 3. The number of species belonging to each taxonomic group per station

| **Taxonomic group** | **Number of species** | | | |
|---|---|---|---|---|
| | S1 | S2 | S3 | S4 |
| Baccilariophyceae | 29 | 18 | 23 | 15 |
| Chlorophyceae | 9 | 4 | 8 | 9 |
| Euglenophyceae | 4 | 4 | 3 | 3 |
| Cyanophytes | 0 | 2 | 0 | 3 |
| **Total species** | 42 | 28 | 34 | 29 |

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ISSN 2602-1463
Vol. 8 (6) 2024 Engineering Across Borders



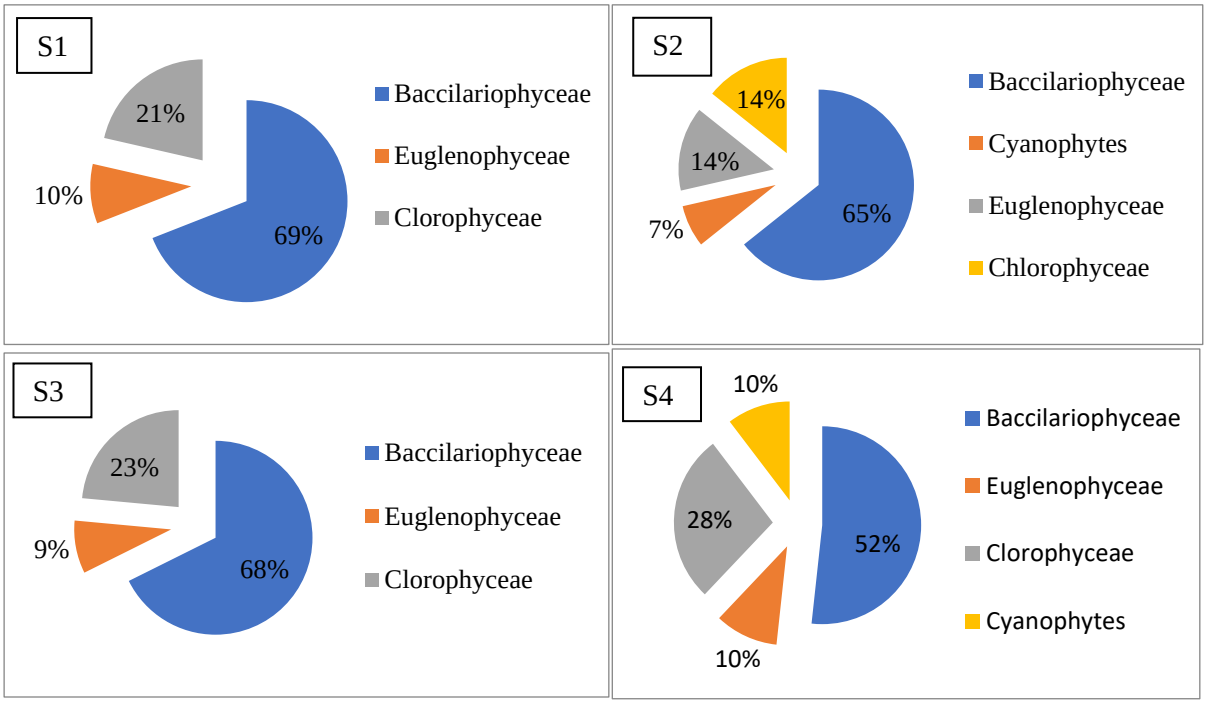
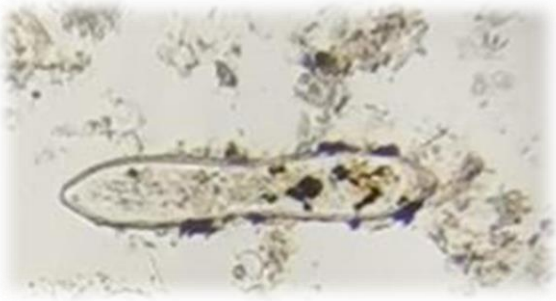
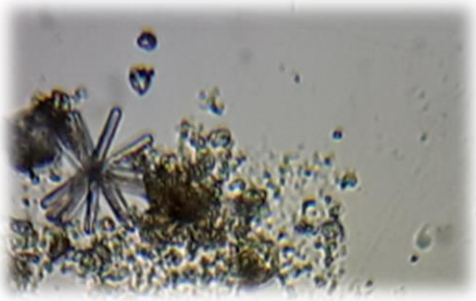



Figure 3. Relative abundance of phytoplankton by station

Station 1 is characterized by the dominance of the species *Cymatopleura solea*, followed by the species *Synedra berolinensis* and *Melosira granulata*, species from the diatom group, from the euglenophycea species *Trachelomonas planktonica* predominates and from the Chlorophycea species *Scenedesmus quadricauda* (figure 4).



*Cymatopleura solea*



*Synedra berolinensis*

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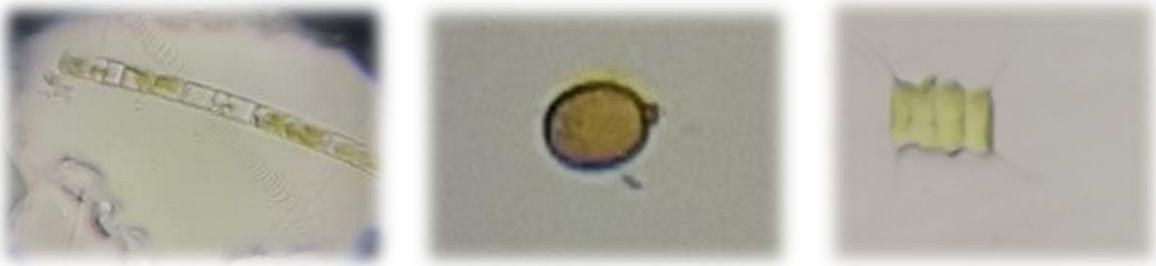
ISSN 2602-1463
Vol. 8 (6) 2024 Engineering Across Borders





*Melosira granulate* *Trachelomonas planctonica* *Scenedesmus quadricauda*

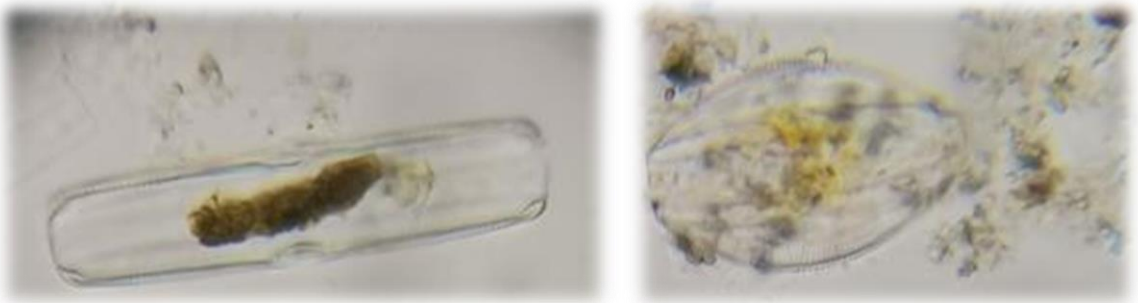
Figure 4. Dominant species in station 1 (original photo)

Station 2 is characterized by the dominance of the species *Cocconeis placentula*, followed by the species *Cymatopleura solea* and *Melosira italica*, species of the diatom group, of the euglenophyceae species the *Trachelomonas verrucosa* species predominates and of the chlorophyceae species the *Scenedesmus quadricauda* species predominates (figure 5).

*Cocconeis placentula* *Melosira italica* *Trachelomonas verrucosa*

Figure 5. Dominant species in station 2 (original photo)

Station 3 is characterized by the dominance of the species *Pinularia viridis*, followed by the species *Coconeis plancentula* and *Amphora ovalis v gracialis*, species from the group of diatoms, from the group of euglenophyces the species *Trachelomonas verrucosa* predominates and from the group of chlorophytes the species *Scenedesmus quadricauda* prevails (figure 6).



*Pinularia viridis* *Amphora ovalis v gracialis*

Figure 6. Dominant species in station 3 (original photo)

Station 4 is characterized by the dominance of the species *Synedra berolinensis*, followed by the species *Coconeis plancentula* and *Cymbella lanceolata*, species from the diatom group, from the euglenophyceae species *Trachelomonas planktonica* predominates and from the chlorophyceae species *Scenedesmus quadricauda* followed by *Pediastrum boryanum* predominates (figure 7).

*Cymbella lanceolata* *Pediastrum boryanum*

Figure 7. Dominant species in station 4 (original photo)

Diatoms are extremely widespread and occur as the dominant organisms of many diverse habitats. They are particularly conspicuous in both marine and freshwater phytoplankton.
Diatoms are of particular importance in aquatic ecosystems, being primary producers in trophic networks, producers of dissolved and atmospheric O2, organisms active in the circuit of chemical elements in nature (Werner, 1977b), or participants in the self-purification process of natural waters.

## 4. Conclusions

Within the phytoplankton communities, there were small changes in terms of the number of species, however, the large number of species at this depth especially characterizes the homogenization period in autumn, which can itself explain this phenomenon. Since the samples were taken in the autumn season, diatoms dominated in all the stations.
The number of taxa and specimens identified in the phytoplankton structure shows a good diversity of the phytoplankton community during the study period.

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ISSN 2602-1463
Vol. 8 (6) 2024 Engineering Across Borders



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