TEMPORAL PATTERNS OF PLANKTON DYNAMICS IN EUTROPHIC COASTAL LAGOON

Sponsored by AMBER

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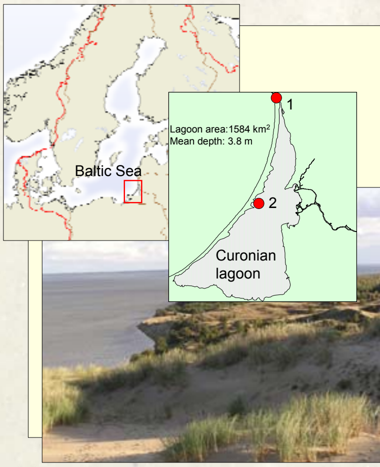


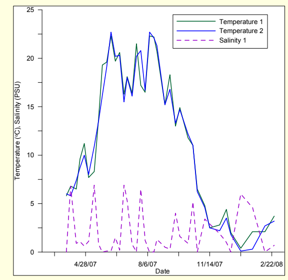
The aim of this study was to reveal the pattern of plankton seasonal dynamics, particularly bacteria and ciliates, in the Curonian lagoon (SE Baltic Sea).

Curonian lagoon is the transitional eutrophic water body. The central part of the lagoon (**st. 2**) contain fresh water, while the salinity in the northern part (**st. 1**) is influenced by the irregular Baltic Sea water inflows.

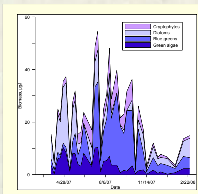
Plankton samples (including ciliates, metazooplankton, phytoplankton and bacteria) were collected weekly from March 2007 till February 2008 at two sampling sites. Main environmental parameters were measured at each sampling site.

Ciliates were analyzed from live material, phytoplankton biomass was determined fluorimetrically as chl a concentration, zooplankton and bacteria samples were analysed using standard microscopy techniques.

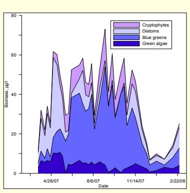
Redundancy analysis and Bio-Env procedure was applied to evaluate the relationships between environmental parameters and ciliate community.



Temperature and salinity in both sampling stations



Phytoplankton, st. 1

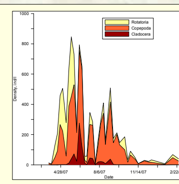


Phytoplankton, st. 2

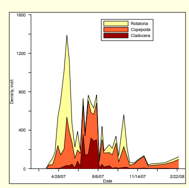
Phytoplankton growth in winter and early spring is nutrient-unlimited and controlled only by ambient physical conditions. Late spring is silica and phosphorus-limited.

The shift from spring diatom dominated community to blue greens could be supported by riverine discharge reduction and wind climate changes. Cyanobacteria dominated period is nitrogen- and light-limited.

During the summer, the phytoplankton community could be dominated either by the cyanobacteria or by the diatoms depending on temperature and wind climate (Pilkaitytė, Razinkovas 2006; 2007).



Crustaceans & rotifers, st. 1



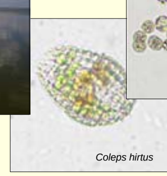
Crustaceans & rotifers, st. 2

Crustacean zooplankton follows succession pattern typical for freshwater eutrophic ecosystems. The negligible development of large herbivores in early spring and autumn could be explained by lagoon hydrodynamics.

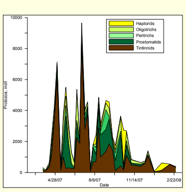
The midsummer prevalence of small cladocerans e.g. *Ceriodaphnia*, *Diaphanosoma* or *Chydorus* is related to the large cyanobacteria, namely *Aphanizomenon flos-aquae*.

The prolonged salinity inflows could only "produce" the gaps in the successional sequence; the pattern of temporal sequence for the succession stages remained stable during all study period (Gasiūnaitė, Razinkovas 2004).

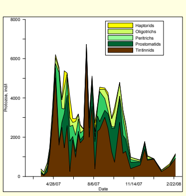
Vorticella microstoma



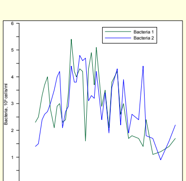
Coleps hirtus



Ciliates, st. 1



Ciliates, st. 2



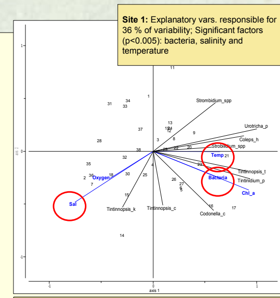
Bacteria, st.1 and 2

Ciliate assemblage in st. 1 was dominated by tintinnids, particularly *Tintinnopsis kofoidi and T. cylindrata* at the end of June – beginning of July. During the autumn brackish water assemblage was dominated by *Myrionecta rubra* (haptorids)- common species in the Baltic sea. Salinity together with temperature and bacterial abundance is one of the main factors, shaping ciliate community at the lagoon-sea transition.

Freshwater ciliate assemblage (st. 2) was totally dominated by herbivorous tintinnid species *Tintinnidium pusillum* and *Codonella cratera*. Their dynamics is strongly related to chlorophyll a changes. Prostomatids (*Coleps hirtus*) and oligotrichs and naked choreotrichs (*Stombidium viridae*, *Strobilidium velox*, *S. humile*) abundance increased during early summer and autumn. Generally, temperature and chlorophyll a concentration are the main factors.

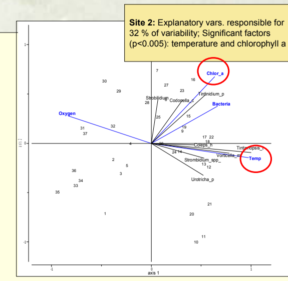
Bacterial abundance correlated significantly ($p<0.05$) with temperature (0.7 and 0.58 respectively) and chlorophyll a concentration (0.69 and 0.46) in both sites.

Site 1: Explanatory vars. responsible for 36 % of variability; Significant factors ($p<0.005$): bacteria, salinity and temperature



Spearman rank correlation
K Best variable combinations (ρ_w)
Ciliate community structure: 1. Salinity (0.39), Chloropyll a (0.15) , Temperature (0.14), Bacteria (0.08), Oxygen (-0.13) 2. Salinity, Bacteria (0.42); Salinity, oxygen (0.28); Temperature, Salinity (0.24); Temperature, Chloropyll a (0.23) ... 3. Salinity, Oxygen, Bacteria (0.29), Temperature, Salinity, Chlorophyll a (0.26); Salinity, Temperature, Bacteria (0.24)

Site 2: Explanatory vars. responsible for 32 % of variability; Significant factors ($p<0.005$): temperature and chlorophyll a



Spearman rank correlation
K Best variable combinations (ρ_w)
Ciliate community structure: 1. Temperature (0.38), Chloropyll a (0.24) , Bacteria (0.24), Oxygen (-0.06) 2. Temperature, Bacteria (0.38); Temperature, Oxygen (0.36); Temperature, Chlorophyll a (0.35), Chorophyll a, Bacteria (0.25) ... 3. Temperature, Oxygen, Bacteria (0.37), Temperature, Oxygen, Chlorophyll a (0.35); Temperature, Bacteria, Chlorophyll a (0.35), Oxygen, Chlorophyll a, Bacteria (0.26)

Conclusions

Phytoplankton, crustacean zooplankton and rotifer dynamics in the Curonian lagoon is highly dependent on hydrodynamic conditions and exhibit two stages: "riverine" in spring and autumn, and "lake" in summer.

Factors, shaping abundance, community structure and dynamics of bacteria and ciliates are site-dependent.

No statistically significant correlation was found between the dominant ciliates species abundance and crustacean copepods in both sites