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# Lake Durowskie

Phytoplankton and periphyton  
communities

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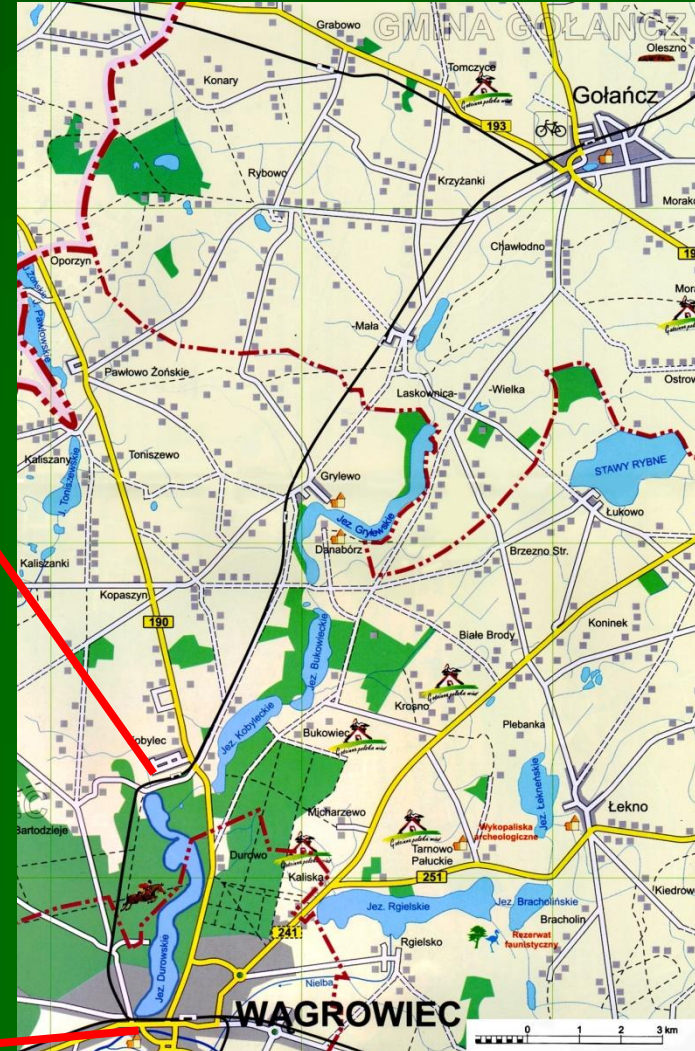
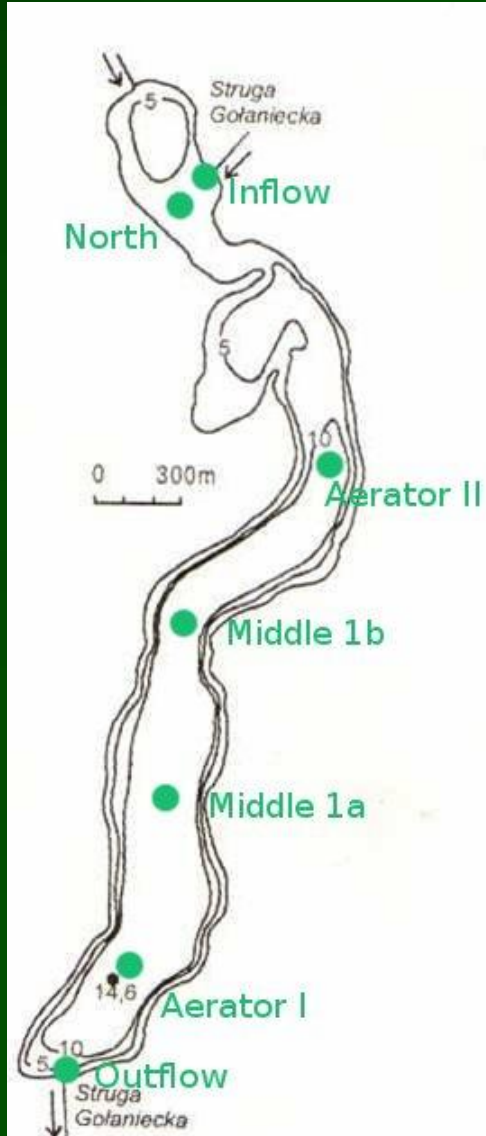
# Introduction

1. Fresh water ecosystem has being threatened by eutrophication
  - mainly nitrogen and phosphorous from agriculture industry and urban wastes
2. Phytoplankton- water quality assesment by:
  - phytoplankton abundance (chlorophyll a)
  - taxonomic composition (dominants and indicators)
3. Phytoplankton is one of the four biological quality elements (but five biological groups: phytoplankton, macrophytes and phytobenthos, macroinvertebrates and fish) required for the ecological status assesment of surface waters

# Aim

1. to assess the trophic level of the lake on the basis of phytoplankton biomass and periphytic diatom species
2. to compare phytoplankton and periphytic composition and distribution in seven representative sites of the lake.
3. to see if there is spatial or temporal difference in phytoplankton distribution across the lake
4. to estimate water quality according WFD based on periphytic diatom's index
5. to answer if restoration project which started in 2008 is effective or not

# Phytoplankton stations



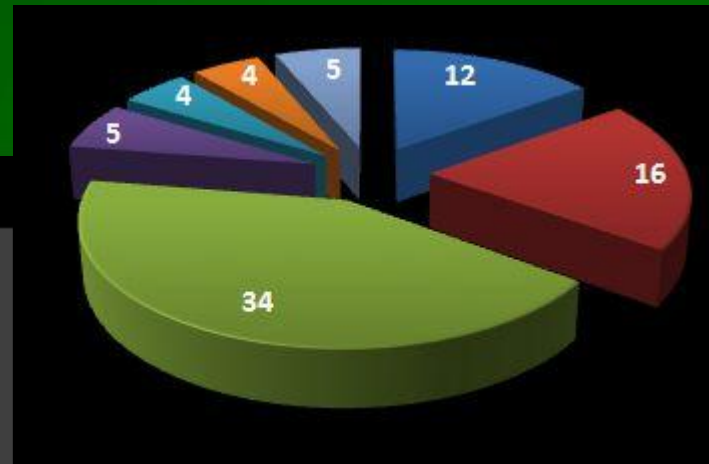
Mapa: Stanowiska poboru fitoplanktonu

# Methods



# Results – number of species

Wykres: Całkowita liczba gatunków w jeziorze Durowskim



Wykres: Liczba gatunków na poszczególnych stanowiskach (średnia ogólna)

# Results – Mixed Phytoplankton Index

Station	2008	2009	2010	Trophy
Aerator 1	9,67	16	8,3	Eutrophy
Aerator 2	~	26	11,5	Eutrophy
Middle 1a	~	9	12,5	Eutrophy
Middle 1b	~	~	8,3	Eutrophy
Inflow	~	~	18	Eutrophy
Outflow	~	~	6,5	Eutrophy
North	~	~	11,5	Eutrophy

Tabela: Mixed Phytoplankton Index

1,0 < mesotrophy < 3.0 < eutrophy

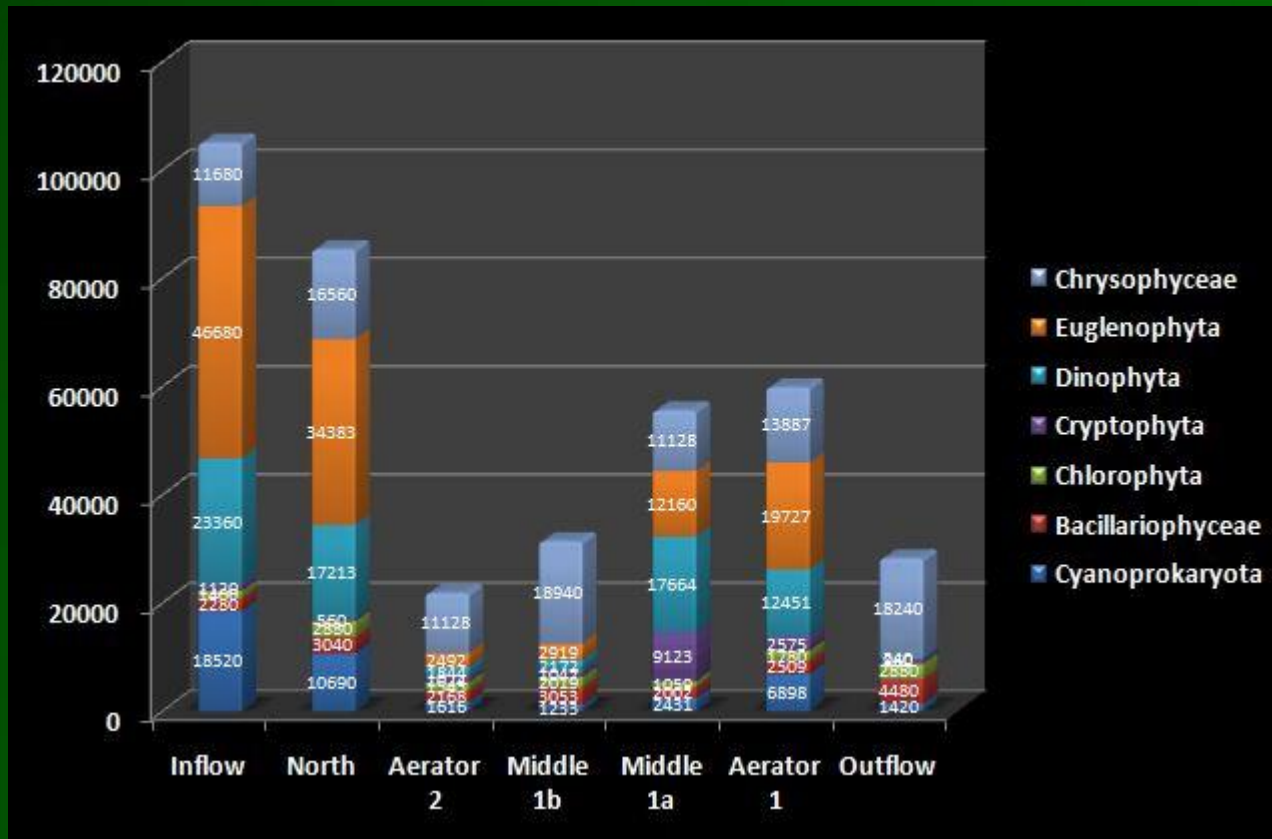
# Results – Jaccard Index

Year	2009	2010
2008	0,84	0,513
2009	~	0,48

Tabela: Współczynnik Jaccard'a

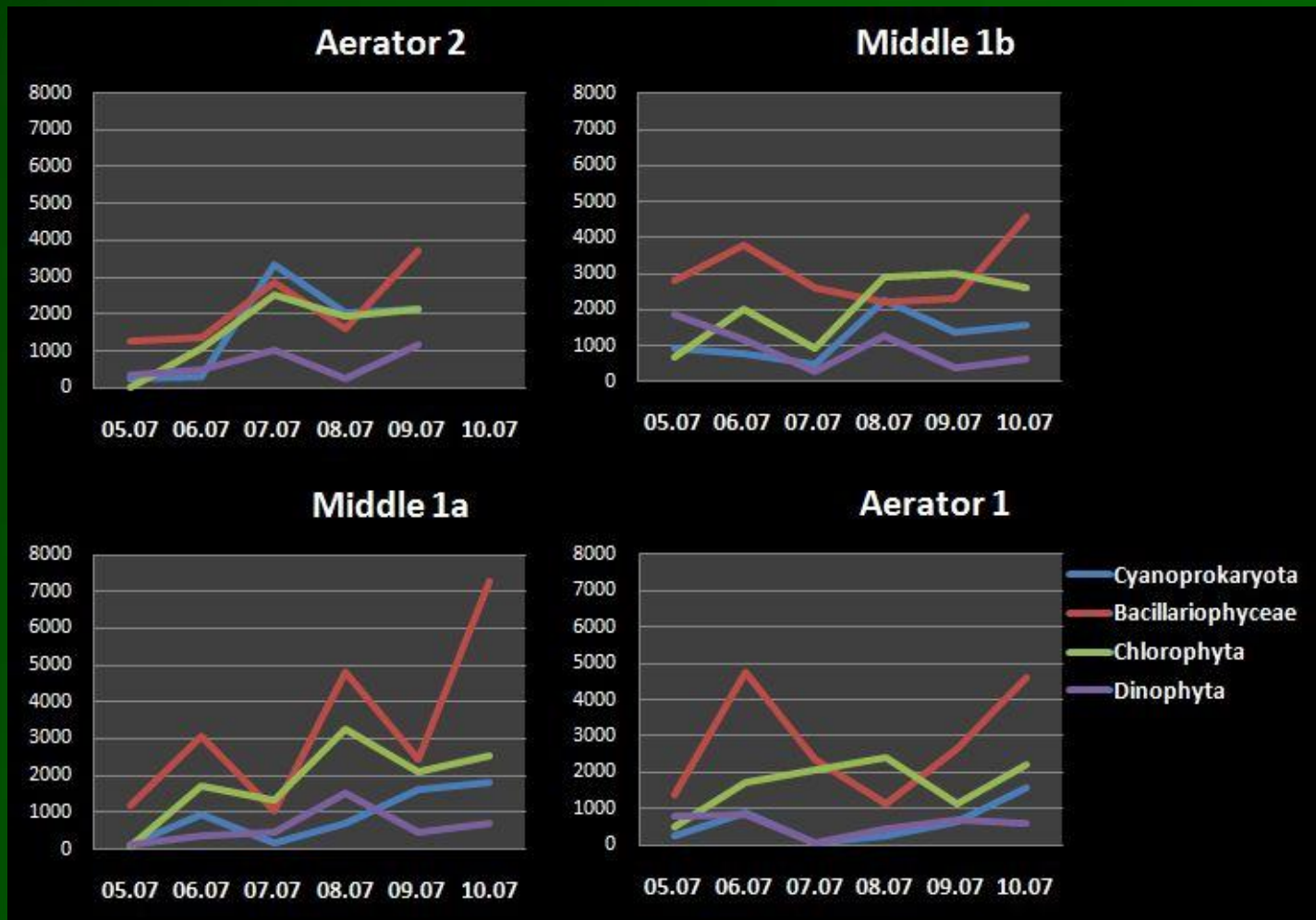


# Results – number of cells



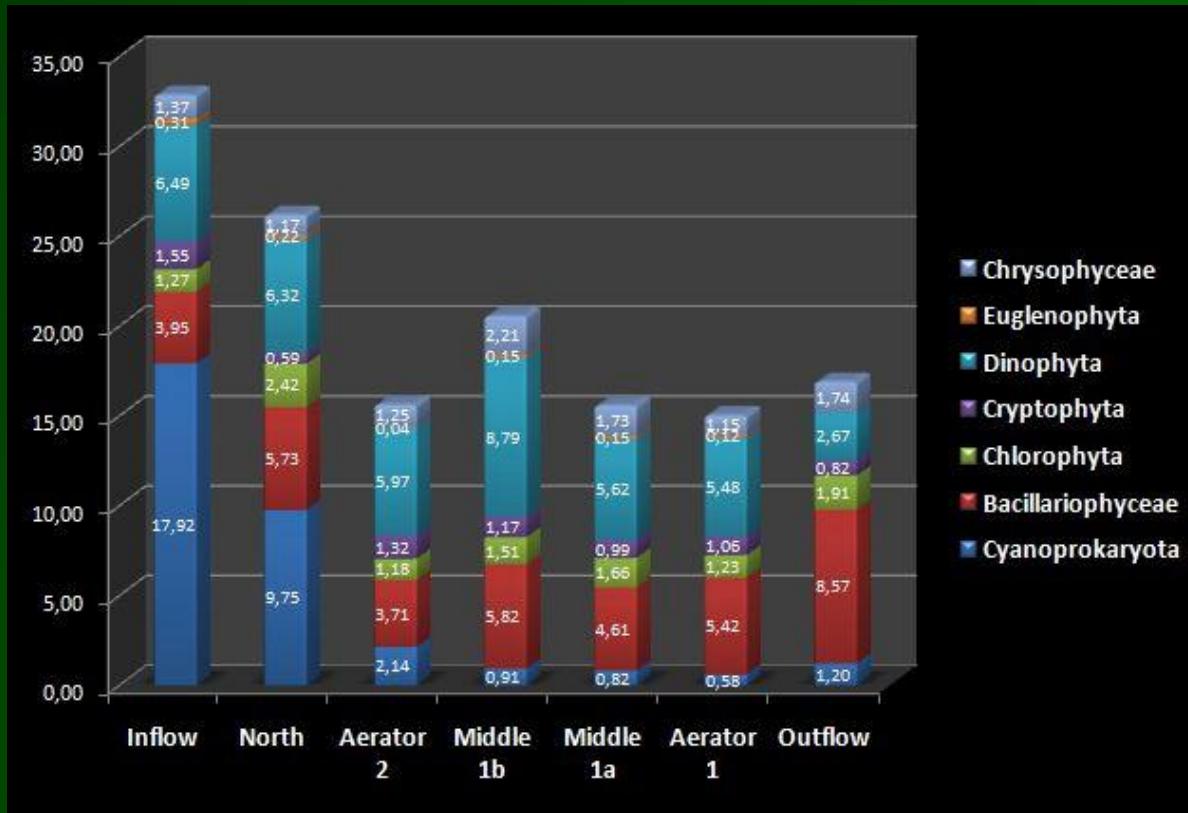
Wykres: Średnia liczba komórek na poszczególnych stanowiskach

# Results – number of cells



Wykres: Zmiany liczebności na wybranych stanowiskach

# Results – biomass

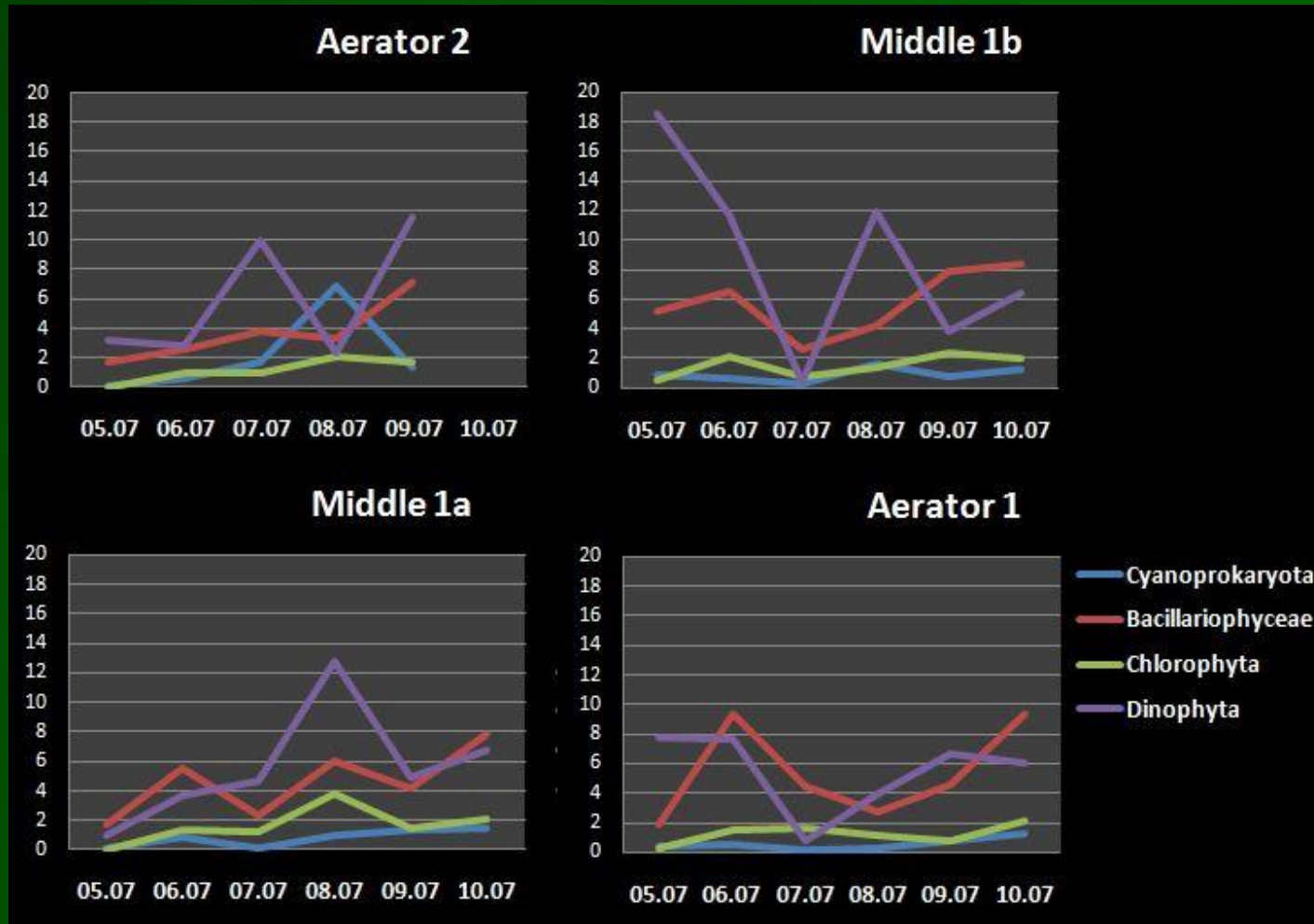


Trophy	Biomass [mg/l]
oligotrophy	0.2 - 0.5
mesotrophy	1.0 - 3.0
eutrophy	2.5 - 10
hypertrophy	> 10

Tabela: Skala trofii wg Zdanowskiego (1991)

Wykres: Średnia biomasa na poszczególnych stanowiskach

# Results – biomass



Wykres: Zmiany biomasy na wybranych stanowiskach

# Compearing – biomass



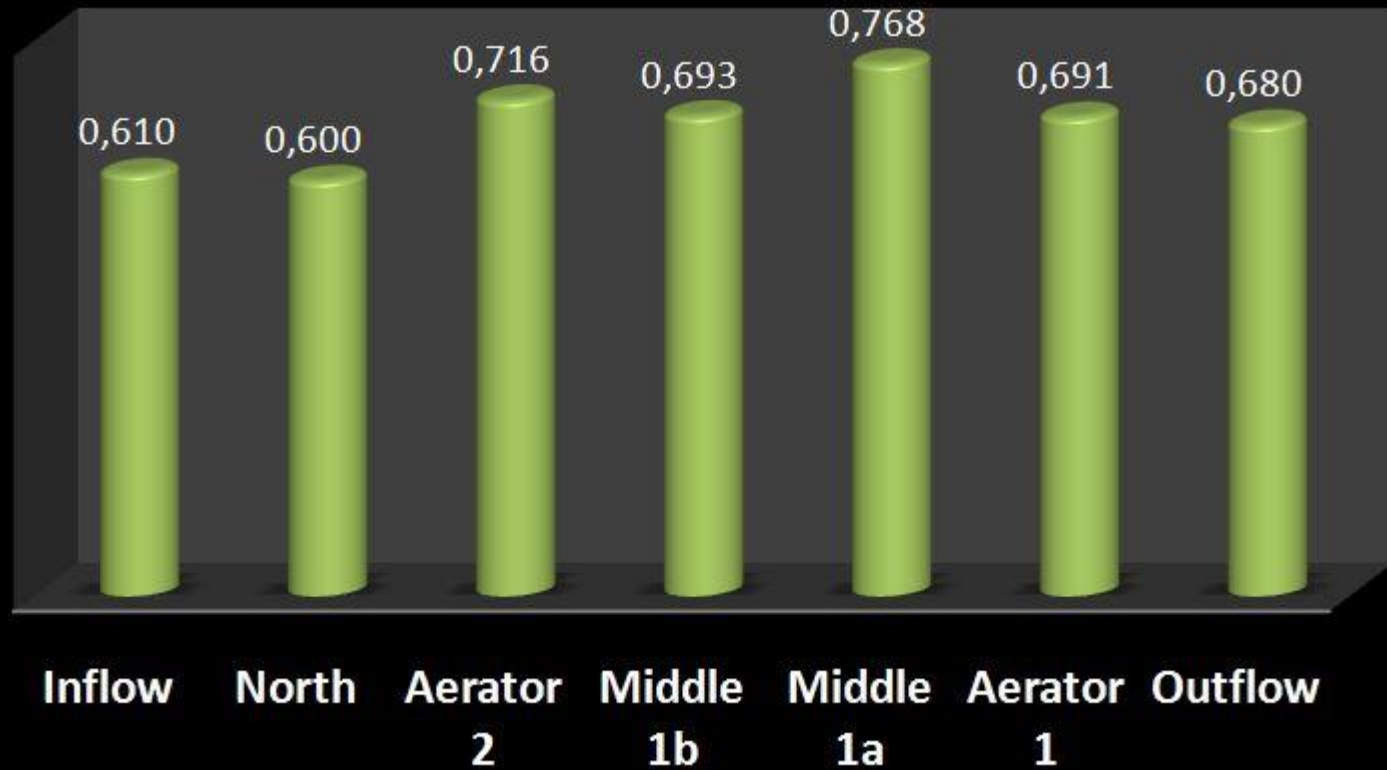
Wykres: Porównanie biomasy w latach 2009 i 2010

# Results – Shannon-Weaver Index



Wykres: Współczynnik Shannon'a-Weaver'a

# Results - Evenness



Wykres: Współczynnik evenness

# Zooplankton pressure on algae

Small green algae are appearing in very small numbers



Ryc: Tetraedron minimum (A. Br.) Hansgirg

Ryc: Monoraphidium contortum (Th.) K.-Legn



Ryc: Pteromonas angulosa (Carter) Lemm.

Ryc: Oocystis lacurtris Chodat



Ryc: Elkatothrix gelatinosa Wille

Ryc: Desmodesmus communis (Hegew.) Hegew.



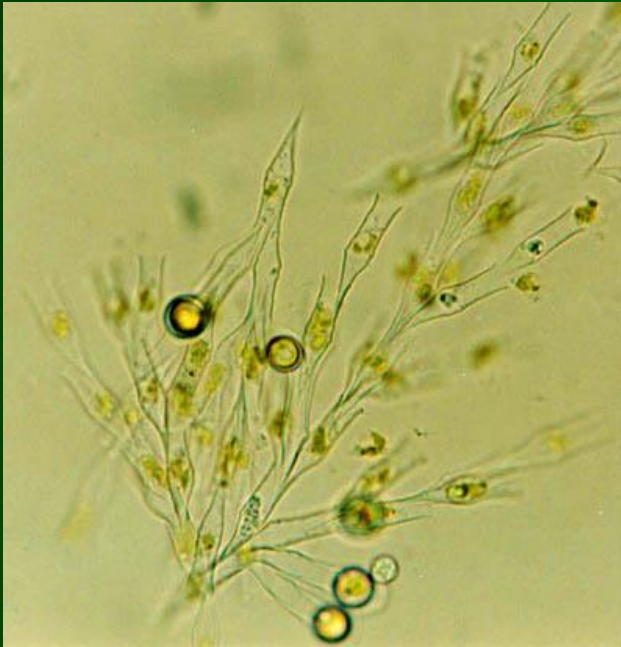
Ryc: Tetrastrum staurogeniaeforme (Schroed.) Lemn





# Zooplankton pressure on algae

Big in the size colonies  
(e.g. Dinobryon sp.)



Largeness of cells (e.g.  
diatoms, dinoflagellates)



Ryc: Fragllaria ulna



Ryc: Copepoda



Ryc: Ceratium  
hirundinella

# Zooplankton pressure on algae

Cells with long spikes (e.g. greens)

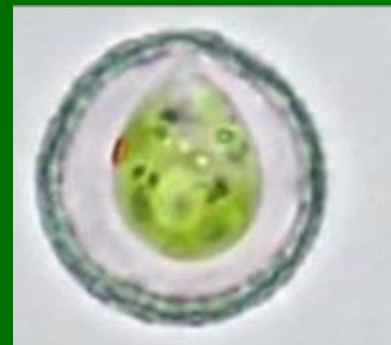


Ryc: *Golenkinia radiata*



Ryc: *Trubelaria planctonica*

Cells with a very thick cell wall  
(e.g. *Phacotus lenticularis* - Ryc)



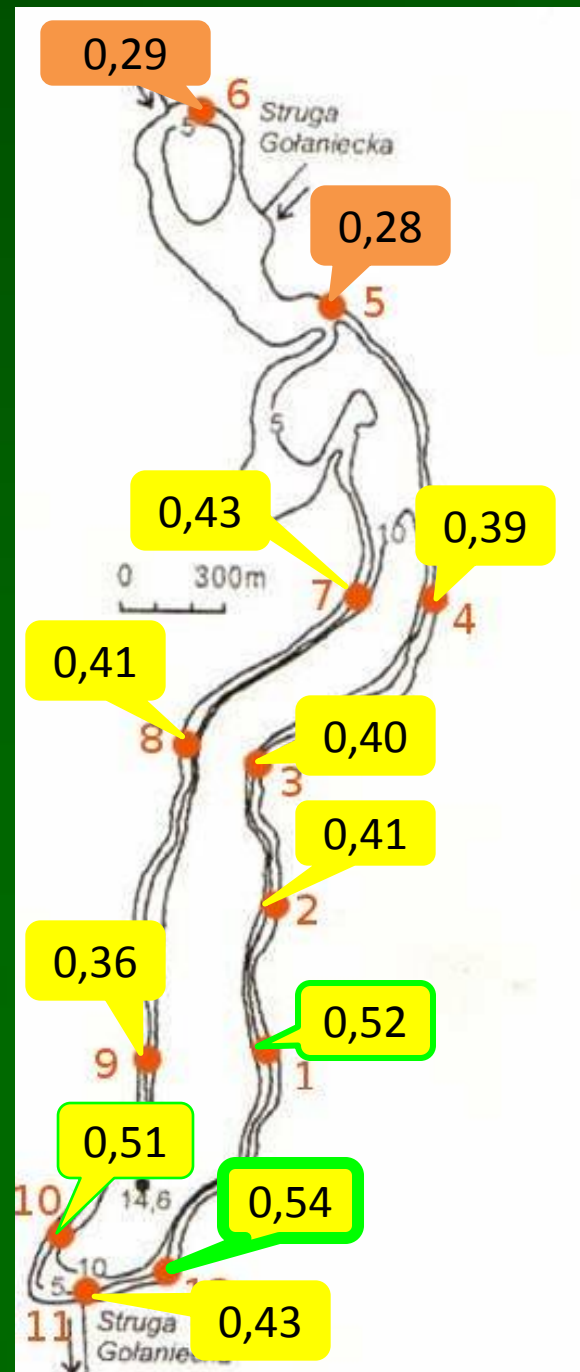
# Diatom Index

Clasification of the ecological state for Lakes:

- >0,83 -very good
- 0,55 -good
- 0,30 -moderate
- 0,15 -poor
- <0,15 -bad

> 0,83
0,55
0,30
0,15
<0,15

Mapa 2: Stanowiska poboru peryfitonu.



# Peryphiton species preferences for oxygen

Very good	100%	Achnanthes minutissima	(10)
Good	75%	Cyclotella radiosa	(28)
Moderate	50%	Gyrosigma attenuatum	(25)
Poor	30%	Surirella ovalis	(6)
Bad	10%	Cyclotella meneghiniana	(1)

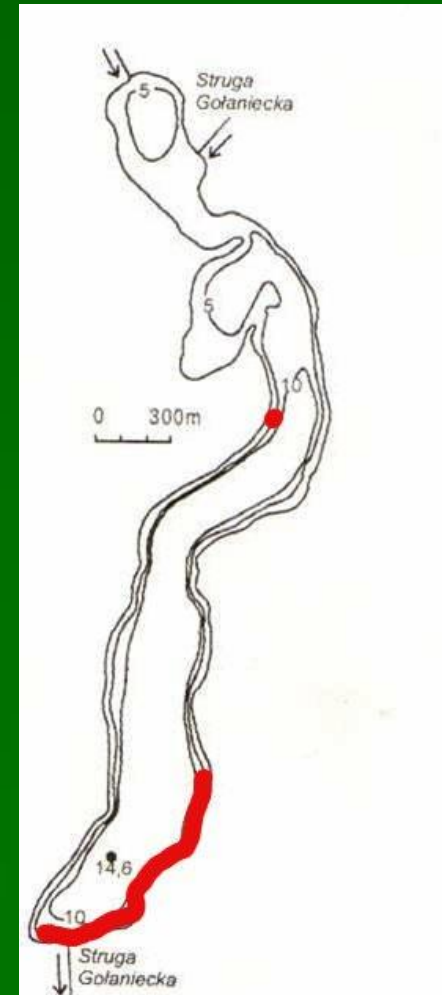
Tabela: Preferencje tlenowe wybranych gatunków peryfitonu. W nawiasie podano liczbę gatunków o określonych wymaganiach.

# Hildenbrandia rivularis- red alga

- Thallus crustaceus making red patches on stones
- stream and lakes, often at rather deep water
- preferences:
  - High conductivity
  - Ca- rich waters
  - From oligotrophy to eutrophy
  - Running water
  - Needs shadow



Ryc: Hildenbrandia rivularis




Mapa 3: Hildenbrandia rivularis - występowanie

# Conclusions

- The quality of water improve because of:
  - 1.Increase the number of taxa compare to 2009
  - 2.Decrease of cyanobacteria biomass
  - 3.Decrease of Mixed Trophic Index
  - 4.Increase the diatoms, dinoflagellates and green algae biomass
  - 5.The Jaccard index shows only 50 % of similarities in the phytoplankton structure in accordance to 2009
- The pressure of big zooplankton Copepoda influence for the algae structure - the large numbers of big cells or big colonies

# Conclusions

- *Struga Gotaniecka* river still has influence for lake - high number of cyanobacteria
- Diatom Index for periphyton shows moderate water quality in the south and poor quality of water in north
- Red alga *Hildebrandia rivularis* is an indicator of meso-eutrophic waters and its presence prove the improvement of water quality
- The positive effect in the phytoplankton community has been observed due to restoration in Lake Durowskie

A close-up photograph of a black seal pup lying on a sandy beach. The pup's face is the central focus, showing its dark eyes, whiskers, and snout. The sand is light-colored and textured. Overlaid on the upper part of the pup's body is the text "Thank you" in yellow, followed by "Dziękujemy" in a larger yellow font.

Thank you  
Dziękujemy