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wyzwala energię

ECOLOGICAL STATE OF LAKE DUROWSKIE BASED ON PHYSICO-CHEMICAL PROPERTIES AND ALGAE IN JULY 2014

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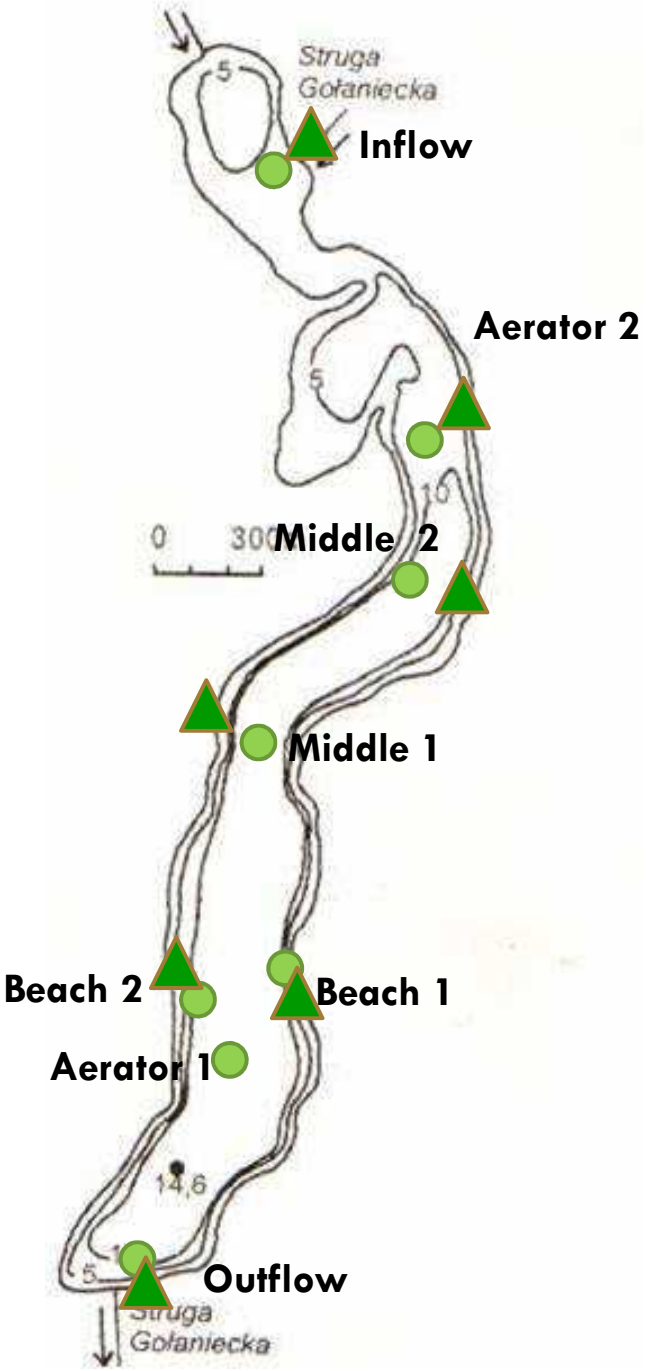
July 2014

Introduction

- Our aim is to assess the ecological state of water based on:
  - physico-chemical water parameters
  - phytoplankton analysis
  - phytobenthos community

Study area



Sampling sites:

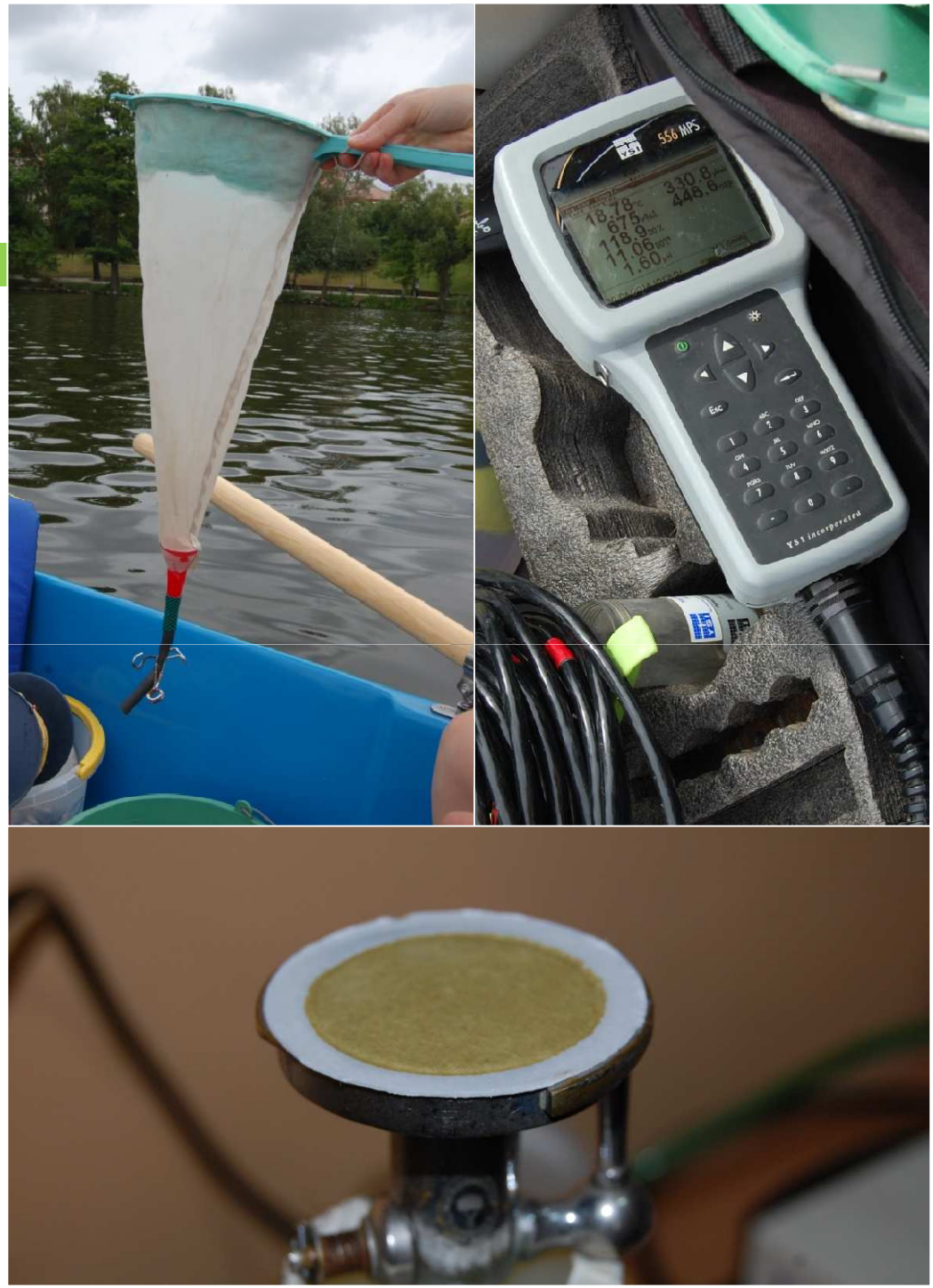
- Phytoplankton and physico-chemical parameters
- Periphyton

Methods

- Sampling:

  June&July, 2014

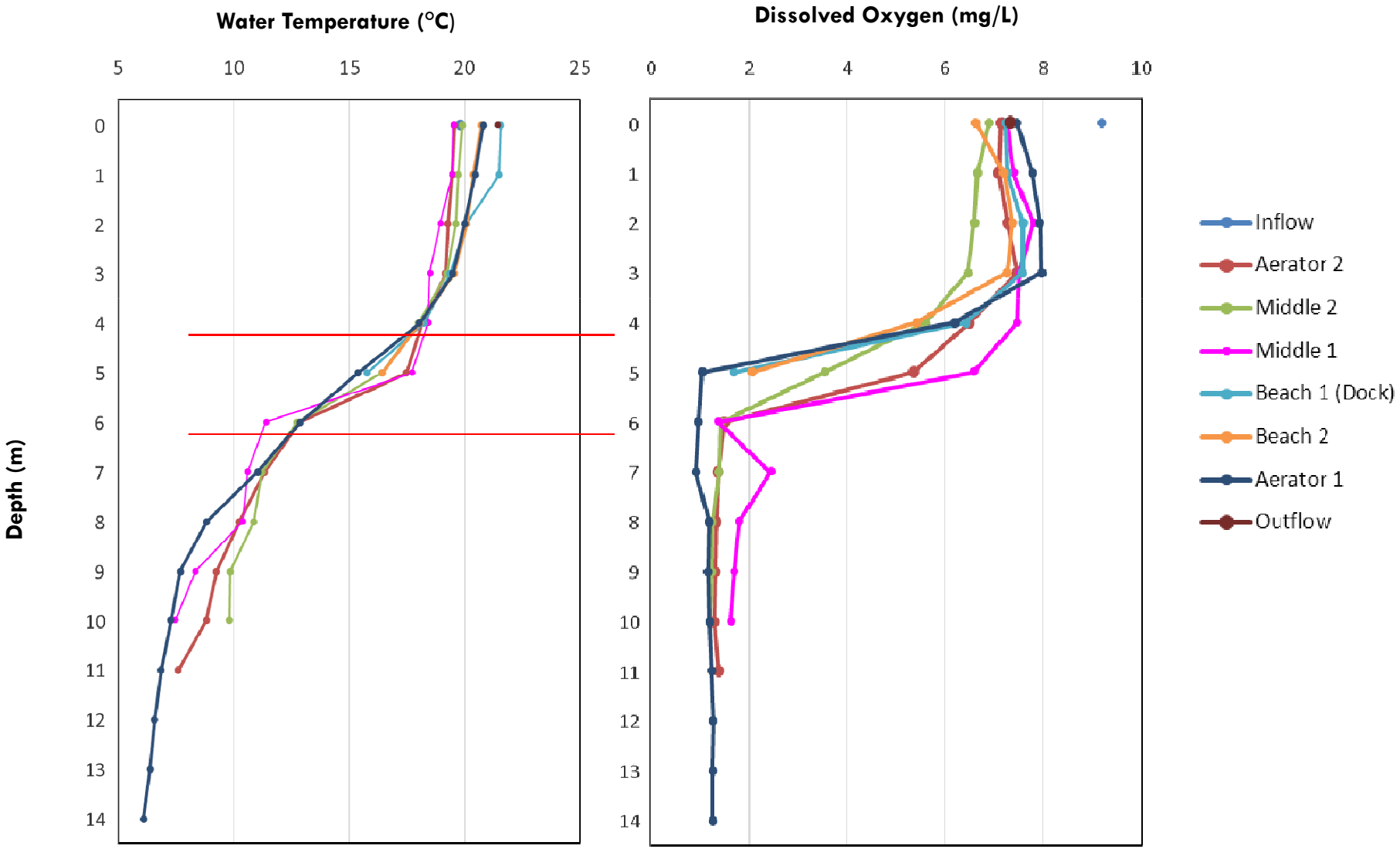
- Parameters measured:
  - pH
  - Temperature
  - Chl a
  - El.conductivity
  - Dissolved oxygen
- Algae sampled:
  - Plankton net
  - Brushed from stones



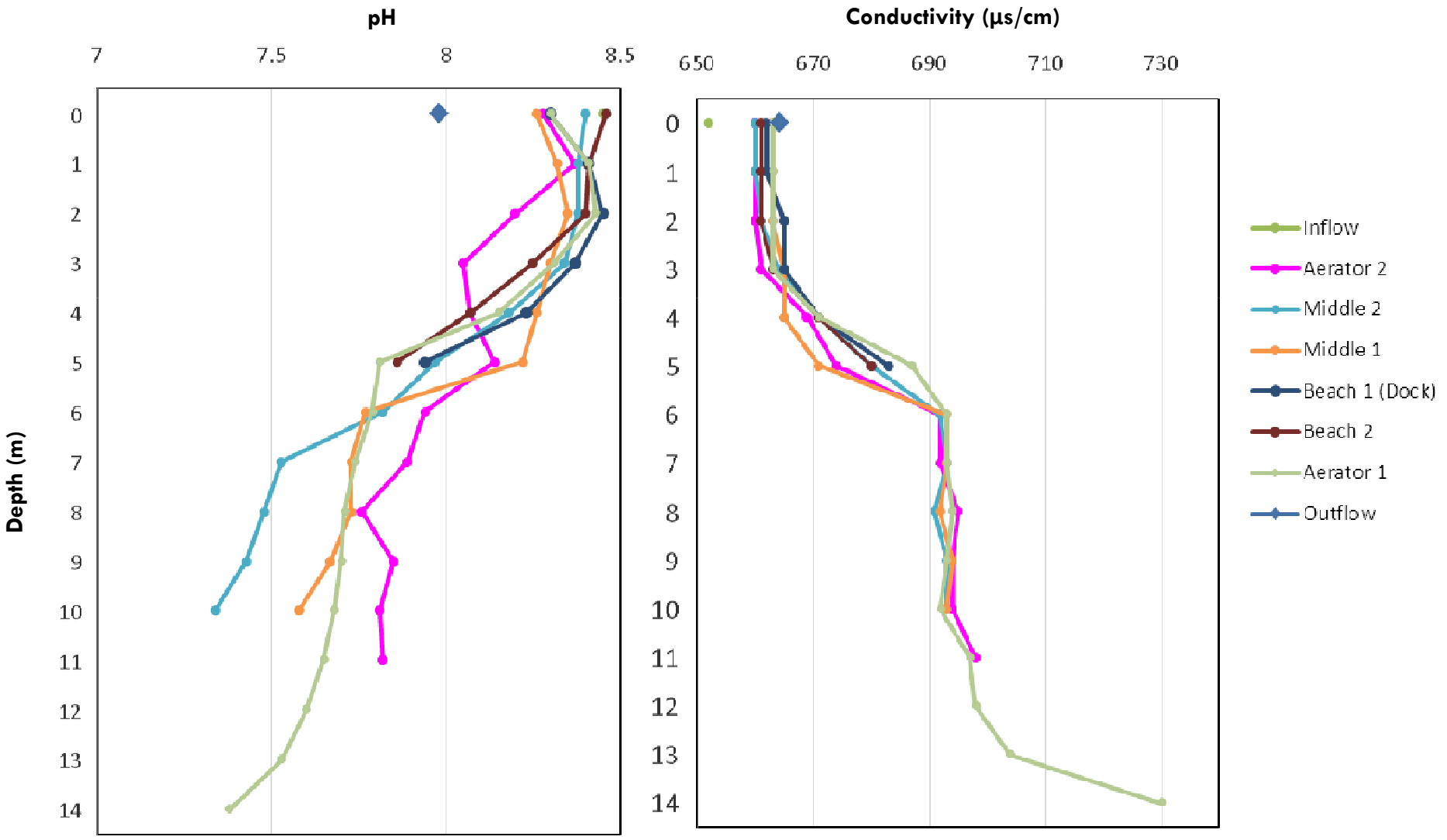
Results

- Physico-chemical parameters
- Phytoplankton
- Periphyton

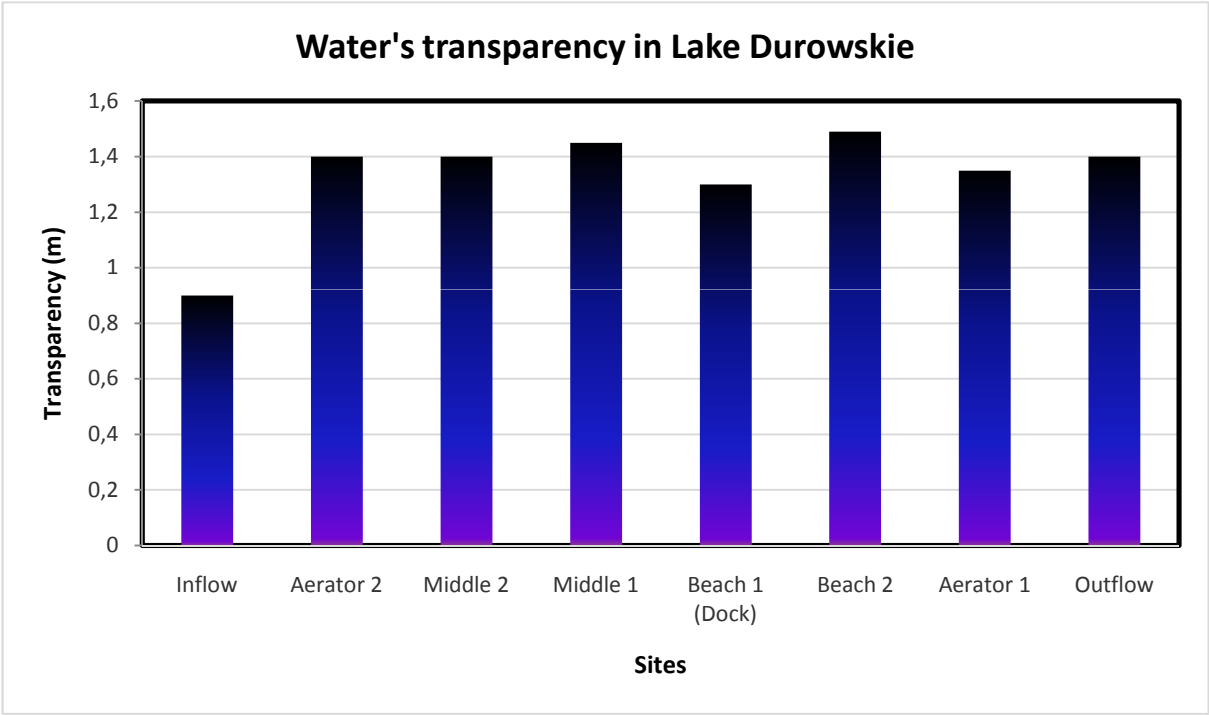
Physico-chemical parameters



Physico-chemical parameters



Physico-chemical parameters



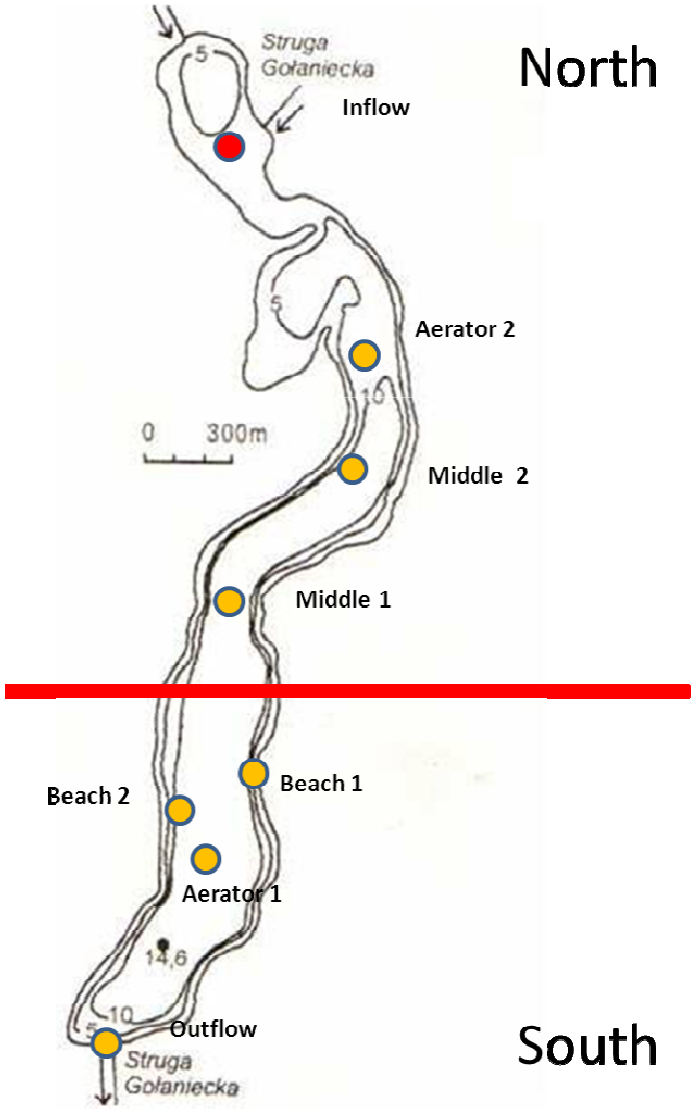
Physico-chemical parameters

Trophic State Index (TSI)

TSI SD= 55.97

TSI Chl *a*=56.39

Oligotrophic
Mesotrophic
Eutrophic
Hypereutrophic



Physico-chemical parameters

Lake classification

We compared our results with the newest law for classification of waters.

This Ordinance of Enviromental Ministery (2008) is compatible with the Water Framework Directive.

Parameter	Value	Classification
Chlorophyll *a*	≈ 11.65 µg/L	Good (II class)
Oxygen concentration	≈ 7.40 mg/L	Good
Conductivity	≈ 660.63 µS/cm	Below good
Secchi disc	≈ 1.33 m	Below good

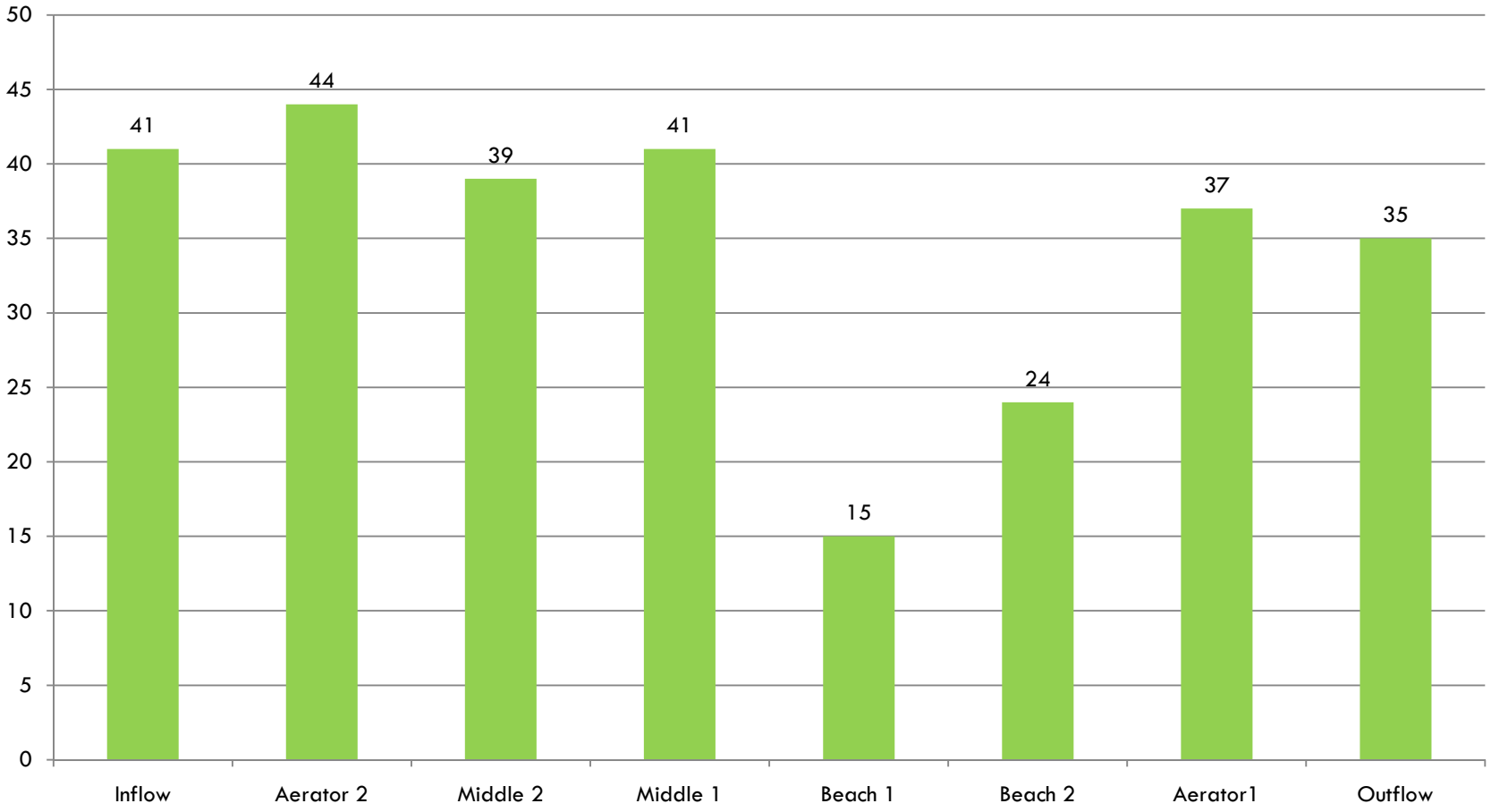
Physico-chemical parameters

Parameter	2011	2012	2013	2014
Chlorophyll *a*	≈ 14.00 µg/L	≈ 2.20 µg/L	≈ 8.45 µg/L	≈ 11.65 µg/L
Electric conductivity	≈ 400.00 µS/cm	≈648.20 µS/cm	≈601.38 µS/cm	≈ 660.63 µS/cm
Surface pH	≈ 8.70	≈8.87	≈8.13	≈ 8.30
SD (Transparency)	≈ 2.00 m	≈ 0.88 m	≈1.68 m	≈ 1.33 m
Dissolved oxygen (surface)	≈ 10.00 mg/L	≈ 13.50 mg/L	≈5.47 mg/L	≈ 7.40 mg/L

Results

- Physico-chemical parameters
- Phytoplankton
- Periphyton

Total number of phytoplankton species



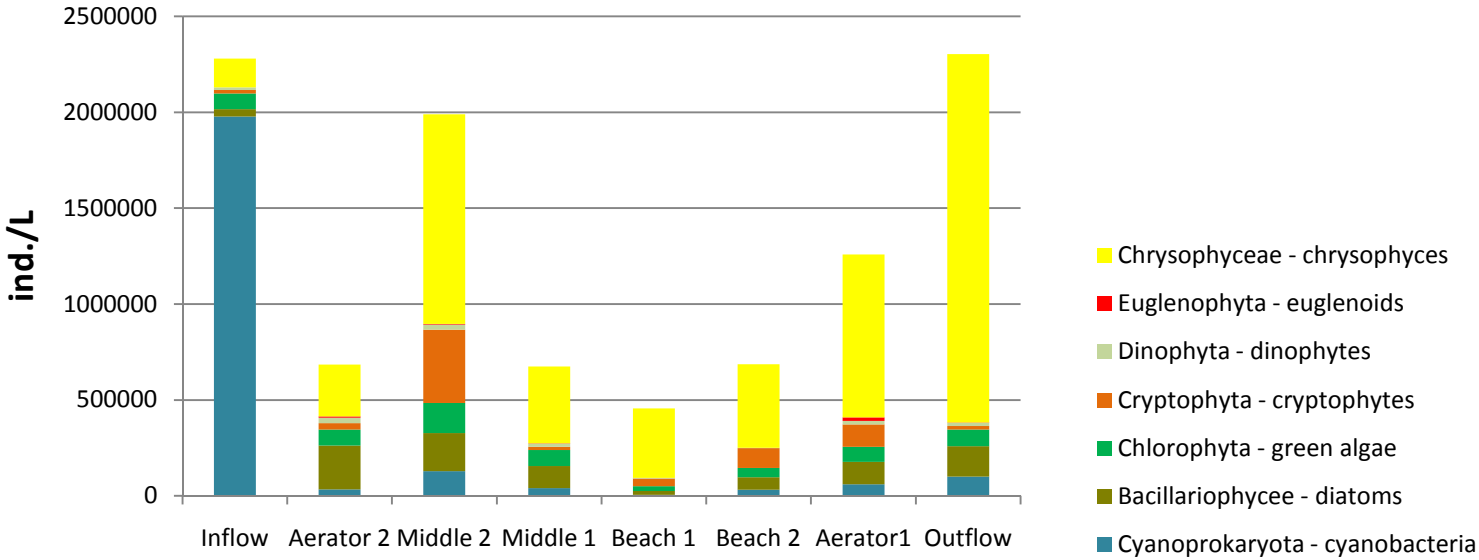
The mixed index of Nygaard

Station	2008	2009	2010	2011	2012	2013	2014	Trophic State
Aerator 1	9,67	16	8,3	9	7	8	9	Hypertrophy
Aerator 2	-	26	11,5	5	8	14	20	Hypertrophy
Middle 1	-	9	12,5	13	3	5,5	11	Hypertrophy
Middle 2	-	-	8,3	18	9	7,5	20	Hypertrophy
Inflow	-	-	1,8	17	9	19	3,75	Eutrophy
Outflow	-	-	6,5	5	-	12	8	Hypertrophy
North	-	-	11,5	5,3	-	-	-	--
Beach 1	-	-	-	3	9	7	5	Hypertrophy
Beach 2	-	-	-	-	5	6	10	Hypertrophy

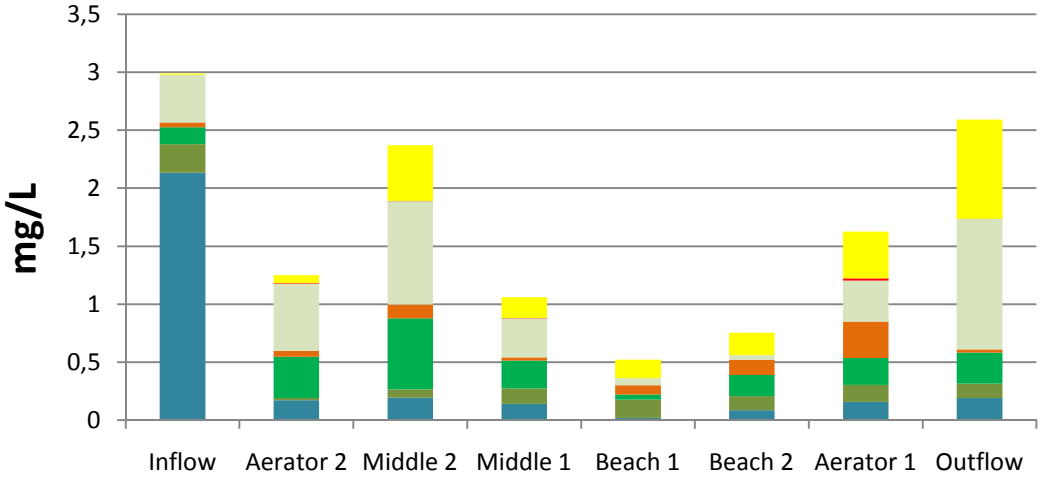
Legend	Result
Dystrophy	0 - 0.3
Oligotrophy	< 1.0
Mesotrophy	1.0 - 2.5
Eutrophy	3 - 5
Hypertrophy	5 - 43

(Cyanobacteria + chlorococcales + centric diatoms + Euglenoids)/desmids

Abundance of every group of algae

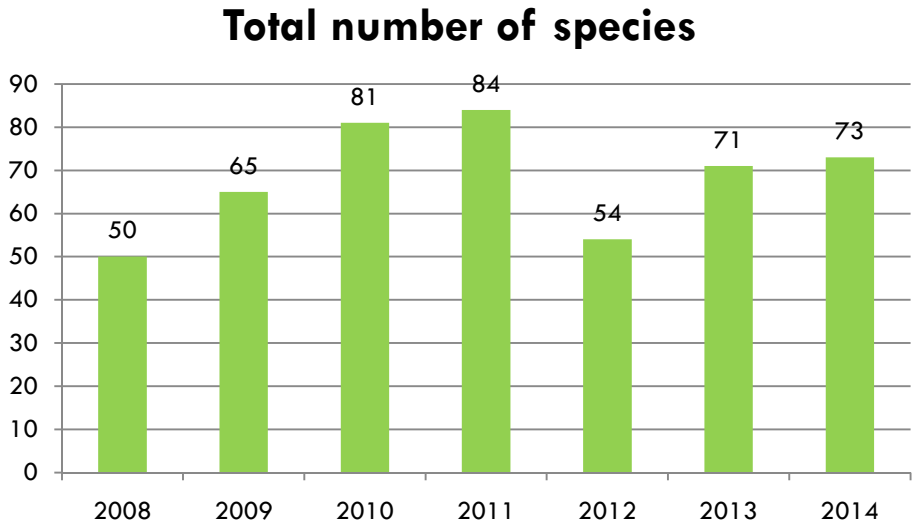


Biomass of every group of algae



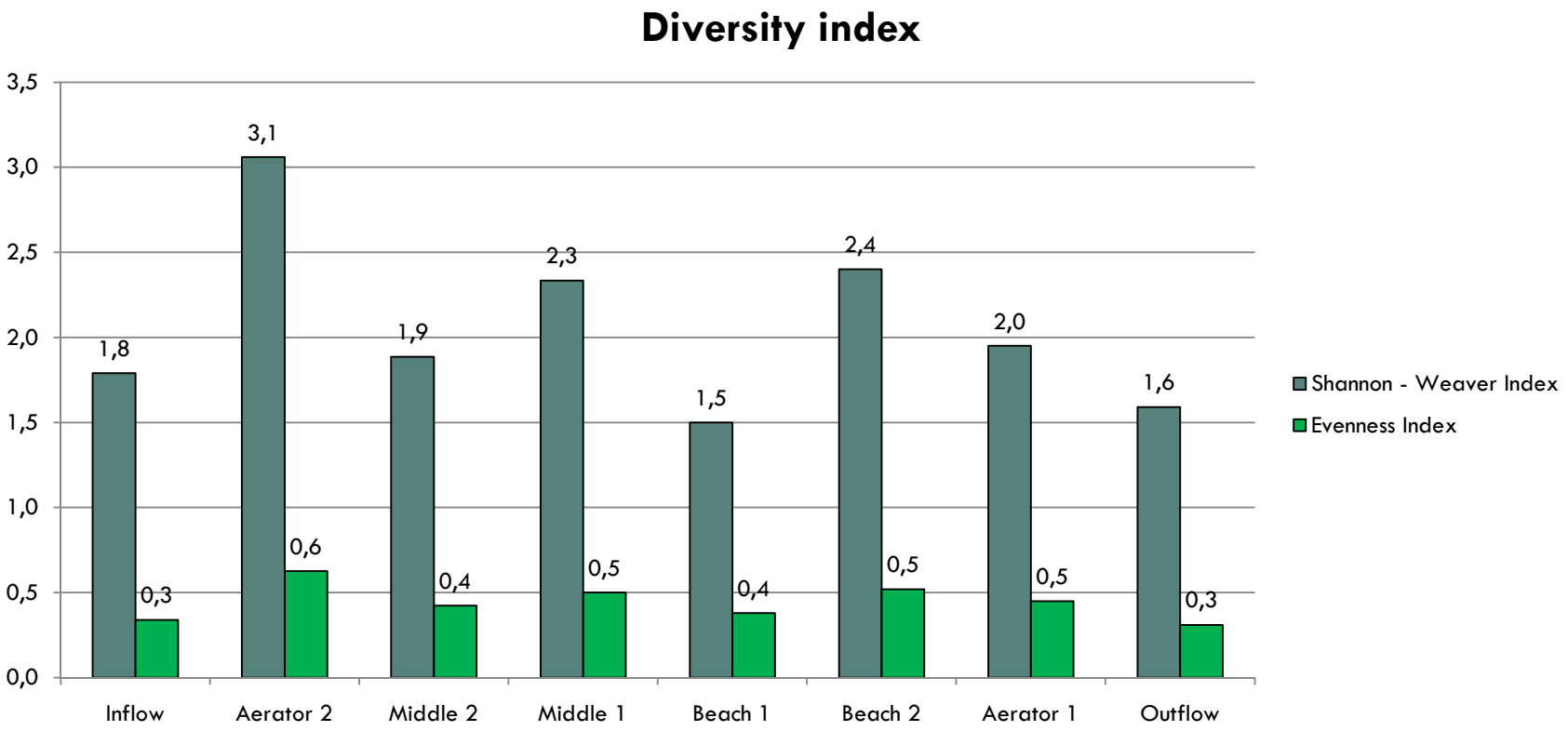
Jaccard index – results [%]

YEAR	2009	2010	2011	2012	2013	2014
2008	84	51	43	33	40	52
2009	-	48	28	20	29	35
2010	-	-	42	42	62	47
2011	-	-	-	34	58	47
2012	-	-	-	-	77	49
2013	-	-	-	-	-	52



Shannon – Wiener and Evenness Indices

Sites	Inflow	Aerator 2	Middle 2	Middle 1	Beach 1	Beach 2	Aerator 1	Outflow
Shannon - Weaver	1,8	3,1	1,9	2,3	1,5	2,4	2,0	1,6
Evenness	0,3	0,6	0,4	0,5	0,4	0,5	0,5	0,3



Results

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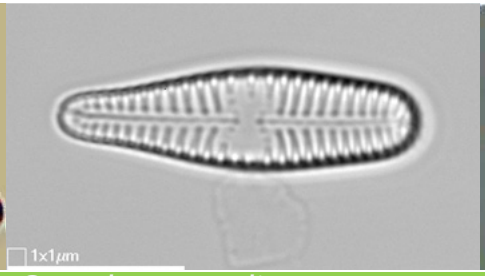
Periphyton


Achnantes minutissima

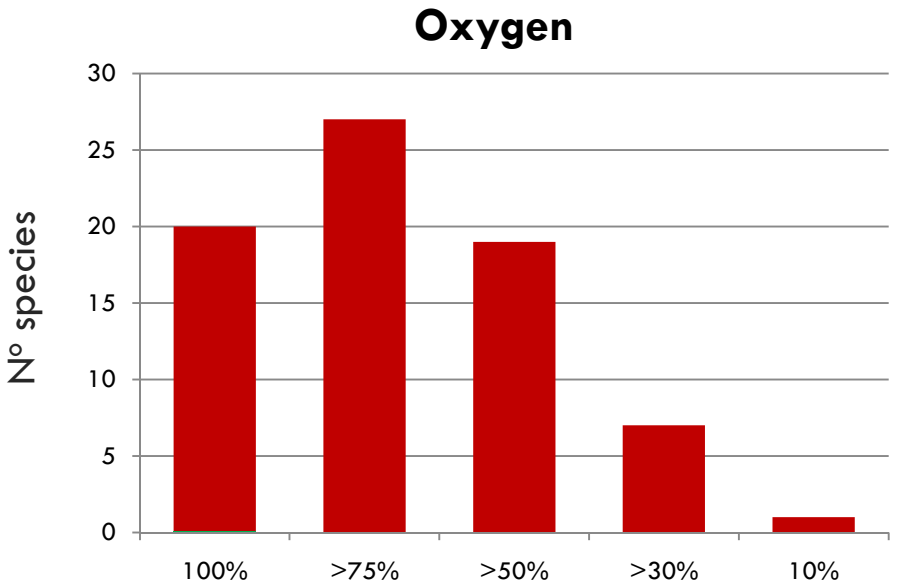

Gomphonema olivaceum

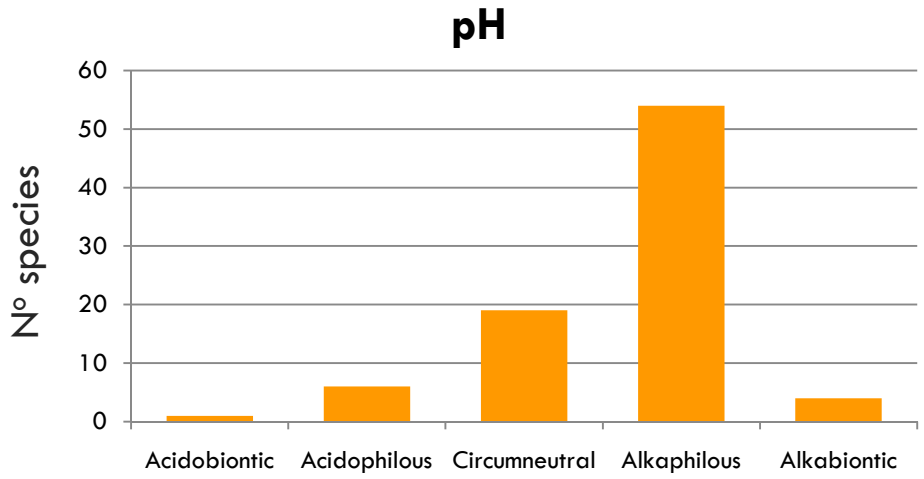

Cymbella minuta

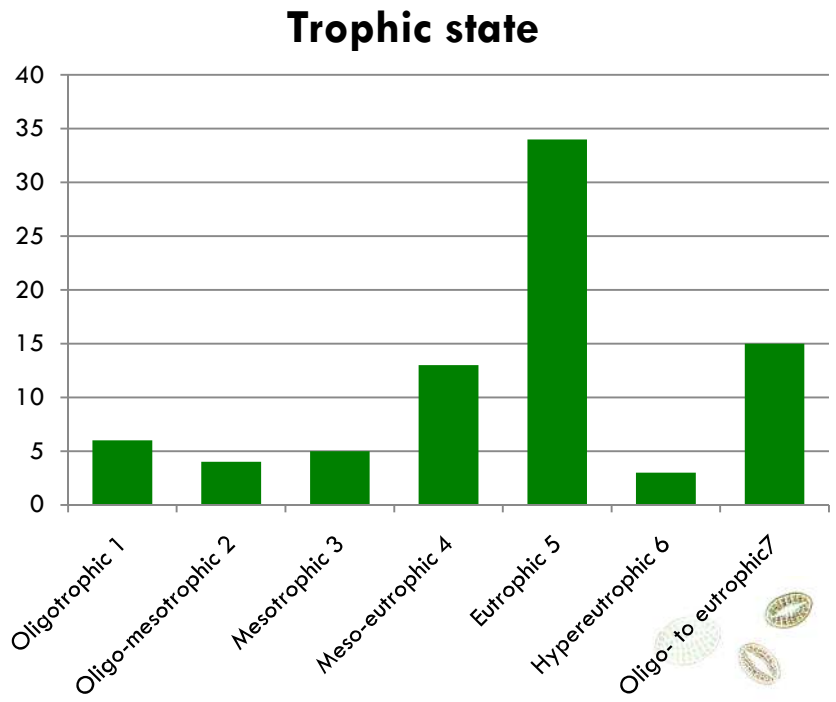
- 110 species
- Dominant species:

	Site							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Achnanthes minutissima	45%	14%	23%	27%		11%	13%	
Achnanthes minutissima var. affinis						11%		
Amphora pediculus			20%					
Cymbella affinis		11%						
Cymbella minuta						16%		
Cocconeis pediculus		11%						
Cocconeis placentula								17%
Gomphonema olivaceum				15%	22%			

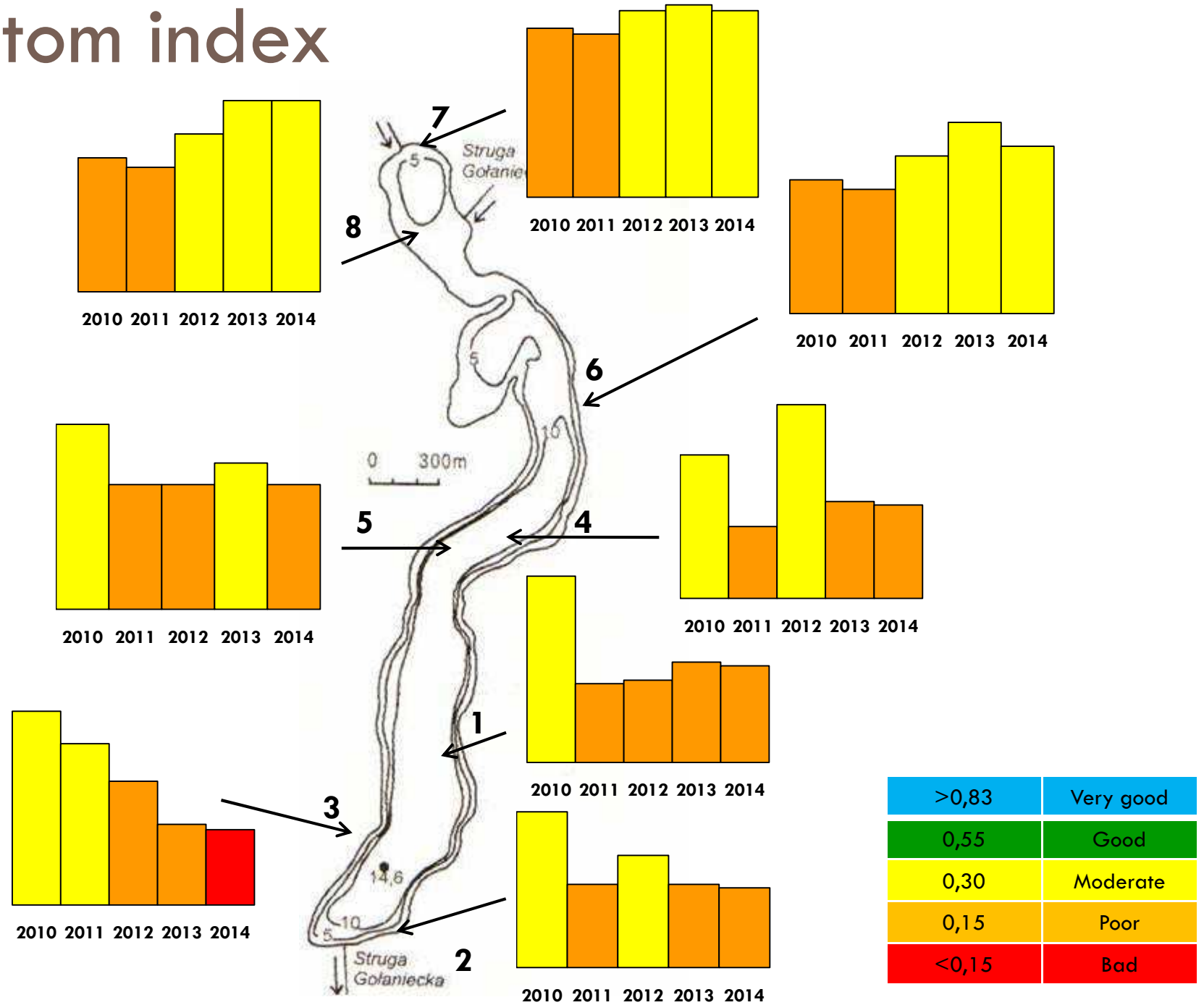
Van Dam's indicators





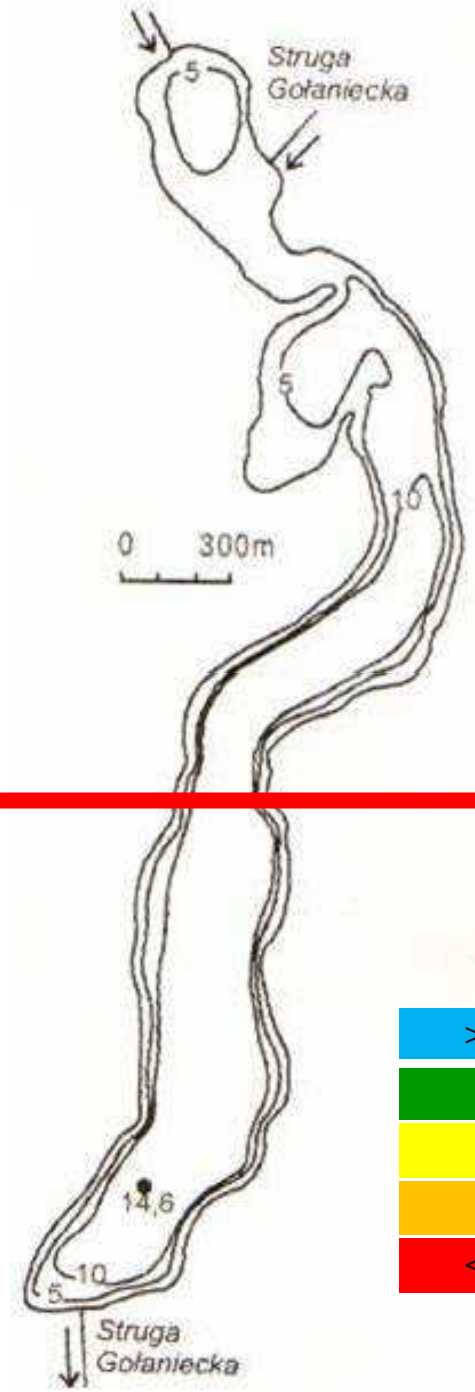


Diatom index



>0,83	Very good
0,55	Good
0,30	Moderate
0,15	Poor
<0,15	Bad

Diatom index



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0,15	Poor
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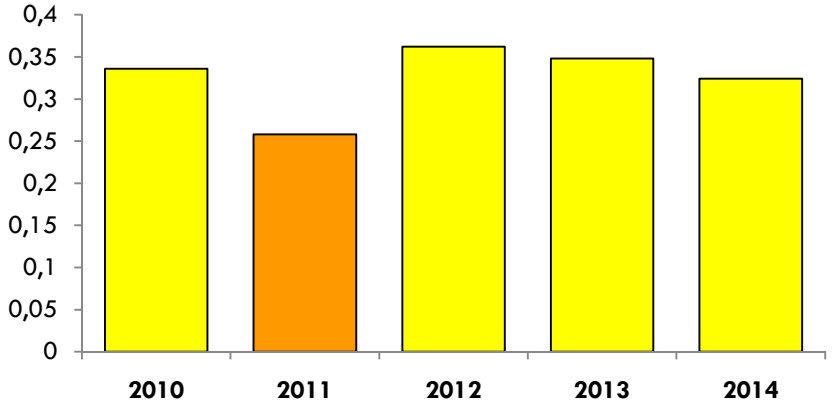
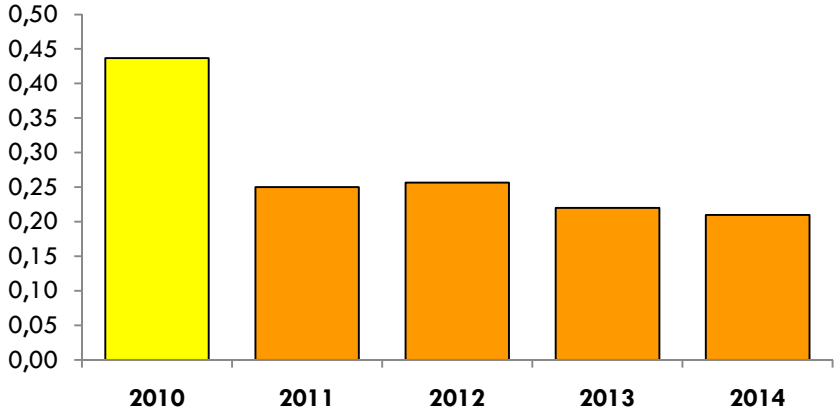
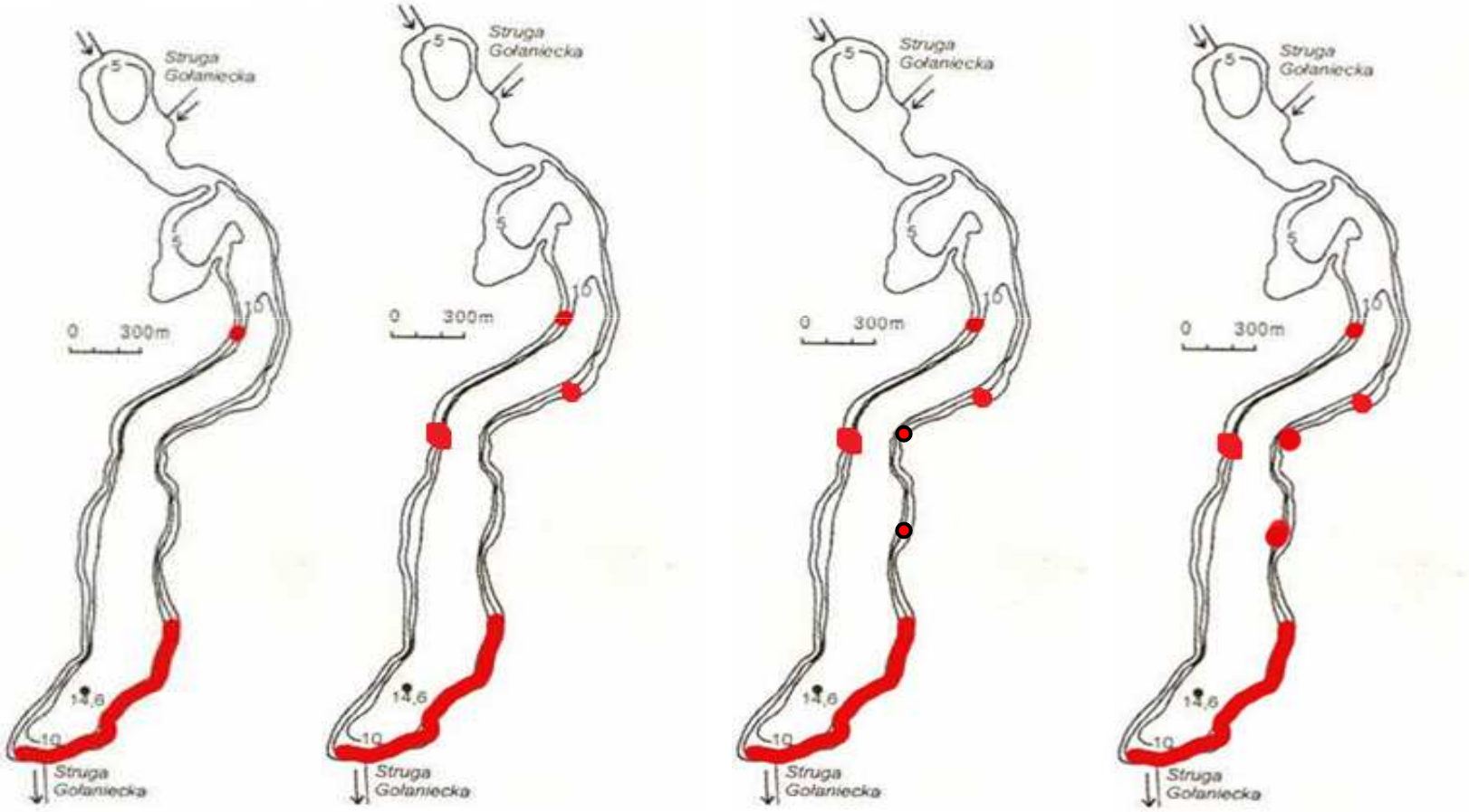
North



South



Changes in the abundance of *Hildebrandia rivularis*



2010 **2011/2012** **2013** **2014**

Conclusions

- The trophic state of the Lake Durowskie is still eutrophic, and the inflow is even hypereutrophic
- The highest amount of Cyanobacteria is located in the inflow of Durowskie Lake
- The diversity of phytoplankton is higher than before restoration
- Ecological state of the lake varied between the stations: Northern part of the lake was of a moderate, southern – of a poor state
- Annual deterioration of the ecological state in the beach 2 was observed

Thank you for your attention!

- Dziękujemy za uwagę!
- Seladametachehun enamesegenalen
- Aplausos por favor
- Ačiu už demesį