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wyzwala energię



# Ecological State of Lake Durowskie Based on Phytoplankton and Periphyton in July 2015

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Xiuming SUN

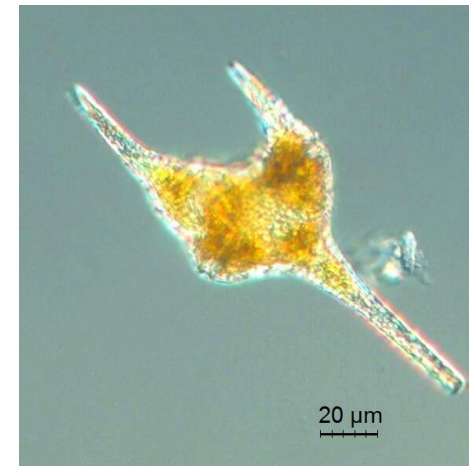
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July 2015

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# Outline

- Introduction
- Study Area
- Methods
- Results
- Conclusions



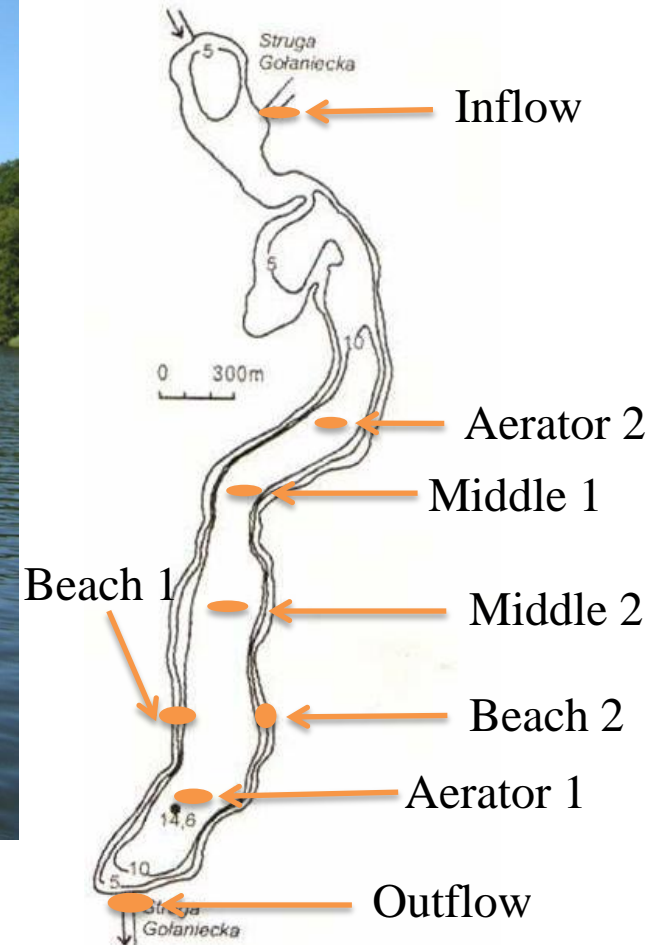
# Introduction

- **Assessment of the ecological state of lake :**
  - *Phytoplankton analysis*
  - *Periphyton analysis*
- **Why phytoplankton and Periphyton?**
  - Support the *basis of the food web* in freshwater ecosystems
  - *Environmental adaptive features* on freshwater ecosystem
  - *Sensitive indicators* for pollution and eutrophication





# Study Area



Samples: Phytoplankton (8 sites)  
Periphyton (10 sites)

**8 sampling sites for phytoplankton**



# Materials and Methods

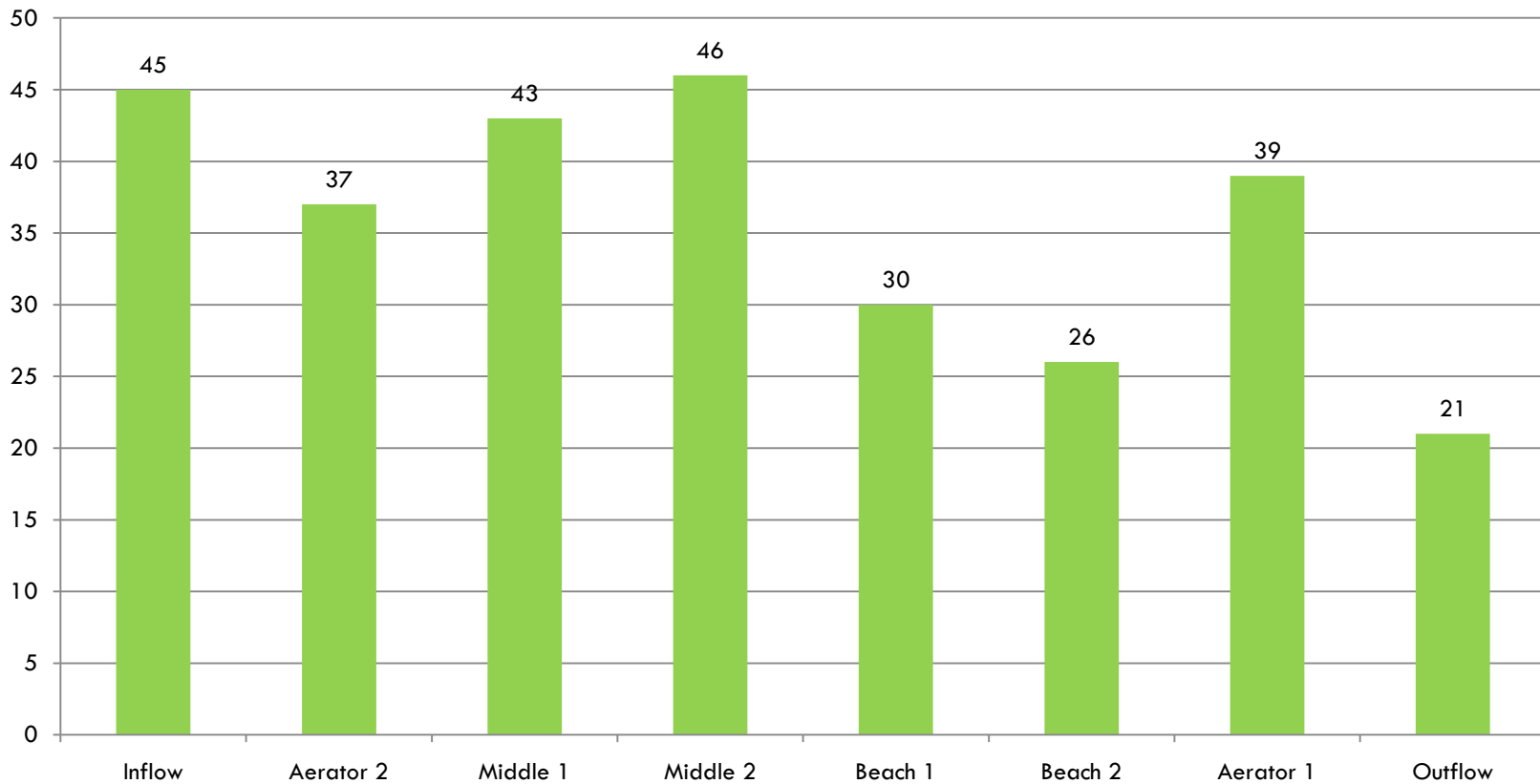
- **Algae sampled:**
  - Water sampler and plankton net
  - Brushed from stones
- **Microscope analysis**
  - Identification of algae
- **Index analysis**
  - Mixed index
  - Jaccard index
  - Diversity index
  - Diatom index
- **Red algae analysis**

**Sampling: 29. June – 03. July**



# Results: Phytoplankton

- Total number of phytoplankton species



# Results: Phytoplankton

- The mixed index of Nygaard

Station	2008	2009	2010	2011	2012	2013	2014	2015
Inflow	-	-	1,8	17	9	19	3,8	17
Aerator 2	-	26	11,5	5	8	14	20	4,3
Middle 1	-	9	12,5	13	3	5,5	11	4,8
Middle 2	-	-	8,3	18	9	7,5	20	4
Beach 1	-	-	-	3	9	7	5	5,5
Beach 2	-	-	-	-	5	6	10	12
Aerator 1	9,7	16	8,3	9	7	8	9	6,7
Outflow	-	-	6,5	5	-	12	8	8

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

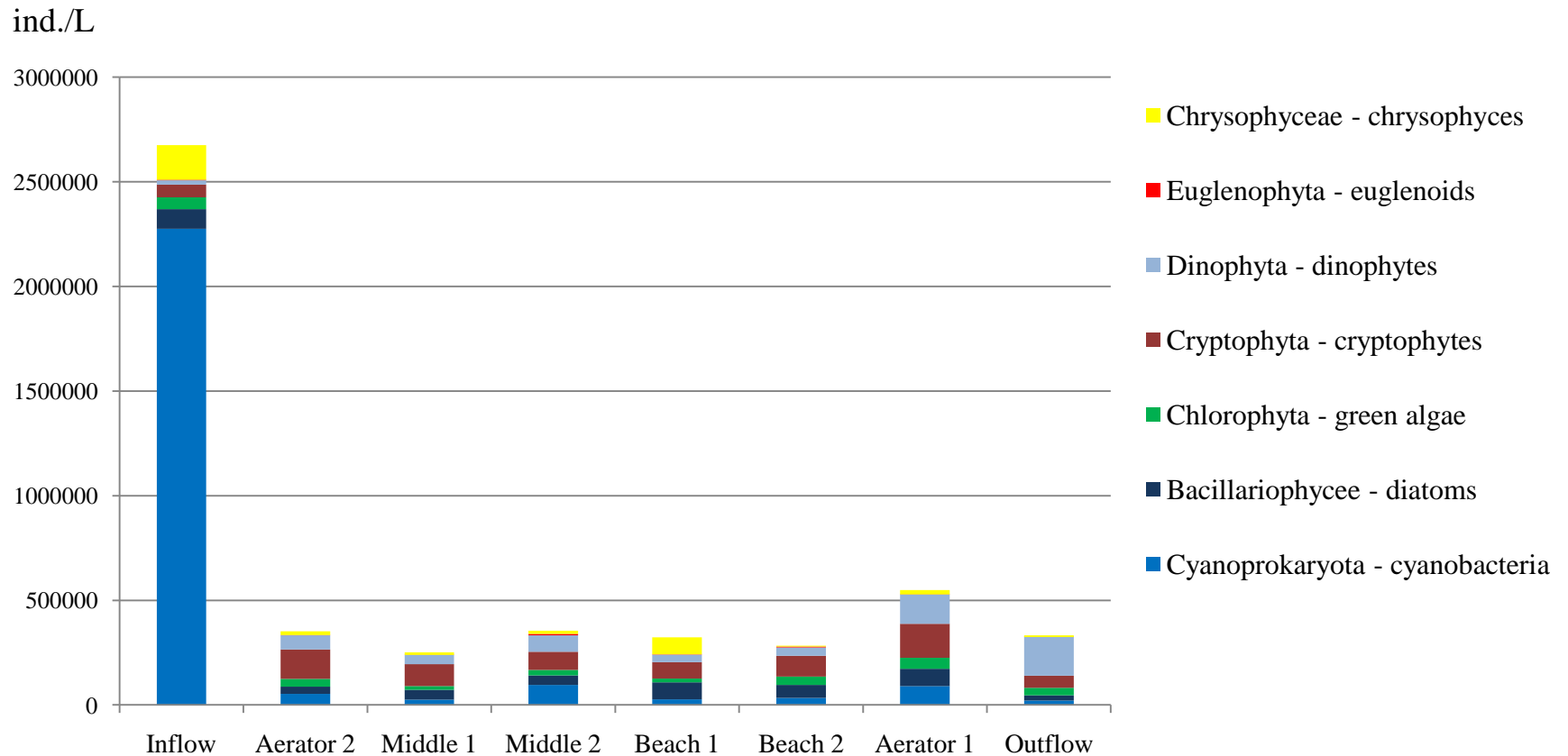
Legend	Result
Dystrophy	0 - 0.3
Oligotrophy	< 1.0
Mesotrophy	1.0 - 2.5
Eutrophy	3 - 5
Hypertrophy	5 - 43

Station	2015	Trophic State
Inflow	17	Hypertrophy
Aerator 2	4,3	Eutrophy
Middle 1	4,8	Eutrophy
Middle 2	4	Eutrophy
Beach 1	5,5	Hypertrophy
Beach 2	12	Hypertrophy
Aerator 1	6,7	Hypertrophy
Outflow	8	Hypertrophy



# Results: Phytoplankton

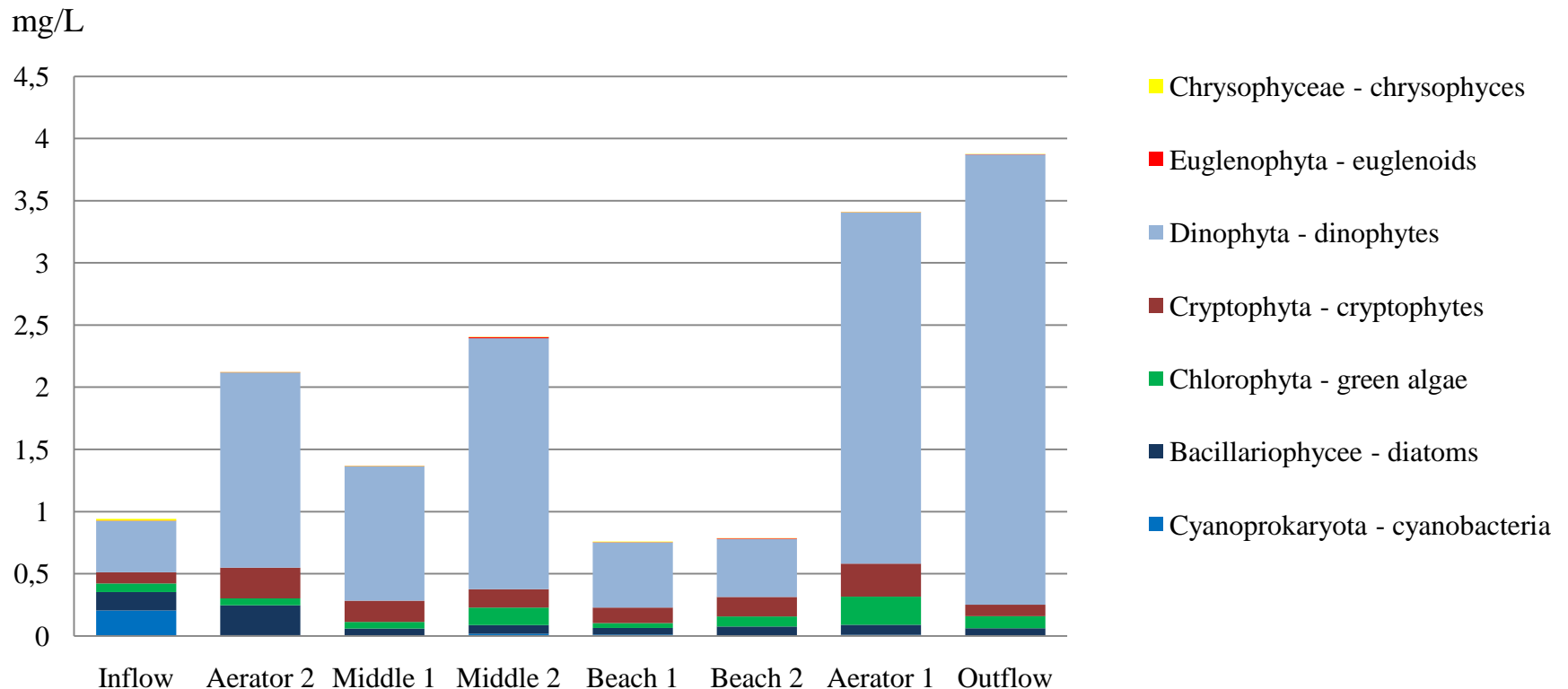
- Abundance of each group of algae (number of cells)





# Results: Phytoplankton

- Biomass of each group of algae

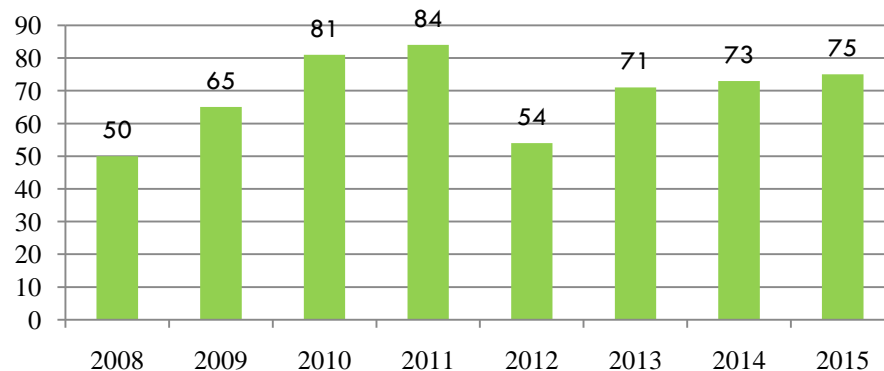


# Results: Phytoplankton

- Jaccard index – results [%]

YEAR	2009	2010	2011	2012	2013	2014	2015
2008	84	51	43	33	40	52	82
2009	-	48	28	20	29	35	39
2010	-	-	42	42	62	47	37
2011	-	-	-	34	58	47	50
2012	-	-	-	-	77	49	59
2013	-	-	-	-	-	52	78
2014	-	-	-	-	-	-	57

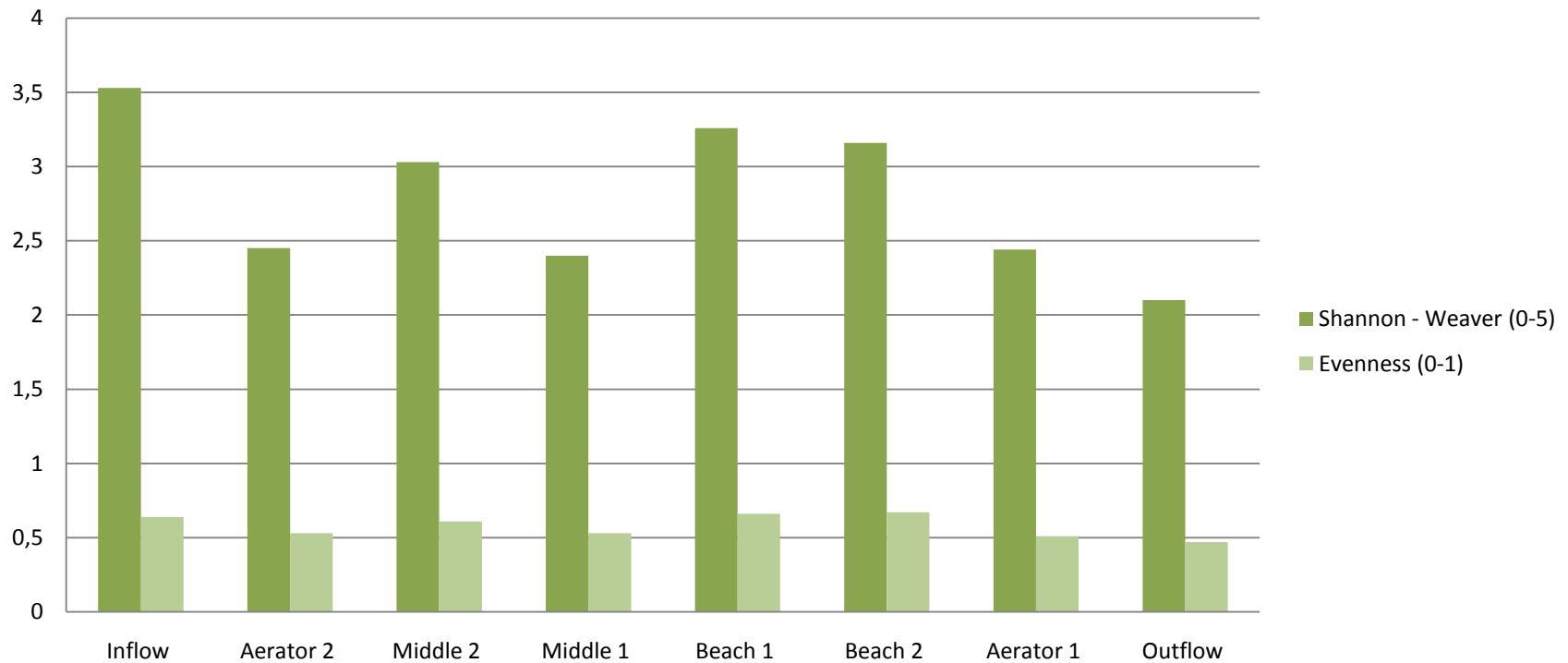
Total number of species



# Results: Phytoplankton

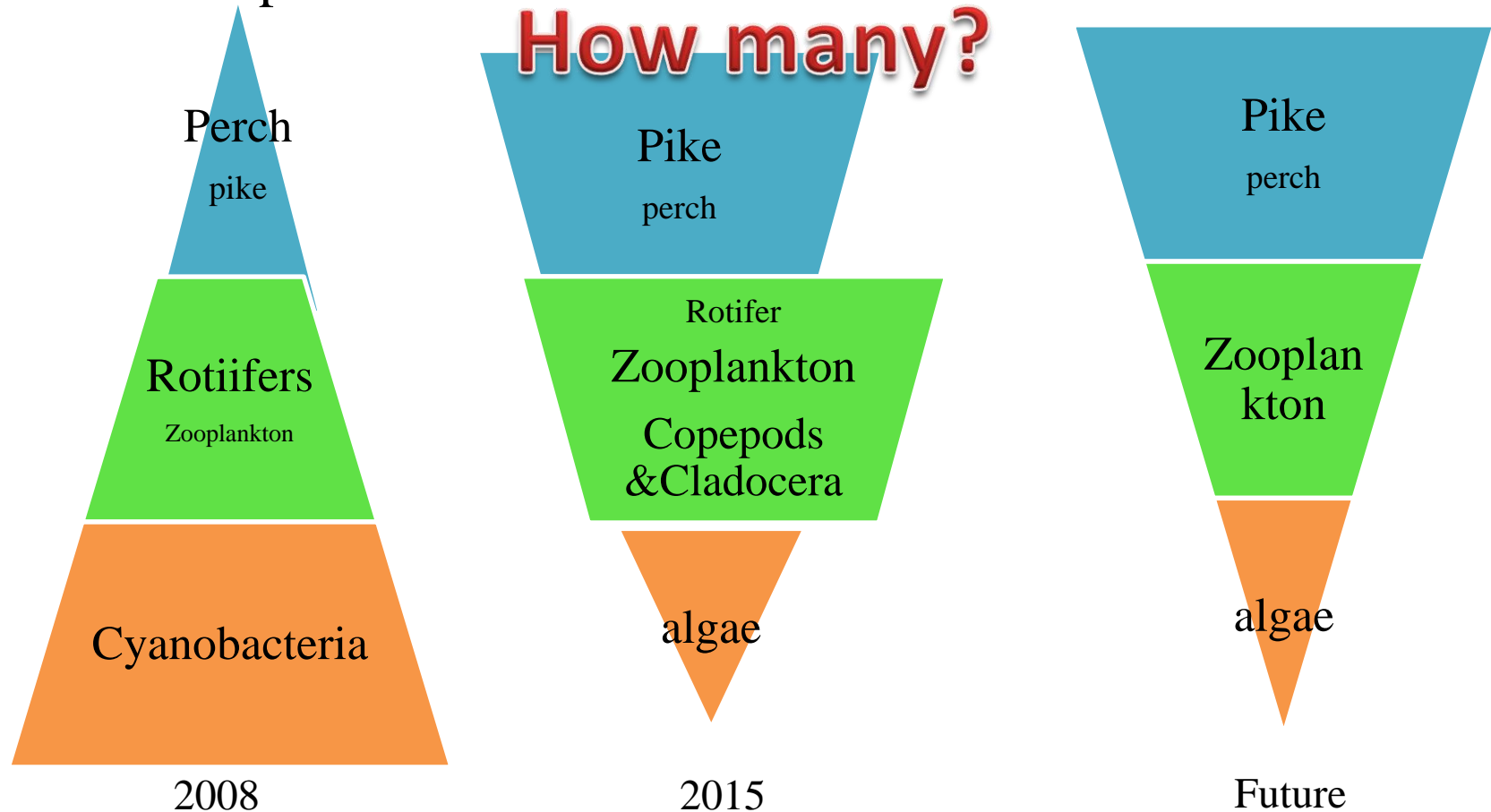
- Diversity Index

Shannon- Weaver and evenness indecies



# Results: Grazing-Trophic Pyramid

- Biomanipulation state



# Results: Periphyton

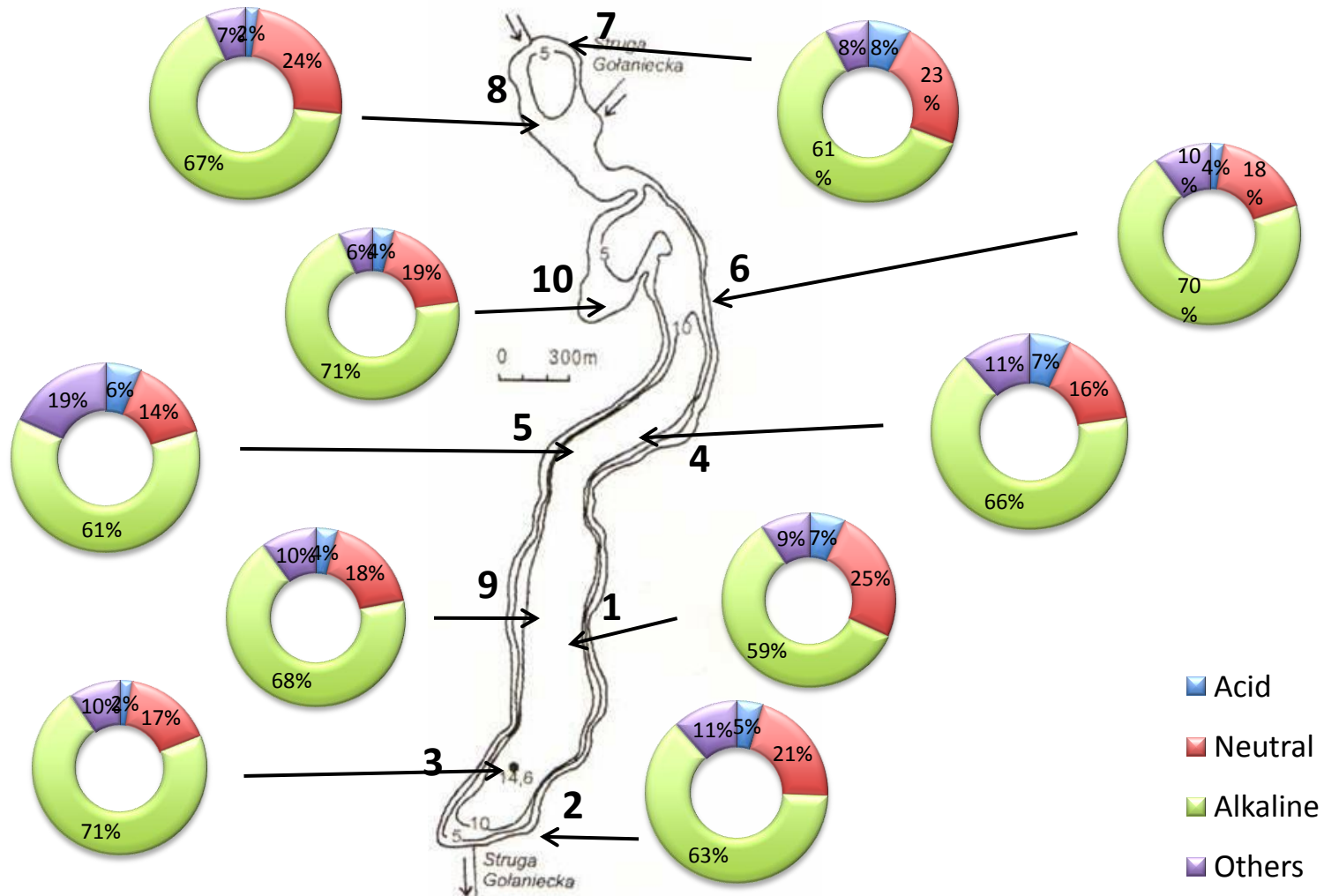
- 103 species
- Dominant species:

Dominants in periphyton community	Species percentage from different sites (%)									
	1	2	3	4	5	6	7	8	9	10
<i>Achnanthes minutissima</i>	71	22	19	20	6	9	11		5	5
<i>Fragilaria crotonensis</i>	9						7	7	4	
<i>Cymbella affinis</i>	8		5				5			11
<i>Cymbella minuta</i>	7	9			6	15	8		7	5
<i>Cocconeis placentula</i>		11	12			7		11		
<i>Fragilaria pinnata</i>			6	6	5	7		5		
<i>Gomphonema olivaceum</i>				8	21				18	15

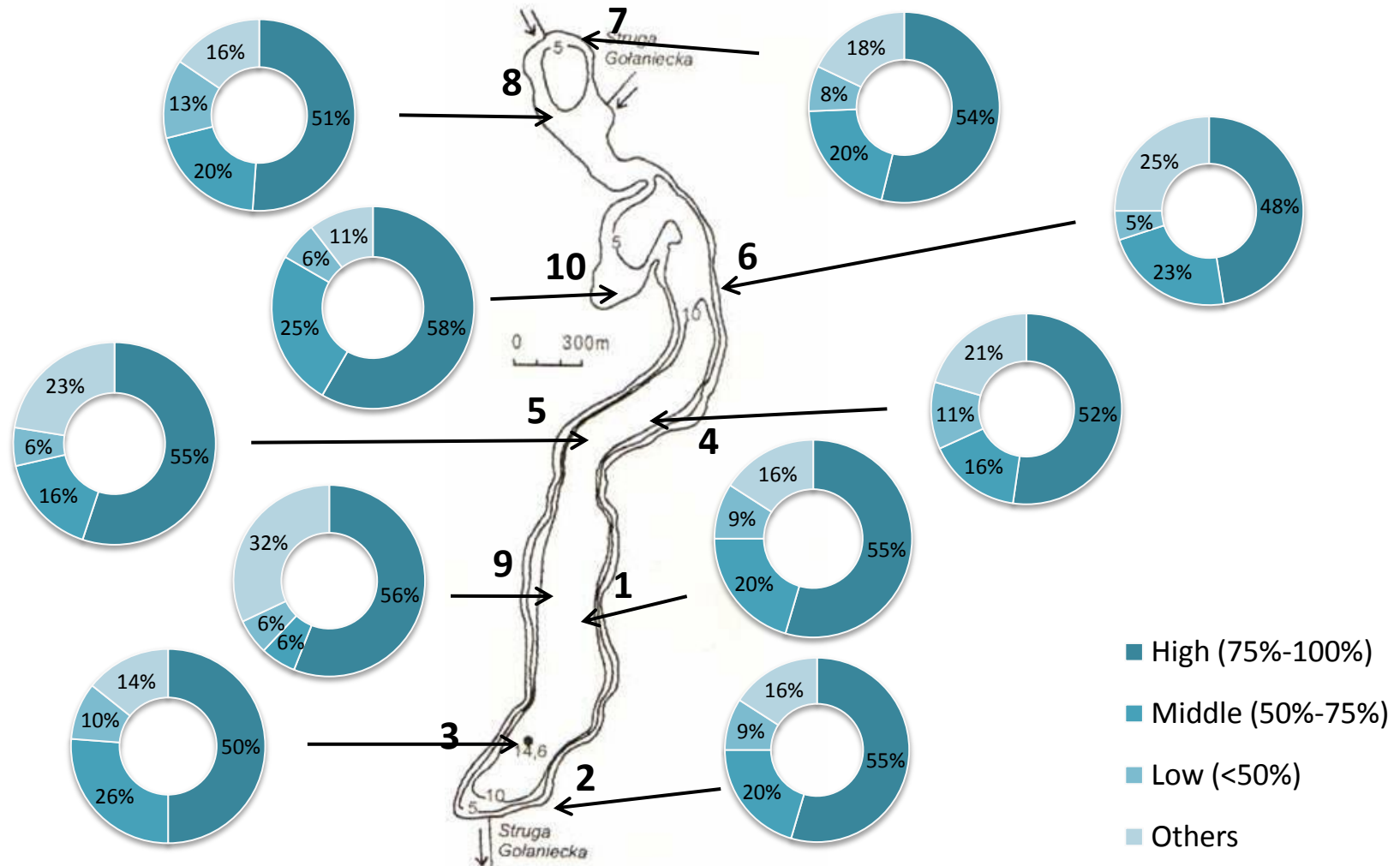




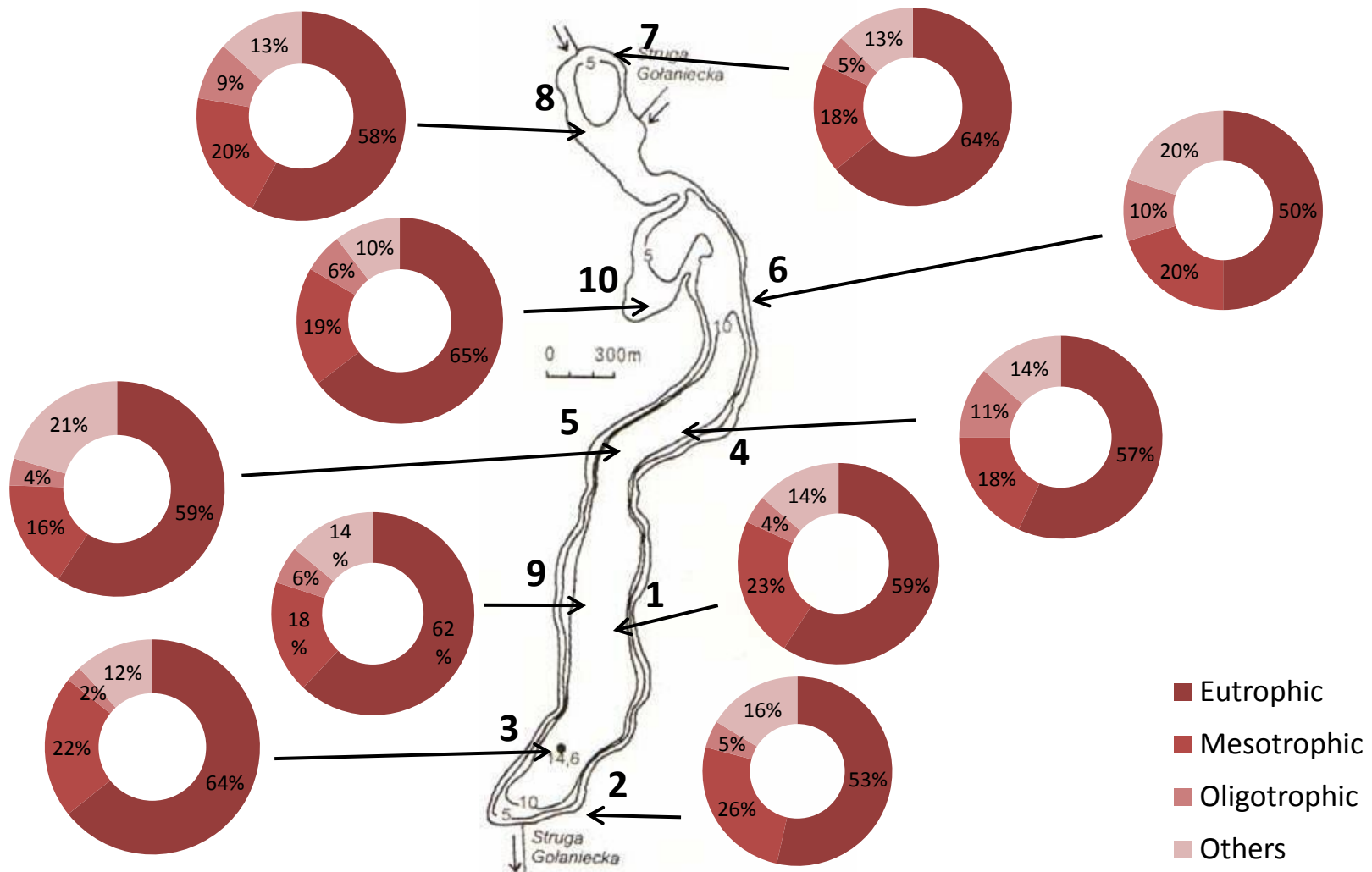
# Results: Periphyton\_pH preference of dominants



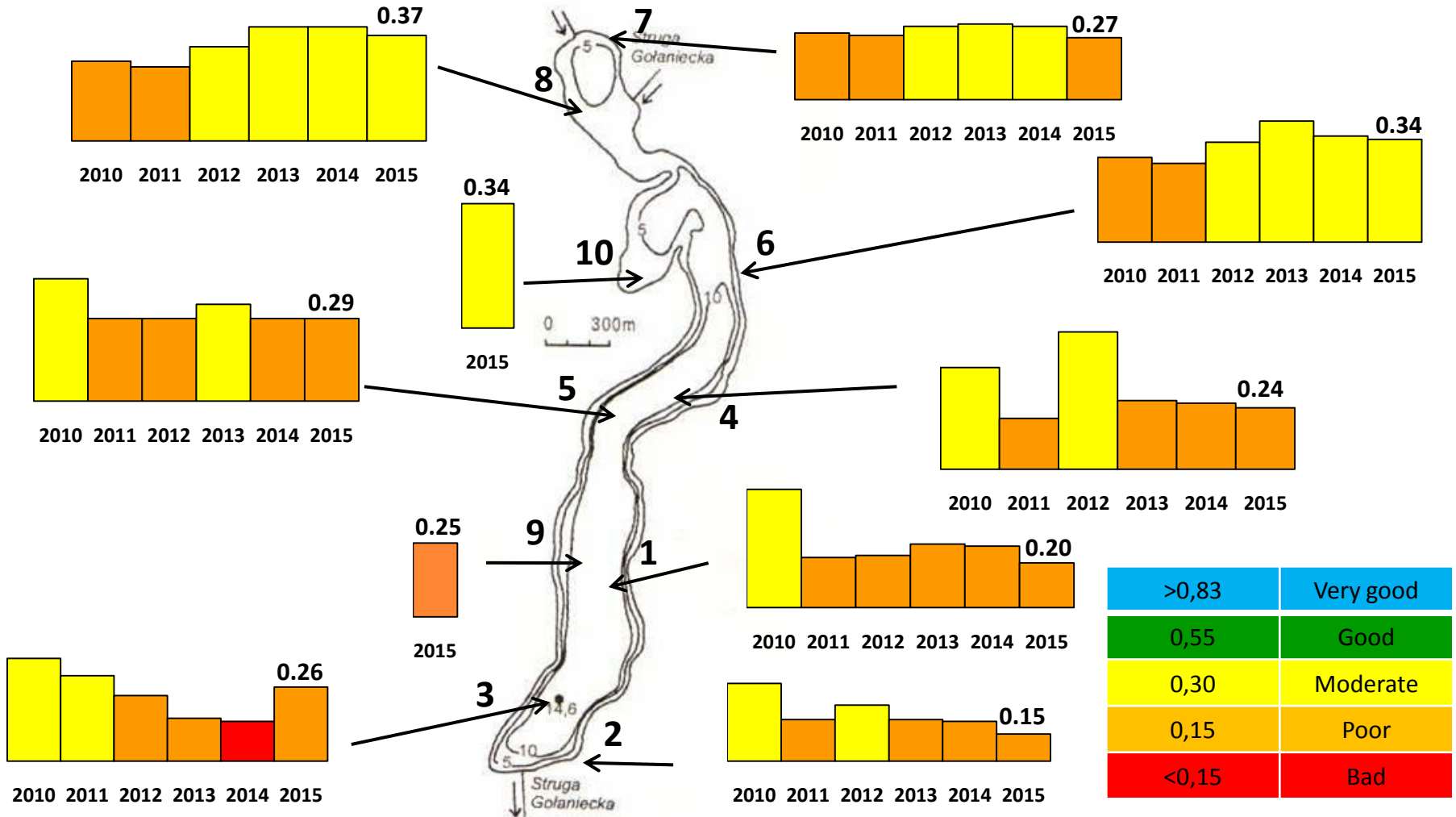
# Results: Periphyton $O_2$ preference of dominants



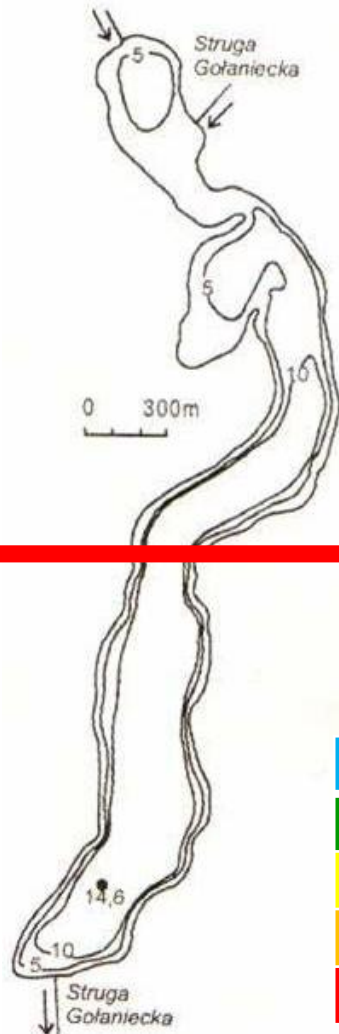
# Results: Periphyton\_Trophy preference of dominants



# Results: Periphyton\_Diatom Index

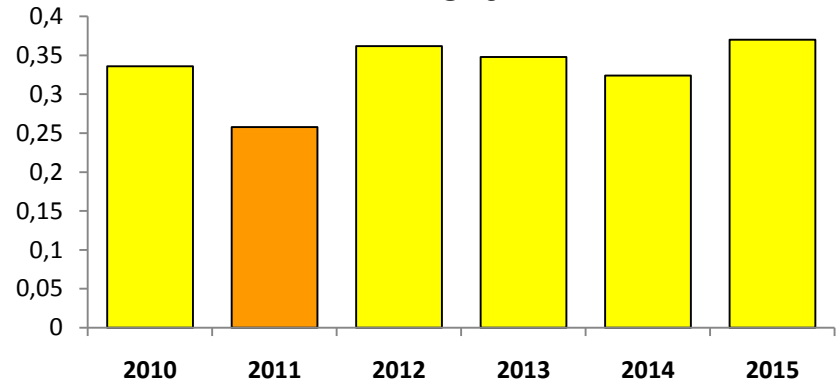


# Results: Periphyton\_Diatom Index

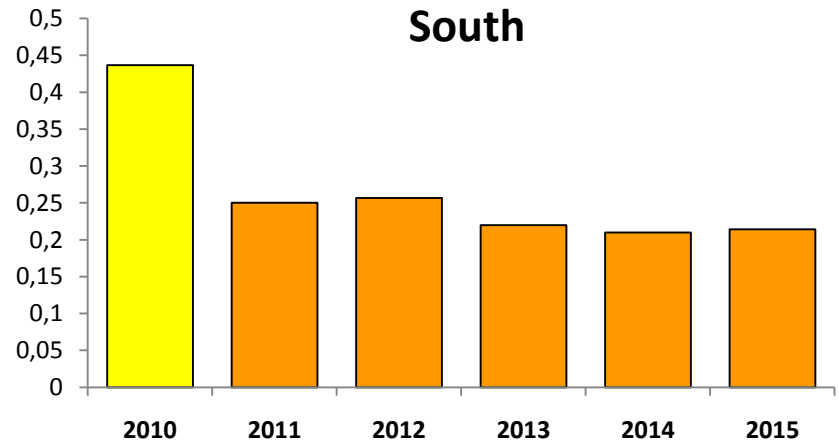


>0,83	Very good
0,55	Good
0,30	Moderate
0,15	Poor
<0,15	Bad

## North



## South





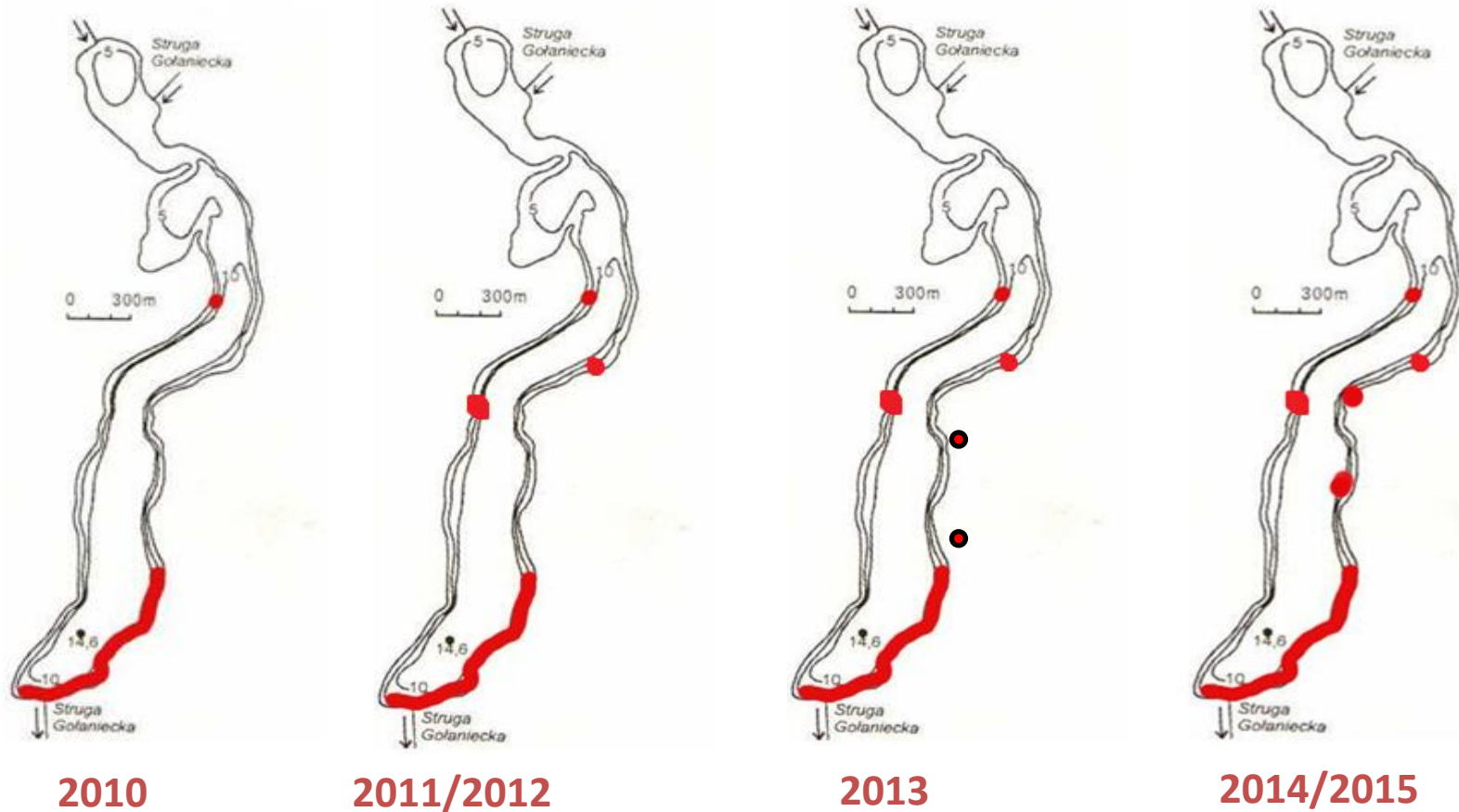
# Results: Red Algae

- *Hildenbrandia rivularis* is considered to be a bioindicator of **good water quality**.
- *Hildenbrandia rivularis* primarily occurs in the **south-eastern** part of the Lake Durowskie.
- In 2015, the occurrence does not change, so the situation is still stable.



# Results: Red Algae

- Changes in the abundance of *Hildebrandia rivularis*



# Conclusion

- There are 5 new species appearing. 😊
- The trophic state of the Lake Durowskie is still eutrophic, and the inflow is hypereutrophic. 😞
- Biomanipulation method is successful, the algal density decreases. 😊
- The diatom index shows the northern part is successful, 😊 while the south is still poor – remains the same as last year. 😞
- The restoration process is working, but it still needs time.

# Thank you for your attention!!

