

Macroinvertebrates in Lake Durowskie

Ecological state of Lake Durowskie during restoration measures in 2017

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Wągrowiec & Poznań

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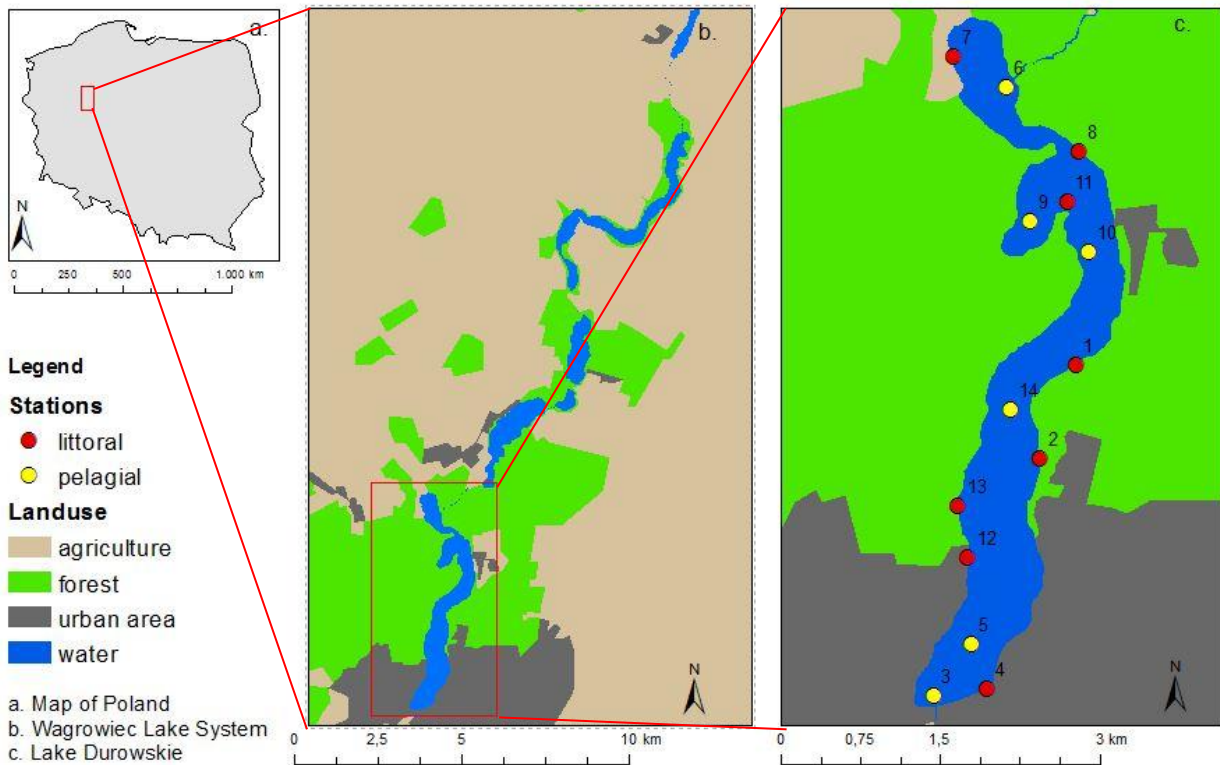
Recommendations



Study area

Surface area	143.7 ha
Maximum depth	14.6 m
Mean Depth	7.9 m
Catchment area	236.1 km ²

Wągrowiec Lake System and Lake Durowskie



Introduction

Problems

- high nutrient input
- eutrophication
- large cyanobacterial water blooms (2008)



Restoration measures in the lake (from 2009 on)

- Oxygenation of hypolimnetic waters with two wind driven aerators
- Iron treatment using small doses of coagulant
- Biomanipulation by stocking the lake with pike and pikeperch fry

Introduction: Macroinvertebrates as indicators for water quality

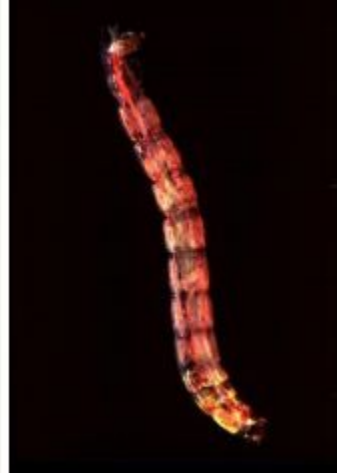
Mollusca

Ephemeroptera

Gastropoda

Diptera

Culicidae



very good

good

moderate

poor

bad

Research question

Assessment and evaluation of the current ecological state and long-term trend of Lake Durowskie based on macroinvertebrates as indicators.

Methods: Data collection



← Kajak sampler
Ø 6 cm



Czapla sampler
Ø 5,7 cm →



Methods: Species identification



Methods: Data Analysis

Determination of:

- Individuals per m²
- Biomass per m²
- Biodiversity: Shannon-Wiener Index
- Biological Monitoring Working Party (BMWP)

→ for every station

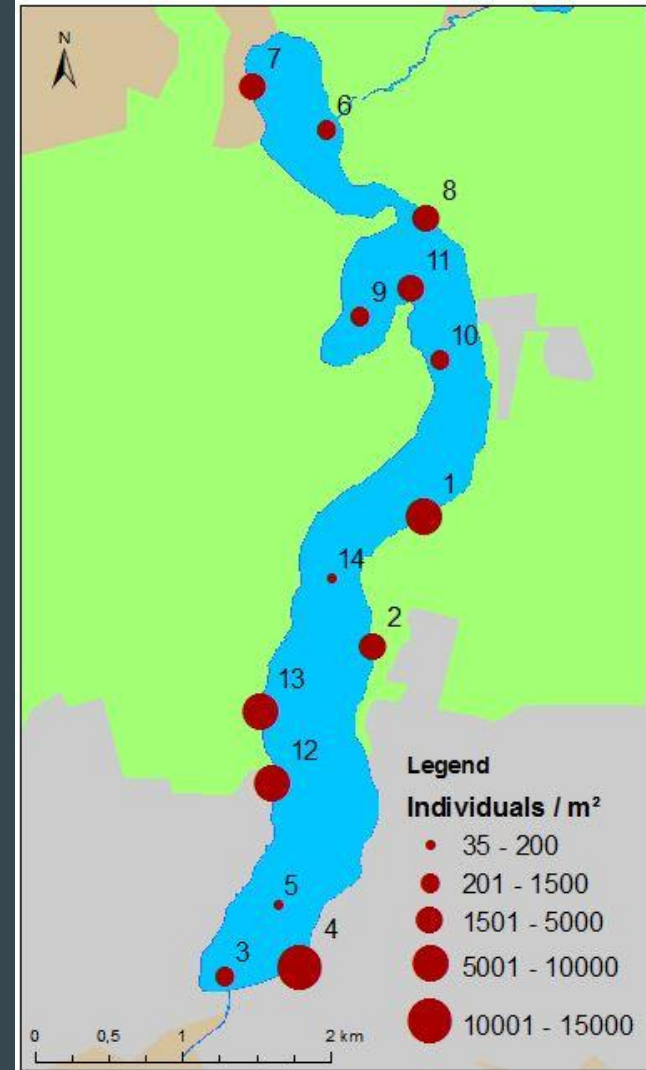
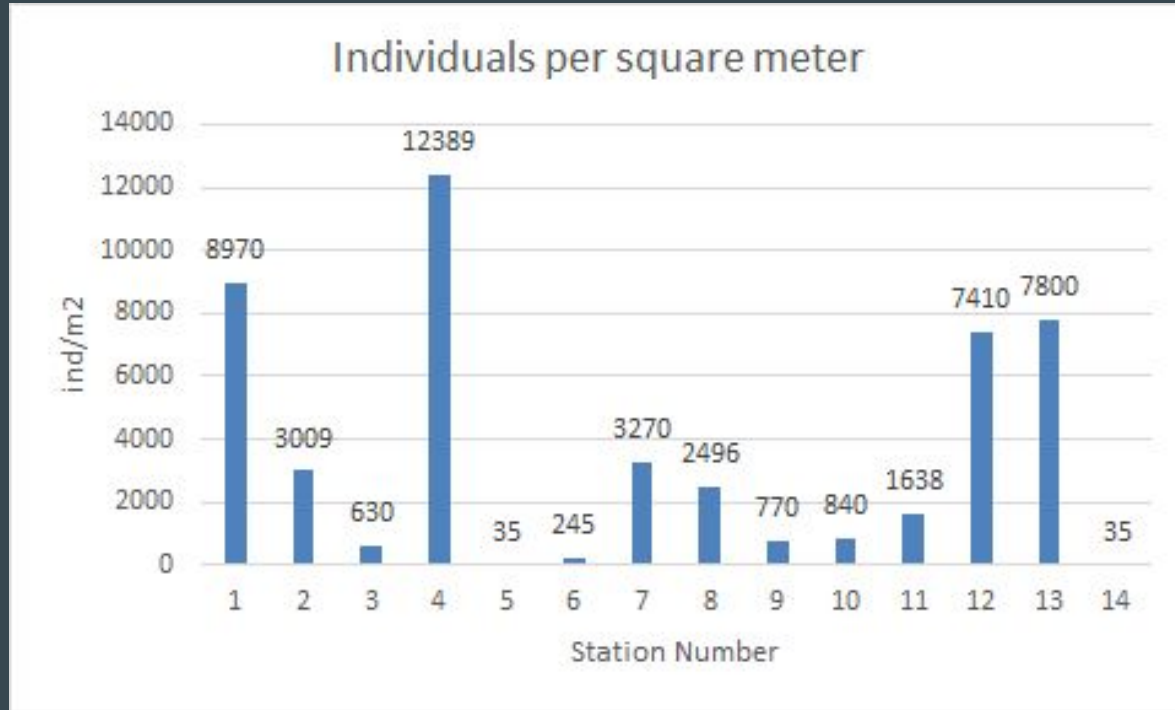
→ in comparison with data from recent years

$$H' = - \sum_{i=1}^s p_i \ln p_i$$

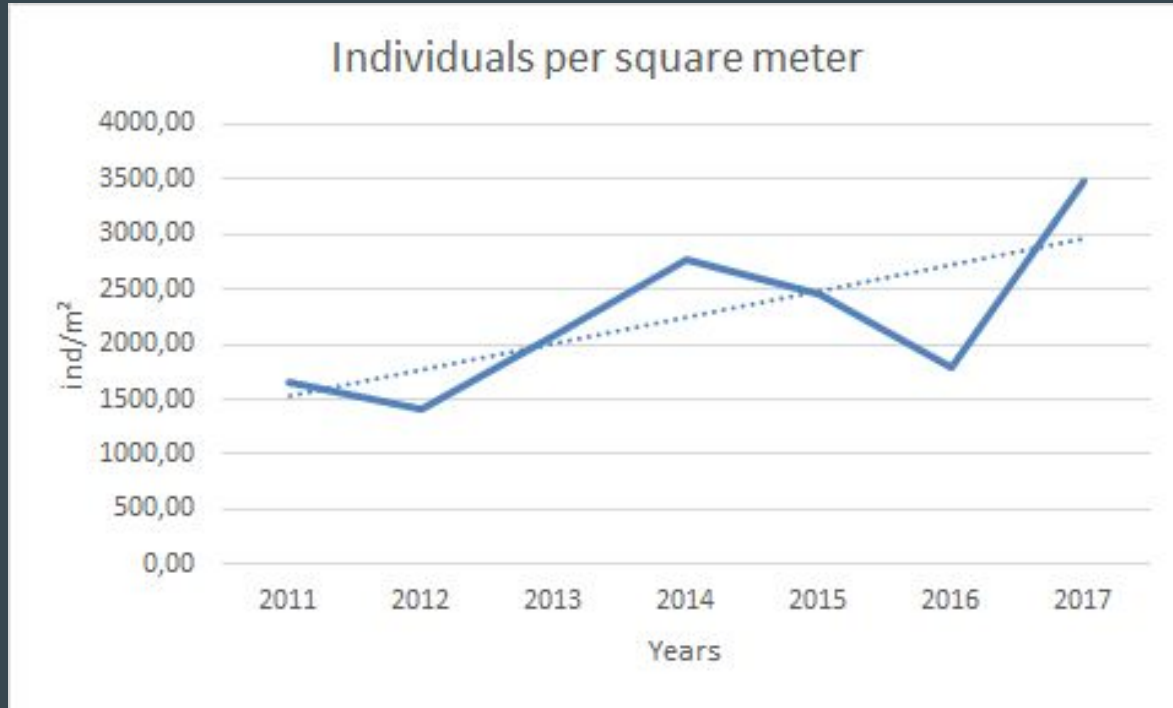
p_i = number of individual in the sp. / number of ind. in total
 s = number of species



Results: Number of individuals / m²

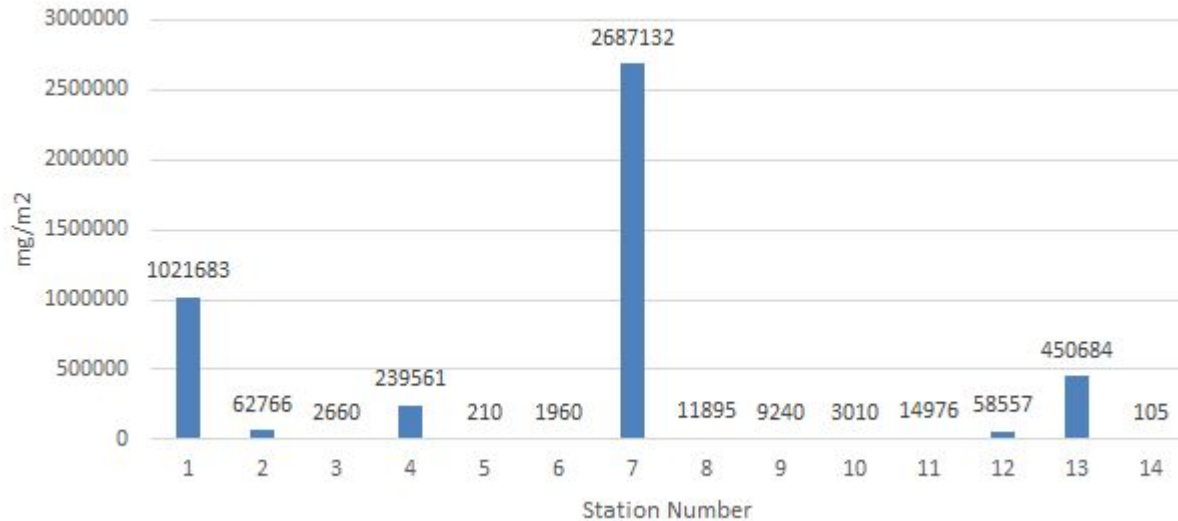


Results: Number of individuals / m² - long-term trend

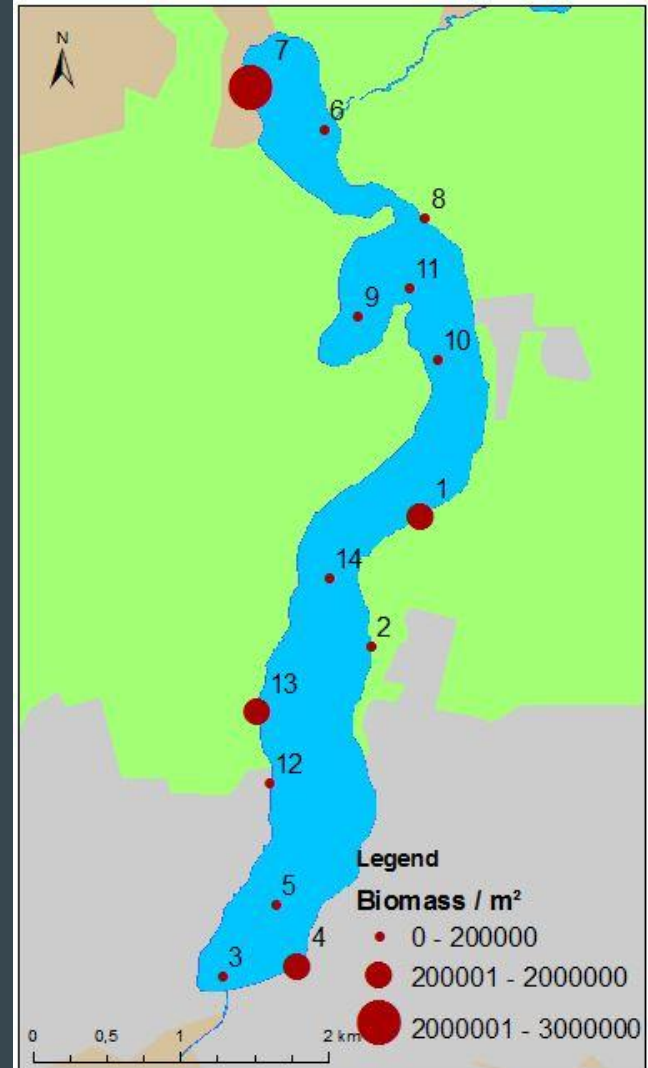


Results: Biomass (mg/ m²)

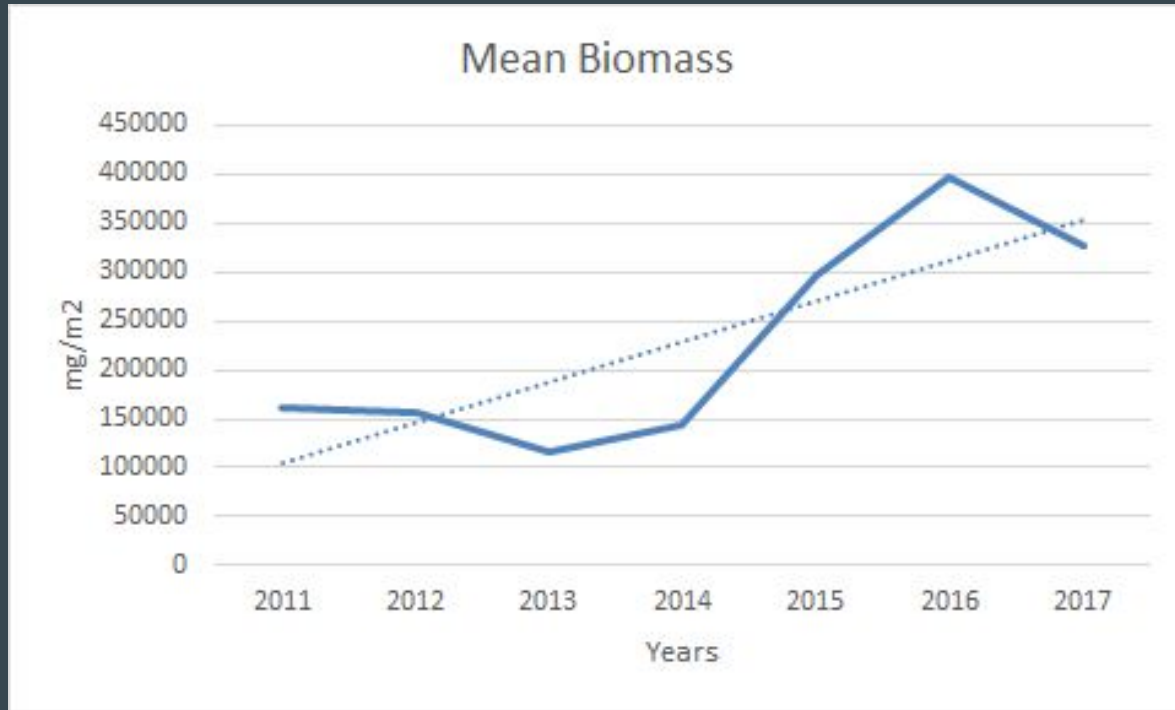
Biomass per square meter



Station 7: 2.7 kg (mostly Bivalvia)

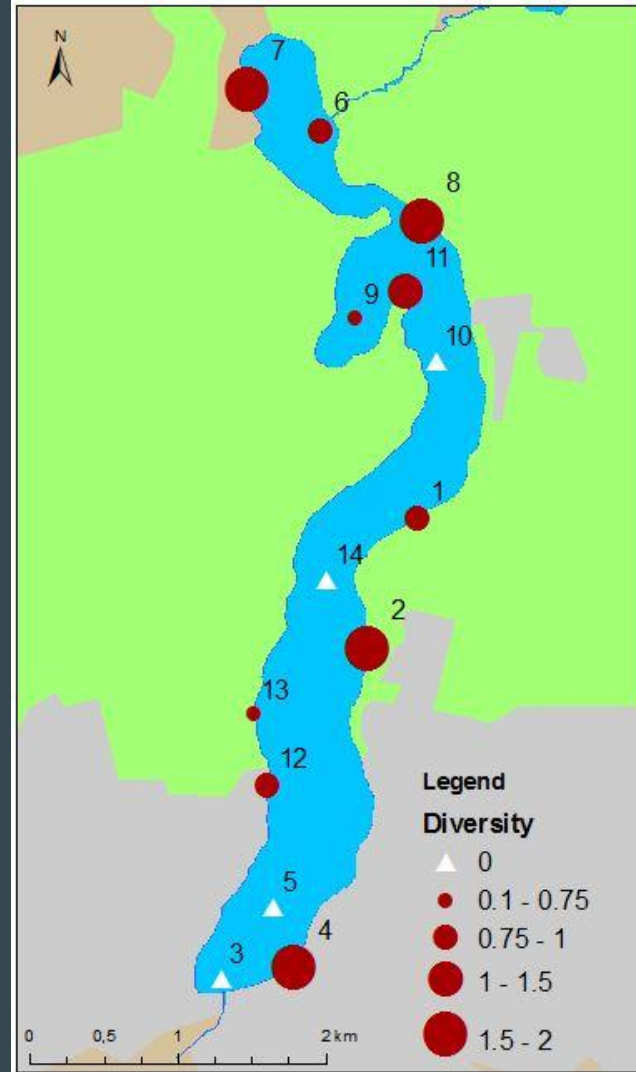
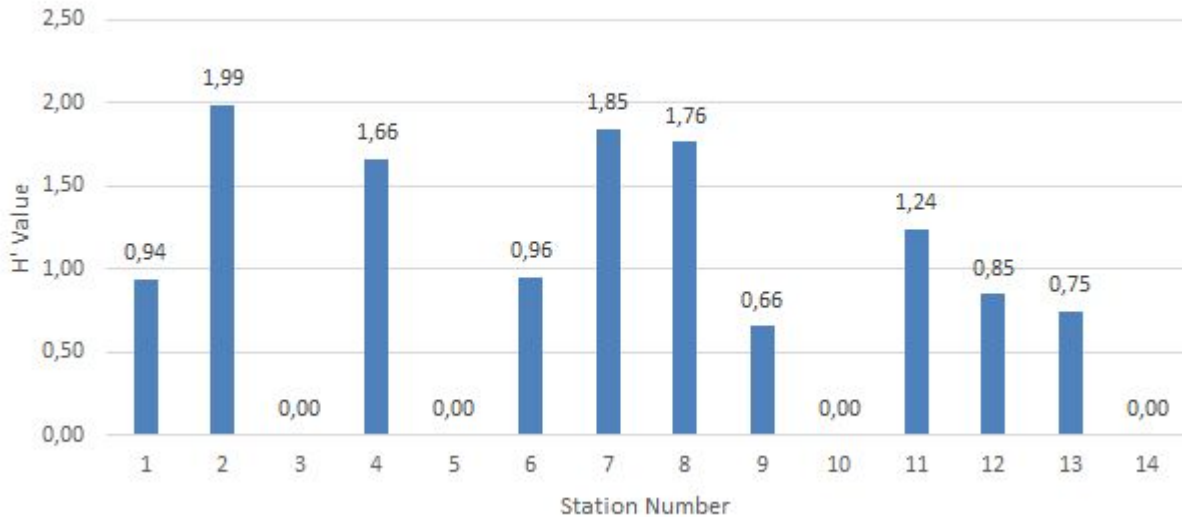


Results: Biomass (mg/ m²) - long-term trend

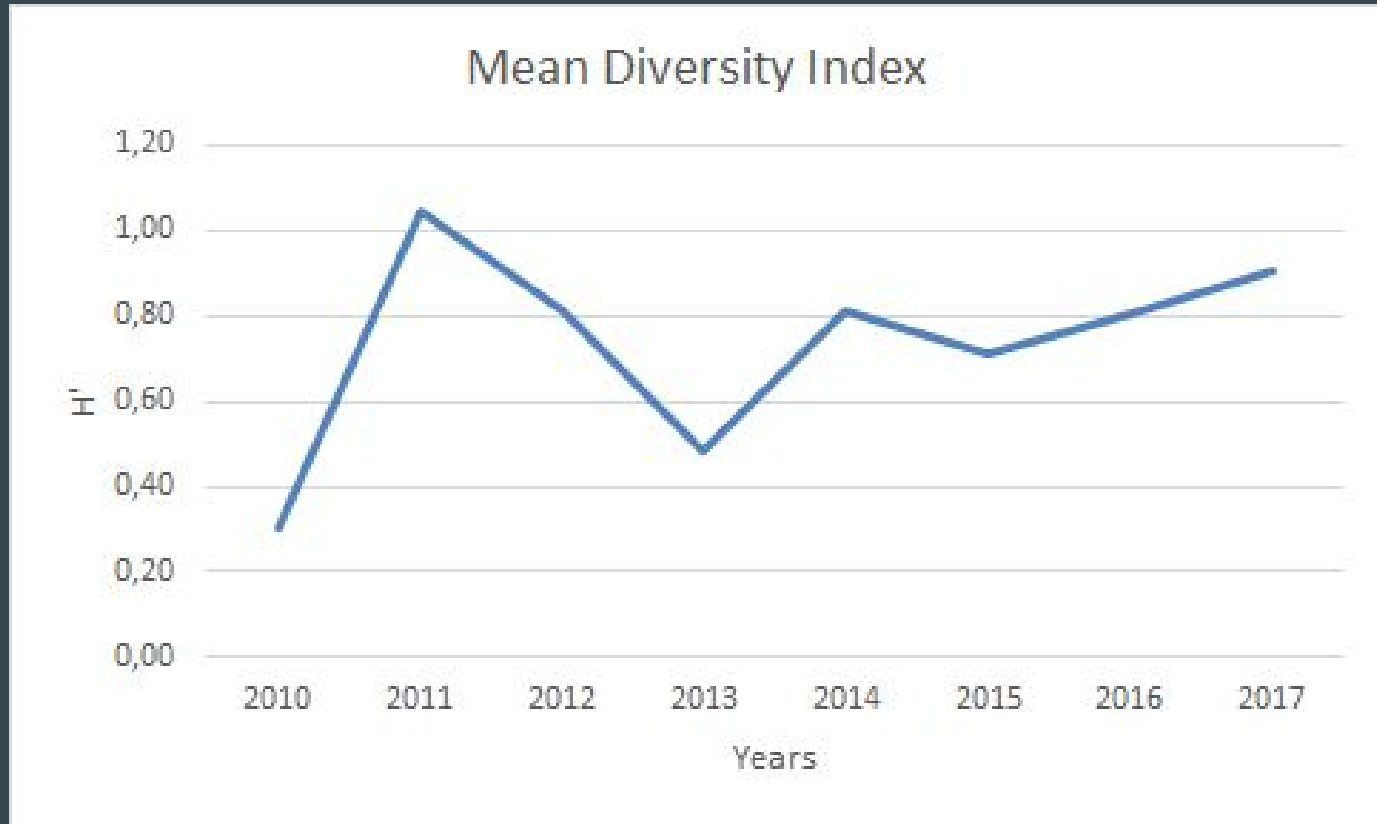


Results: Biodiversity

Shannon-Wiener Diversity Index



Results: Biodiversity - long-term trend



Biological Monitoring Working Party (BMWP)

based on sensitivity to pollution

values 1-10

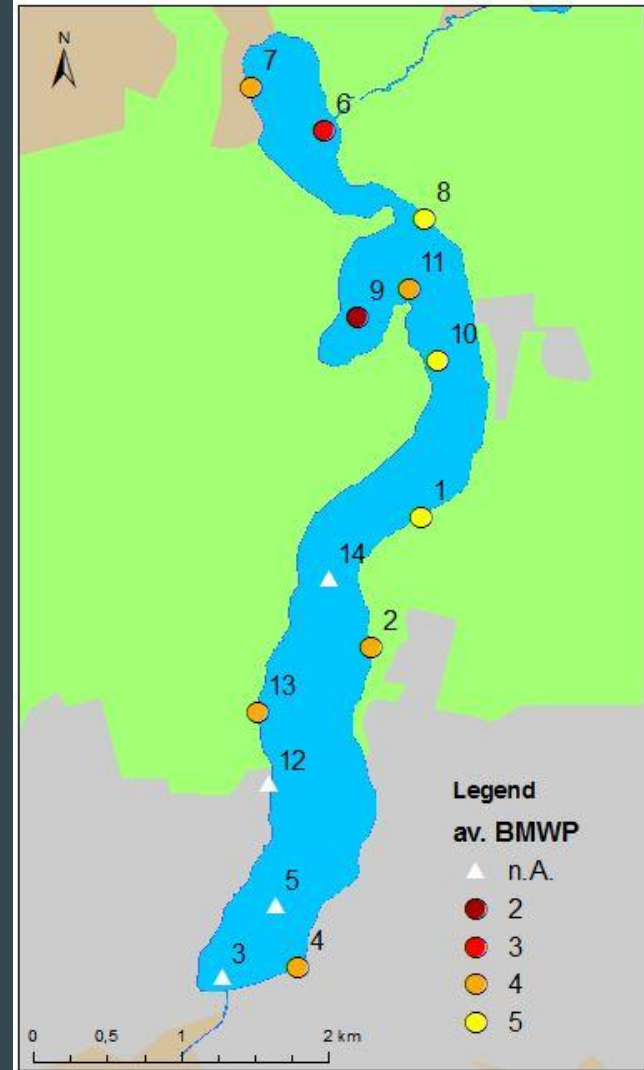
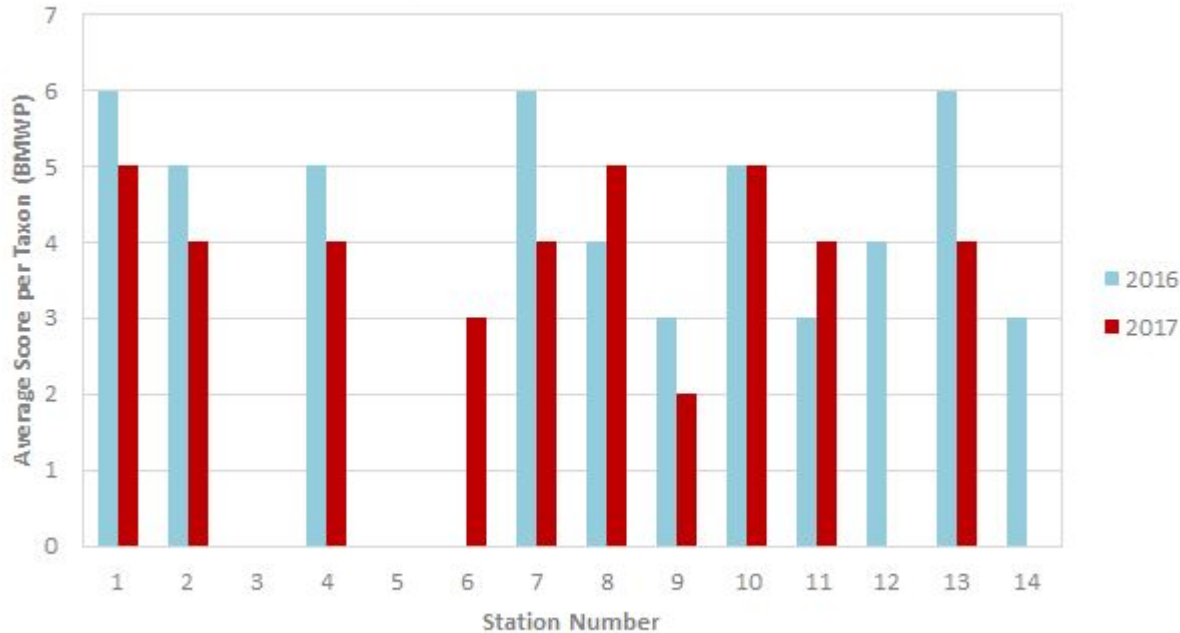
1 - tolerant to pollution

10 - intolerant to pollution

Group	Familles	Score
Mayflies	Siphonuridae, Heptageniidae, Leptophlebiidae, Ephemerellidae, Potamanthidae, Ephemeridae	10
Stoneflies	Taeniopterygidae, Leuctridae, Capniidae, Perlodidae, Perlidae, Chloroperlidae	
River bug	Aphelocheiridae	
Caddisflies	Phryganeidae, Molannidae, Beraeidae, Odontoceridae, Leptoceridae, Goeridae, Lepidostomatidae, Brachycentridae, Sericostomatidae	
Crayfish	Astacidae	8
Dragonflies	Lestidae, Agriidae, Gomphidae, Cordulegasteridae, Aeshnidea, Corduliidae, Libellulidae	
Caddisflies	Psychomyidae, Philopotamiidae	
Mayflies	Caenidae	7
Stoneflies	Nemouridae	
Caddisflies	Rhyacophilidae, Polycentropidae, Limnephilidae	
Snails	Neritidae, Viviparidae, Ancyliidae	
Caddisflies	Hydroptilidae	6
Mussels	Unionidae	
Shrimps	Corophiidae, Gammaridae	
Dragonflies	Platycnemididae, Coenagriidae	
Waterbugs	Mesoveliidae, Hydrometridae, Gerridae, Nepidae, Naucoridae, Notonectidae, Pleidae, Corixidae	5
Water beetles	Haliplidae, Hygrobiidae, Dytiscidae, Gyrinidae, Hydrophilidae, Clambidae, Helodidae, Dryopidae, Elminthidae, Chrysomelidae, Curculionidae	
Caddisflies	Hydropsychidae	
Craneflies	Tipulidae	
Blackflies	Simuliidae	
Flatworms	Planariidae, Dendrocoelidae	
Mayflies	Baetidae	
Alderflies	Sialidae	4
Leeches	Piscicolidae	
Snails	Valvatidae, Hydrobiidae, Lymnaeidae, Physidae, Planorbidae	
Cockles	Sphaeriidae	3
Leeches	Glossiphoniidae, Hirudidae, Erpobdellidae	
Hoglouse	Asellidae	
Midges	Chironomidae	
Worms	Oligochaeta (whole class)	1

Results: Biological Monitoring Working Party (BMWP)

Average BMWP for each station



Conclusion

- high variability between stations
- number of individuals/ biomass/ biodiversity low in deep areas
- number of individuals/ biomass/ biodiversity increased during last years
(fluctuations)
- BMWP decreased

Future research recommendations

- baseline information (e.g. GPS positions) of sampling stations and the lake
- influence of weight of certain species should be taken into account
- standardization of data analysis for each year

Management recommendations

- increase restoration efforts
- restoration at upstream lakes
- more aerators to oxygenize deep areas with low level of species diversity
- protection of macrophytes

Thank you for your attention!

Questions? Comments? Advices?



sites clustered by jaccard similarity

