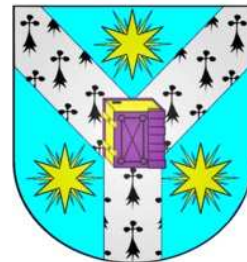


Macroinvertebrate Survey

The Ecological state of the Lake Durowskie during restoration measures

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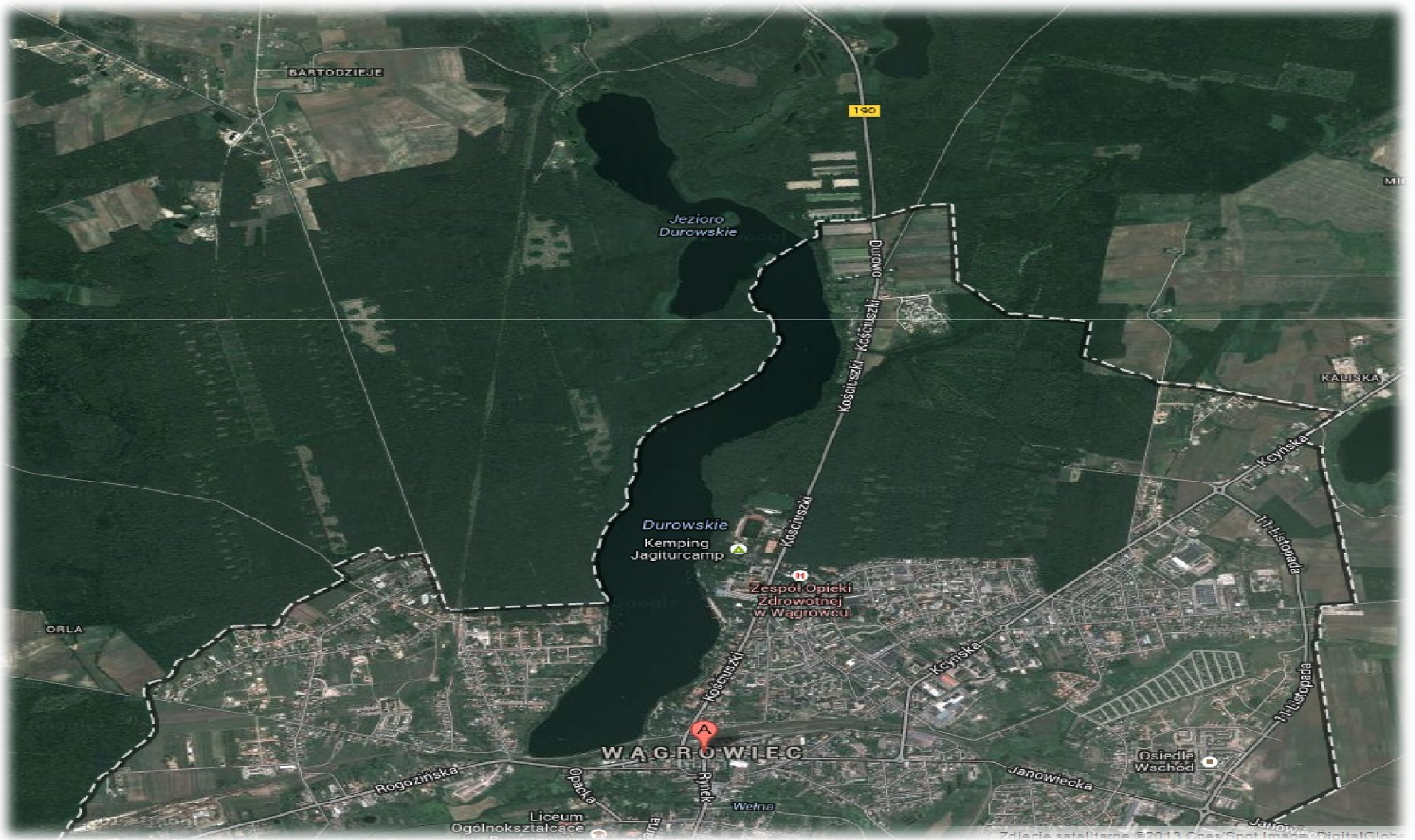


Content

- Introduction
- Material & Methods
- Macroinvertebrates found
- Data & Data analysis
- Discussion & Conclusions



Lake Durowskie





Lake Durowskie

Sample Stations



Stations	Description
1	Littoral with reed near forest cover
2	Littoral near urban area
3	Pelagial near dam
4	Littoral near urban area
5	Pelagial (Areator I)
6	Pelagial near Struga Golaniecka River
7	Littoral near Camping ground
8	Littoral (Bulrush near forest cover)
9	Pelagial
10	Pelagial (Areator II)
11	Littoral with reed
12	Littoral near urban area
13	Littoral with reed near forest cover
14	Pelagial

Legal background

European Water Framework Directive (WFD)

- framework for the protection of water bodies
- target: 'good ecological quality status' for all water bodies by 2015
- need to identify and to assess pressures and impacts
- macroinvertebrates can be used as target organisms

22.12.2000

EN

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L 327/1

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(Acts whose publication is obligatory)

DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 23 October 2000

establishing a framework for Community action in the field of water policy

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission⁽¹⁾,

Having regard to the opinion of the Economic and Social Committee⁽²⁾,

Having regard to the opinion of the Committee of the Regions⁽³⁾,

(3) The declaration of the Ministerial Seminar on groundwater held at The Hague in 1991 recognised the need for action to avoid long-term deterioration of freshwater quality and quantity and called for a programme of actions to be implemented by the year 2000 aiming at sustainable management and protection of freshwater resources. In its resolutions of 23 February 1992⁽⁴⁾, and 20 February 1995⁽⁵⁾, the Council requested an action programme for groundwater and a revision of Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances⁽⁶⁾, as part of an overall policy on freshwater protection.

Material and Methods

„Kajak”



„czapla”



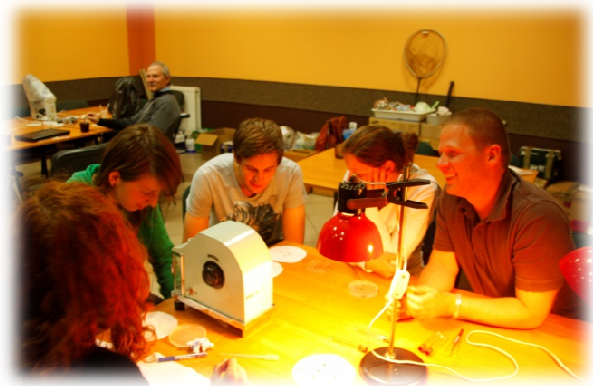
Material and Methods

Taking Samples and using sieving device



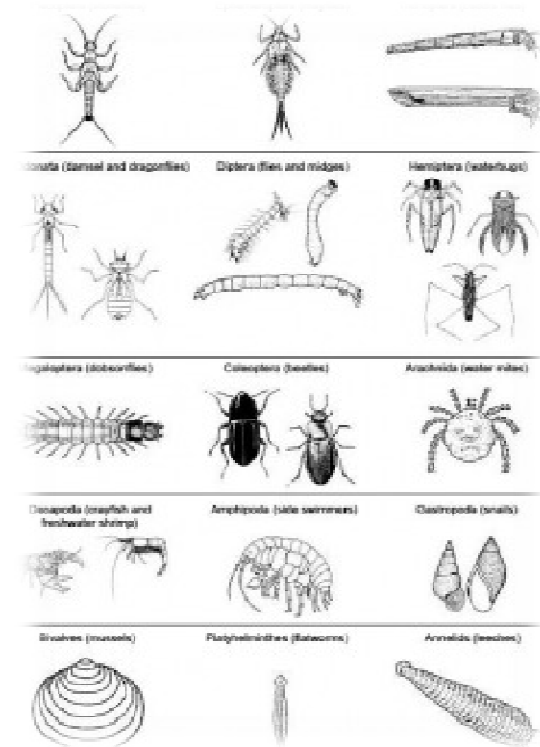
Material and Methods

Sorting, classification, weighting & determination



Macroinvertebrates

- > 2 mm → large enough to be seen with an unaided eye
- inhabiting all types of freshwater
- without a backbone





Macroinvertebrates - Bioindicators

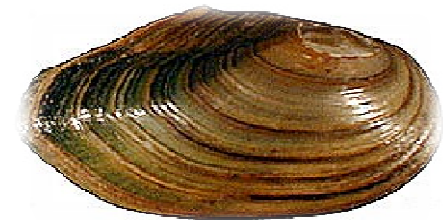
- generally abundant
- critical part of the lake's food web
- cannot escape pollution & show effects of short- and long term pollution events
- generally good response to a multitude of stressors
- affected by the physical, chemical, and biological conditions
- can show the cumulative impacts of pollution
- diversity indicates local conditions
- relatively easy sampling technique

Macroinvertebrate Orders

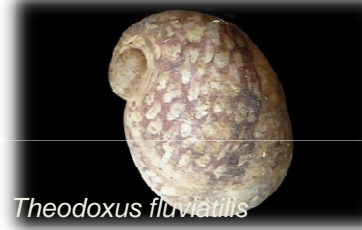
- **Platyhelminthes** (Flatworms)
- **Nematoda** (Roundworms)
- **Oligochaeta** (Aquatic worms)
- **Hirudinea** (Leeches)
- **Gastropoda** (Snails)
- **Unionoida** (Clams and Mussels)
- **Isopoda** (Pill Bugs)
- **Megaloptera** (Dobsonflies / Hellgrammites)
- **Ephemeroptera** (Mayflies)
- **Trichoptera** (Caddisflies)
- **Diptera** (True Flies)
- **Acari** (Mites and Ticks)



Glossiphonia complanata



Anodonta anatina



Theodoxus fluviatilis



Stalis fuliginosa



Trichoptera sp.



Chaoborus flavicans



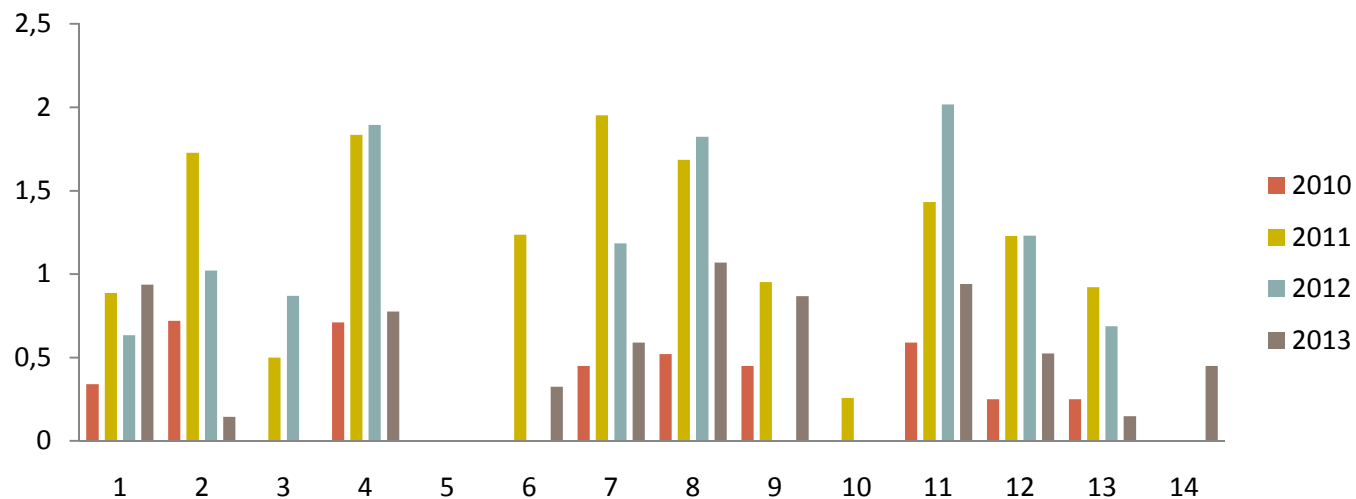
Chironomidae larvae

Data analysis

The Shannon-Wiener Index is a diversity index with a quantitative measure that reflects how many different species there are in a dataset, and simultaneously takes into account how evenly the individuals are distributed among the species found.

$$H' = - \sum_{i=1}^R p_i \ln p_i \quad \text{---} \quad \text{proportion of individuals}$$

Shannon-Wiener index

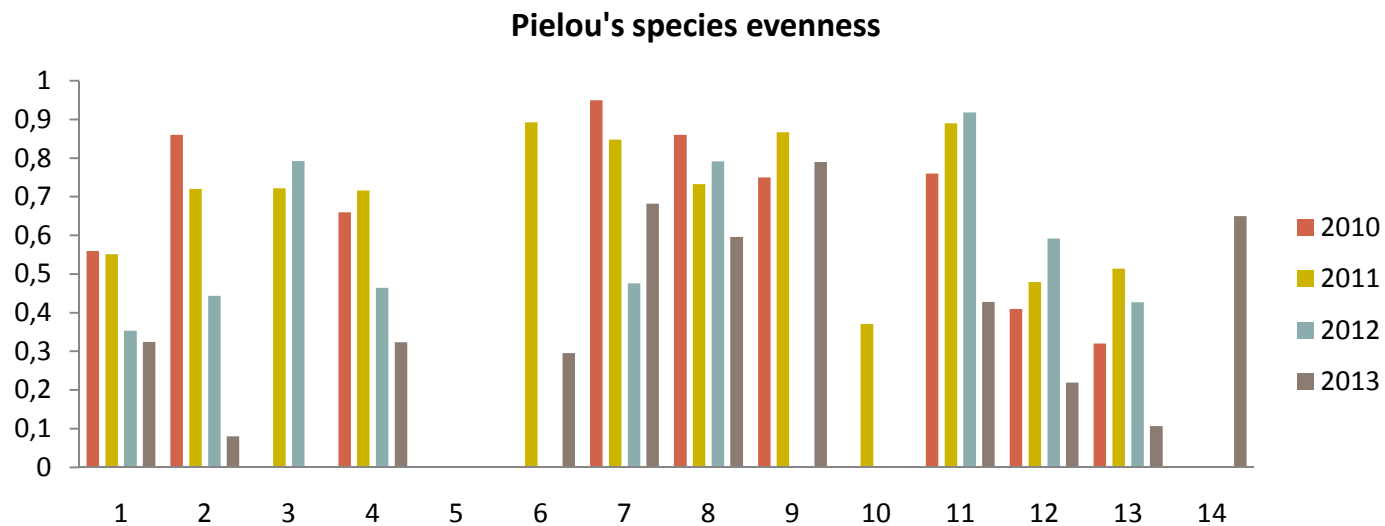


Data analysis

Pielou's species evenness refers to how close in numbers each species in an environment is.

$$J' = \frac{H'}{H'_{\max}}$$

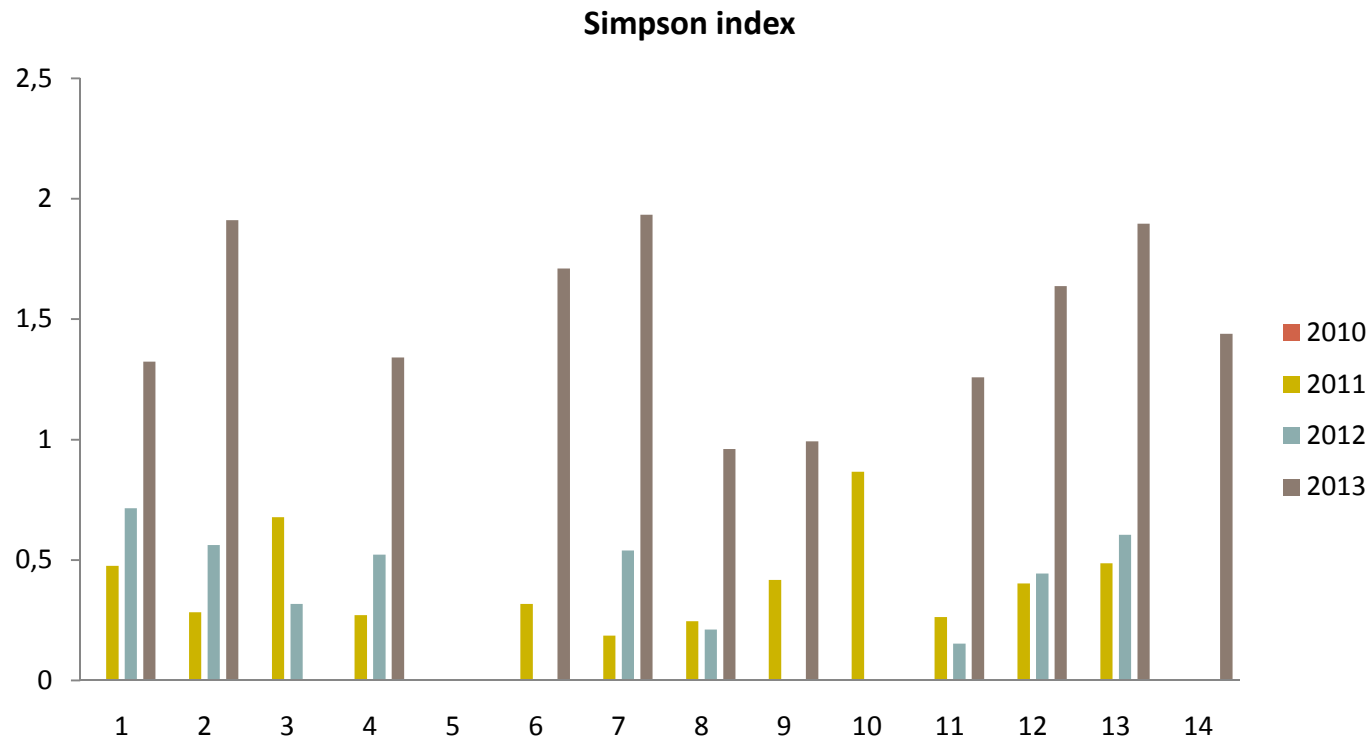
J' is constrained between 0 and 1. The less variation in communities between the species, the higher J' is.



Data analysis

The Simpson index is used to measure the degree of concentration when individuals are classified into type.

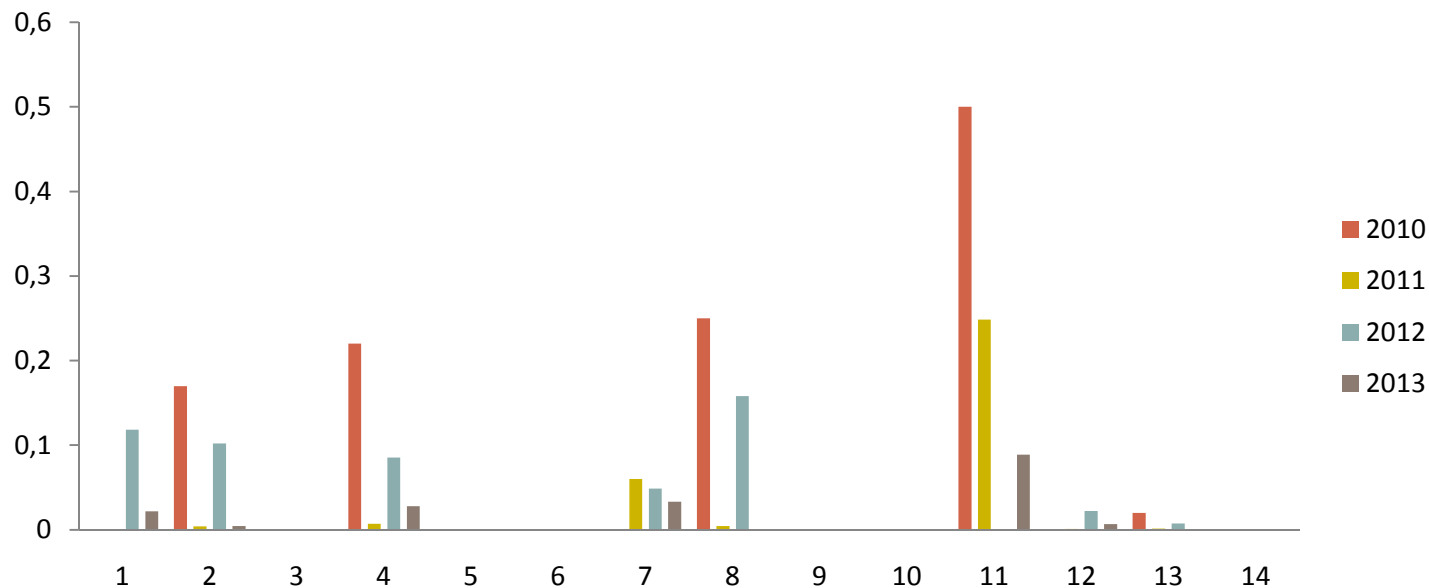
$$\lambda = \sum_{i=1}^R p_i^2$$



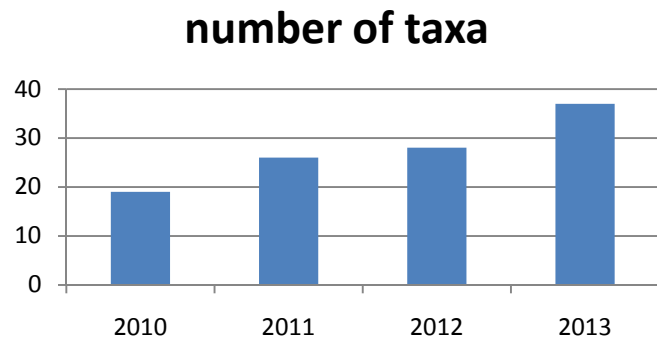
Data analysis

EPT index is an index of water quality based on the abundance of three pollution-sensitive orders of macroinvertebrates. It is calculated as the sum of the number of *Ephemeroptera*, *Plecoptera*, and *Trichoptera* divided by the total number of *Chironomidae*. The EPT Index increases with improving water quality.

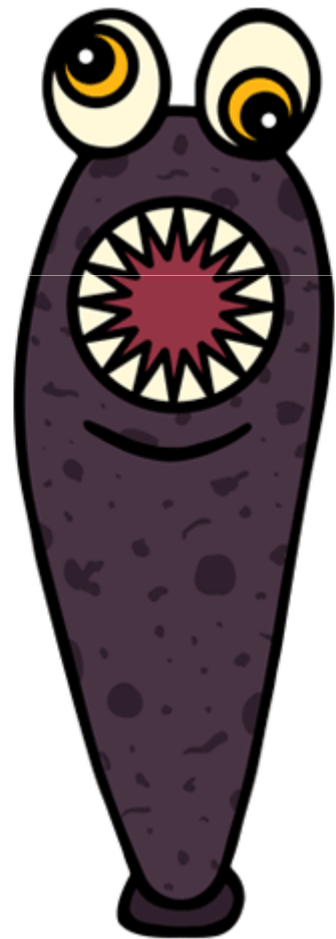
$$\text{EPT Index} = \sum_{\text{EPT}} (\text{EPT} / \text{total \# organisms}) * 100\%$$



Conclusions



- Number of identified taxa with wide ecological range continue to increase → adapted to worse conditions
- According to the EPT-Index the species adapted to good water quality are less abundant
- In general the number of species which indicate a good water quality decrease (e.g. no Plecoptera found) while at the same time the new found taxa indicate worse conditions → higher biodiversity ≠ higher quality
- The species number in the littoral is higher than in the peligial
- Low efficiency of the aerators
- **General trend of all used indices: The quality state of the lake is decreased**



Thank you !!!