

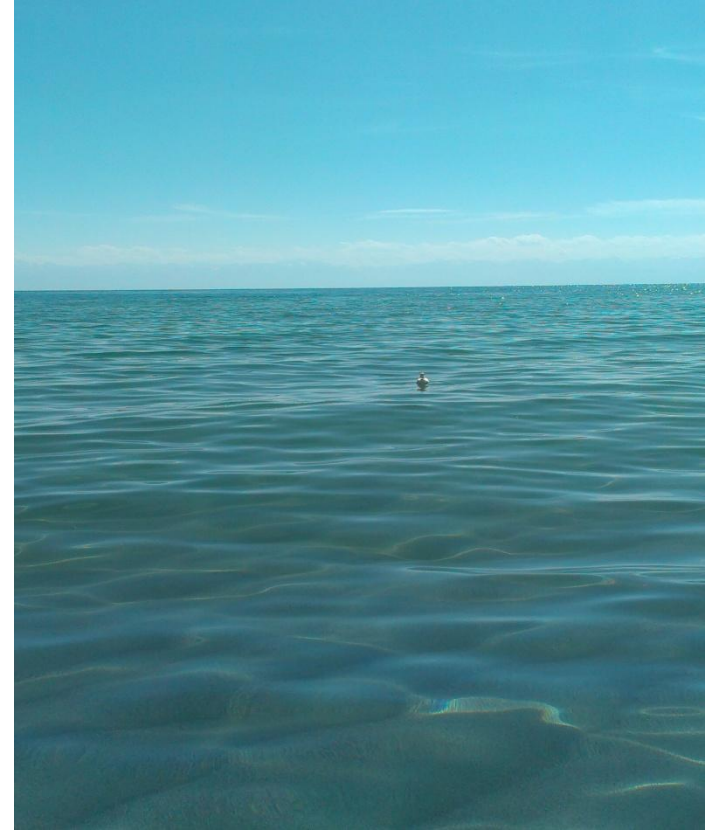
Hydrobiological Monitoring

Public Participation as a tool to optimize the system of Environmental monitoring on the example of the lake Son-Kul, 14-17.08.2017

Nishaeva Sofia

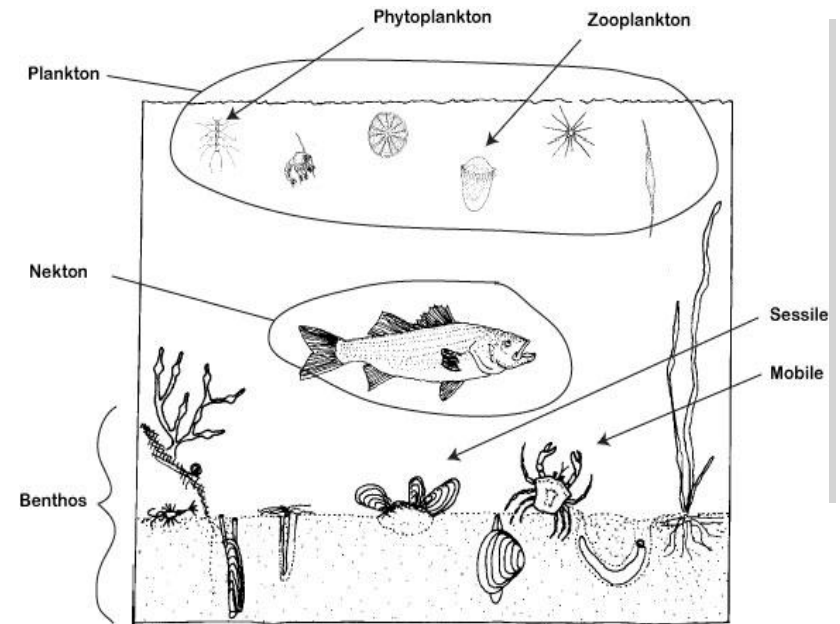
Introduction

- Water quality assessment by the flora and fauna of water bodies.
- An essential part of integrated water monitoring.
- Allows to detect impact preceding the time of water sampling.
- Allows to assess the level and origin of disorders in aquatic ecosystems, the consequences of pollution.
- Aquatic communities indicate the average long-term composition of water.
- In European Union, USA, Australia the biological evaluation is a government obligation.



Bioindication

- Bioindicators:
 - phyto-, zooplankton;
 - benthos;
 - fishes;
 - macrophytes.
- Stressed aquatic system often shows:
 - a reduction on taxon richness,
 - predominance of pollution-tolerant taxa
 - change in number of individuals within a taxon



Source: <http://dtc.pima.edu>

Phytoplankton

- Bacteria, algae, fungi
- Primary production of water bodies
- Depths of sampling: 0-2, 0-4 m (if water is clean)
- Preservation with 4% formalin or Lugol liquid, if needed
- Species, biomass, chlorophyll-a measurements
- Rapid reproduction of blue-green algae induces harmful “bloom”



Plankton net



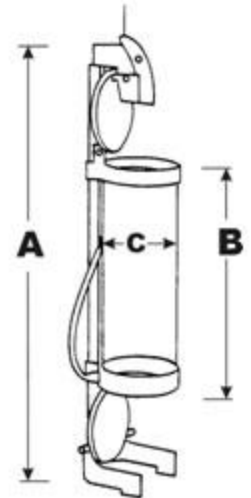
Zooplankton

- Protozoa, Rotifers, Cladocera, Copepoda, Ostracoda
- Eat plankton and each other
- Feed for fishes and other invertebrates
- Sampling from water column with plankton net or Limnos sampler
- Sampling place and time depend of the aims of research
- Some rotifers indicate eutrophication

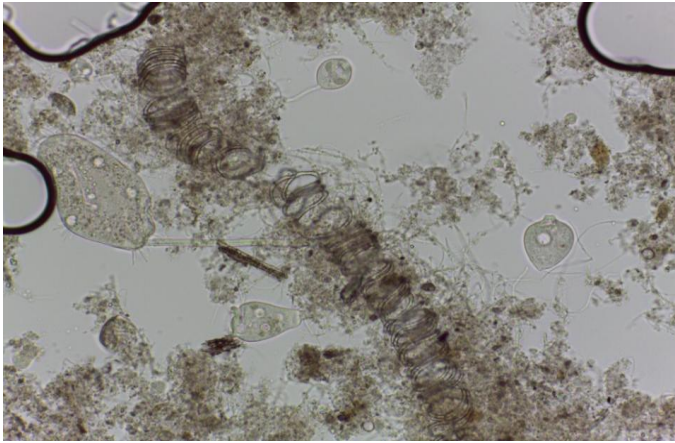


Plankton net

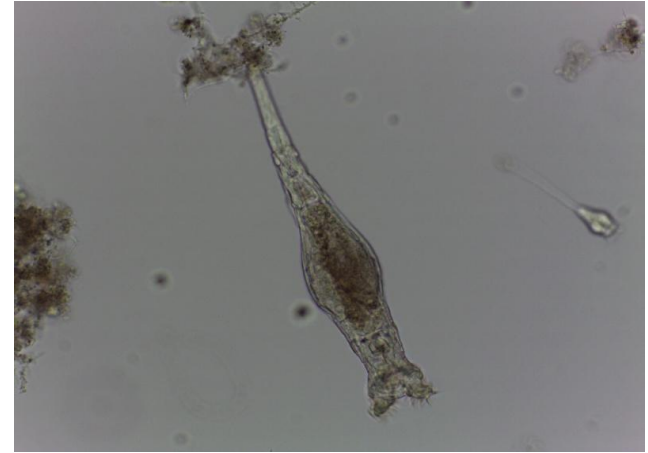
Sampler



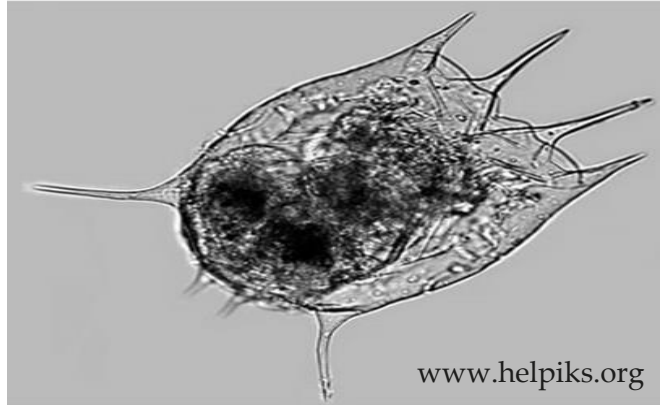
Source: www.limnos.pl
www.biofile.ru



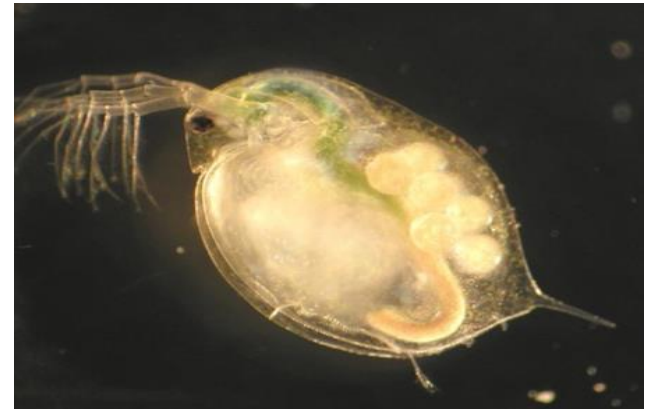
Zooplankton



Rotatoria

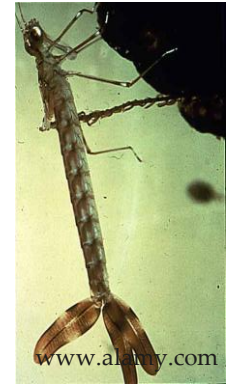


Brachionus calyciflorus



Daphnia magna

Benthos

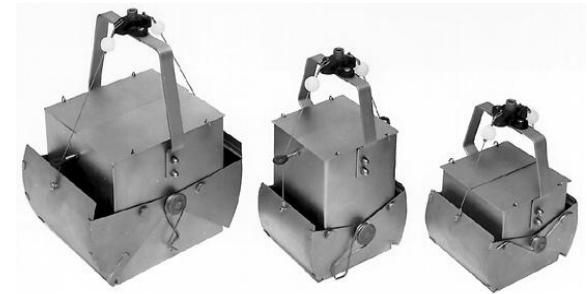
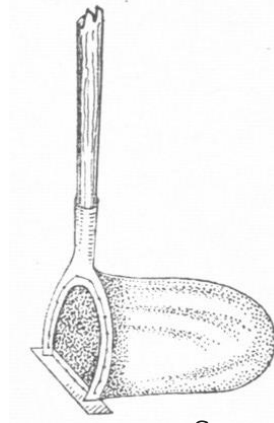


- Insects larvae, worms, mollusks, rotifers, etc
- Ubiquitous and abundant
- Life span is more than 1 year
- Accumulate pollution and transfer it through the food chain
- Reflect long-term changes in water environment
- Easy to identify



Benthos

- ✓ Sampling 2 times a year: spring, autumn
- ✓ Sampler – scrapers, bottom-grab
- ✓ Easy to collect
- ✓ Insect larvae are mainly collected, amount and biomass depend on the season
- ✓ Quality and quantity measurements
- ✓ Passivirta method



Source: www.matrixplus.ru

Bottom animal scoring by the wet weight of animals

Lauri Paasivirta

Oligotrophic	0 - 1.6 g / m ²
Mesotrophic	1.6 - 6 g / m ²
Eutrophic	< 6 g / m ²

Mayer Index

Clean water dwellers, X	Organisms of moderate tolerance, Y	Polluted water dwellers, Z
<ul style="list-style-type: none"> • Stoneflies larvae • Mayfly larvae • Caddis fly larvae • Alderfly larvae • Bivalve mollusks 	<ul style="list-style-type: none"> • Freshwater shrimp • Crawfish • Dragon fly larvae • <i>Tipulidae</i> larvae • Mollusks <i>Planorbidae</i> • Mollusks <i>Viviparidae</i> 	<ul style="list-style-type: none"> • Chironomid larvae • Leech • <i>Asellus aquaticus</i> • Pond snails • Blackfly larvae • Oligochaeta

$$S = X \cdot 3 + Y \cdot 2 + Z \cdot 1$$

>22 – clean water; 17-21 – oligotrophic; 11-16 – mezotrophic, <11 – eutrophic

Issyk-Kul lake

Phytoplankton:

- 400 species, among them:
 - ✓ 68 species of green algae;
 - ✓ 64 blue-green species;
 - ✓ blue-green algae causing harmful blooms are not present;
 - ✓ Maximum growth- spring (May), autumn (Okt-Nov);
 - ✓ depth – 15-50 m
 - ✓ biomass – не более 0,2 г/м³

Son-Kul lake

- 60 species:
 - 34 green algae species;
 - 1 blue-green algae;
 - 56 diatoms species

Issyk-Kul lake

Zooplankton:

- 119 species, among them:
 - ✓ 98 rotifers, 13 copepods, 8 cladocerans
 - ✓ Copepod *Arctodiaptomus salinus* composes 97% of zooplankton
 - ✓ Inhabit the depth from surface till 100 m
 - ✓ Maximum growth – Aug-Sept, minimum – Feb-Mar.

Son-Kul lake

- 28 species:
 - ✓ 17 rotifers, 5 copepods, 6 cladocerans
 - ✓ Endemic *Daphnia Sonculensis*
 - ✓ *Arctodiaptomus bacillifer*
 - 35- 40 000 species/ m^3
 - ✓ After acclimatization of whitefish zooplankton reduced up to 2/3



Issyk-Kul lake

Benthos:

- 224 taxa:
- ✓ Charophyte zone
(from shoreline up to 40 m depth);
- ✓ Chironomids, mollusks, mysids;
- ✓ Abundance reduces with depth

Son-Kul lake

- Dominance of chironomid larvae and mollusks
- Number of freshwater shrimp has decreased after whitefish acclimatization

Lake Issyk-Kul

Fishes:

- 28 species:
 - ✓ 11 indigenous (chebak, chebachok, marinka, osman, carp, etc.)
 - ✓ 17 species have been acclimatized (rainbow trout, pike-perch, whitefish, etc)

Lake Son-Kul

- Until 1950 had been fishless
- White fish, peled, osman have been stocked in to the lake

Conclusion

- Physic-chemical analysis determines concentrations of pollutants at the moment of water sampling
- Biological assessment shows long-term effects of physic-chemical factors on aquatic organisms
- Physical, chemical and biological methods are needed for integrated water quality assessment .

References

1. Armon RH, Hänninen O (2015) Environmental Indicators. Springer: 643-650.
2. Kustareva LA, Naseka AM (2015) Fish Diversity in Kyrgyzstan. Species Composition, Fisheries and Management Problems. Aquatic Ecosystem Health and Management, 18(2): 149-159.
3. Kustareva LA, Lemzina LV (2007) Life in Water Bodies of Kyrgyzstan. Ilim: 37-112.
4. Nurminen L (2013) Sampling and biological measurements/ Presentation. UEF.
5. Welch EB, Jacoby JM, Lindell T (2004) Pollutants Effects in fresh Water/ Applied Limnology. Spon Press: 95-227.

Thank you!



UNIVERSITY OF
EASTERN FINLAND

uef.fi