Global change in alpine lakes – what can microscopic organisms tell us?

Csaba Vad
WasserCluster Lunz
Hungary
Professional background

- 2009: Master degree in Biology
- 2014: PhD in Environmental Biology
- 2015-2016: 5 months with an Ernst Mach Worldwide Grant at WasserCluster Lunz
  - Doing experimental ecology
- 2016-2018: Postdoctoral fellow at WasserCluster Lunz
  - Project: ChrysoWeb – The effect of mixotrophic chrysophytes on secondary productivity in pelagic food webs

Eötvös Loránd University, Budapest

http://ttk.elte.hu/
Professional background

• **Limnology** = the study of inland waters (equivalent of oceanography but focusing on continental waters)

• **Aquatic ecology** = studying the interactions among aquatic organisms and their environment and among the organisms themselves

• **Plankton ecology** = focus on the tiny drifting organisms of the open water
PhD studies

- Ecology and conservation value of ponds and their zooplankton
  → Ponds are unique for biodiversity!

- Empirical studies
WasserCluster Lunz

http://www.wcl.ac.at/

© Zsófia Horváth

Vienna
Lunz am See
Lake Lunz
Biological Station
WasserCluster Lunz

http://www.lunz2010.at/

© Zsófia Horváth
International atmosphere
Biological Station

Our lab:
https://aquascalelab.wordpress.com/
Biological Station

Well-equipped labs

Outdoor experimental facilities

Walk-in climate chamber

Lake lab with boat

Photos - https://aquascalelab.wordpress.com/
Zooplankton

Not only important for whales in oceans...

http://beatohawaii.com/

In freshwaters...

Rotiferans

Tiny crustaceans

Even jellyfish...
Importance

• Key component of the aquatic food webs both in the marine and freshwater systems

• Important food source for larval and adult fish

• Grazers of phytoplankton, bacteria, other unicellular organisms
Crustaceans in the zooplankton

- Water fleas:
  
  ![Water flea image](image1)

- Copepods
  
  ![Copepod image](image2)
Global change

- any consistent trend in the environment that has a global effect
- Examples:
  - Increasing UV-B radiation
  - Biodiversity loss
  - Rising atmospheric greenhouse gases concentrations
  - Eutrophication
  - Land use changes
  - Global Climate change
    - Warming
    - Extreme events
Effects of climate change on lakes...

- Increase in surface water temperature
- Reduction of ice cover
- Melting of glaciers that affect stream discharge
- Salinisation
- Changes in hydrological regime: Drought

- These all have serious ecological consequences!
Global increase in surface temperature

O’Reilly et al. 2015 GRS
Oligotrophic lakes

- The plankton of eutrophic (nutrient-rich) lakes are widely discussed, but much less attention is paid to oligotrophic (nutrient-poor) lakes, such as lakes in the Alps.

- Warming – extended periods of summer stratification

- Browning – due to increased runoff of terrestrial organic matter
Chrysophyte algae (=Golden algae)

- **Mixotrophic:**
  - Able to feed both phagotrophically (on bacteria) and phototrophically
  - Analogous to carnivorous plants
What are the implications of golden algae blooms in aquatic food webs?

Global change

Effects on Zooplankton?
Lake Lunz

- Nutrient-poor (oligotrophic) lake at 600m elevation
- Regularly monitored

In the 50s...
Uroglena blooms in lake Lunz

- Cloudiness of the water
- Fishy odour
- Effects on trophic structure?
Isolating and maintaining cultures

Pure algal cultures

Zooplankton
Feeding experiments
Target species

http://www.mikroskopie-forum.de/

http://www.microscopy-uk.org.uk/

http://www.biolib.cz/

© Csaba Vad
Results

- Both algae have negative effects on zooplankton
- The effects were species-specific among zooplankters
- Food quality: water fleas are more tolerant
- Physical interference: copepods are more tolerant
What are the implications of golden algae blooms in aquatic food webs?

Effects on Zooplankton?
THANK YOU FOR YOUR ATTENTION!