

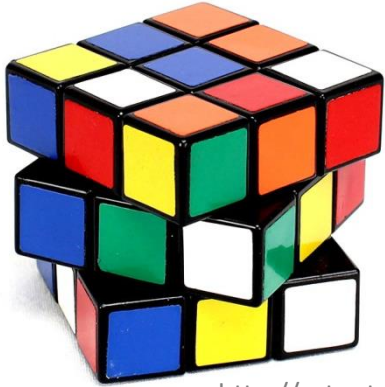


**Global change in alpine lakes – what  
can microscopic organisms tell us?**

**Csaba Vad**  
WasserCluster Lunz



# Hungary



<http://astar.tv/>



<http://www.kutyusok-vilaga.eoldal.hu/>



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<http://travel.nationalgeographic.com/>

# Professional background

- 2009: Master degree in Biology
- 2014: PhD in Environmental Biology



Eötvös Loránd University, Budapest

- 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



Marie Skłodowska-Curie  
Actions



# Professional background

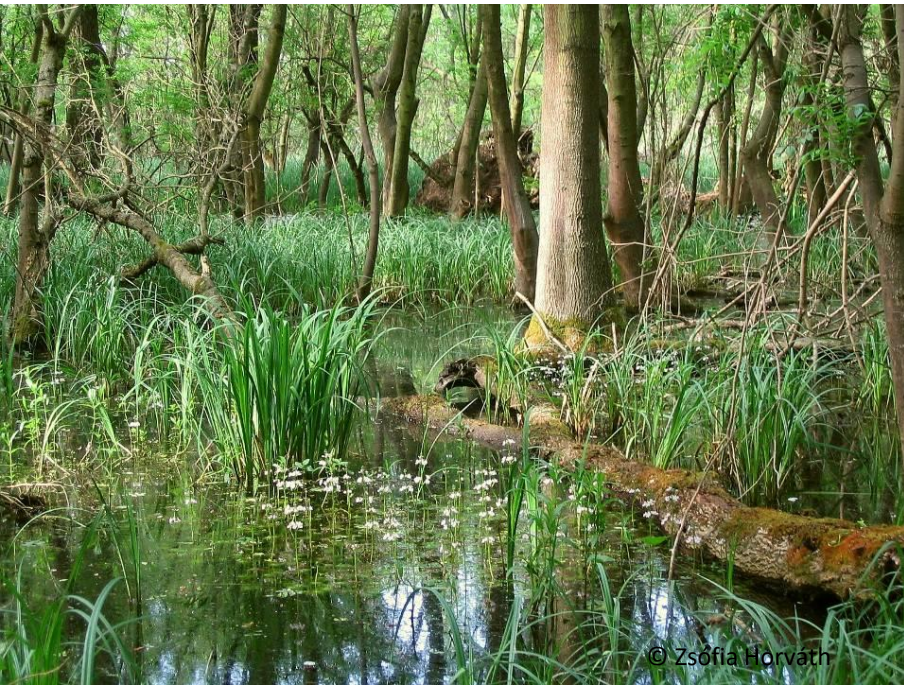
- **Limnology** = the study of inland waters (equivalent of oceanography but focusing on continental waters)



- **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

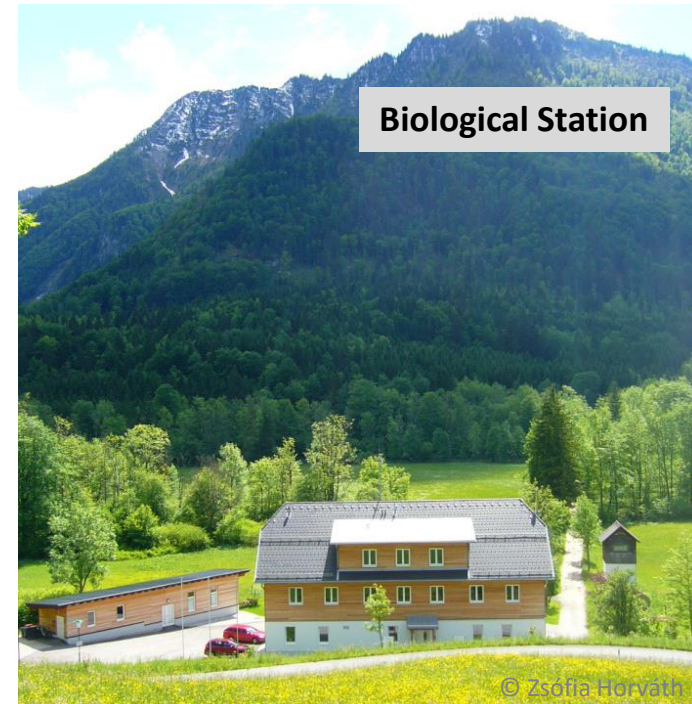
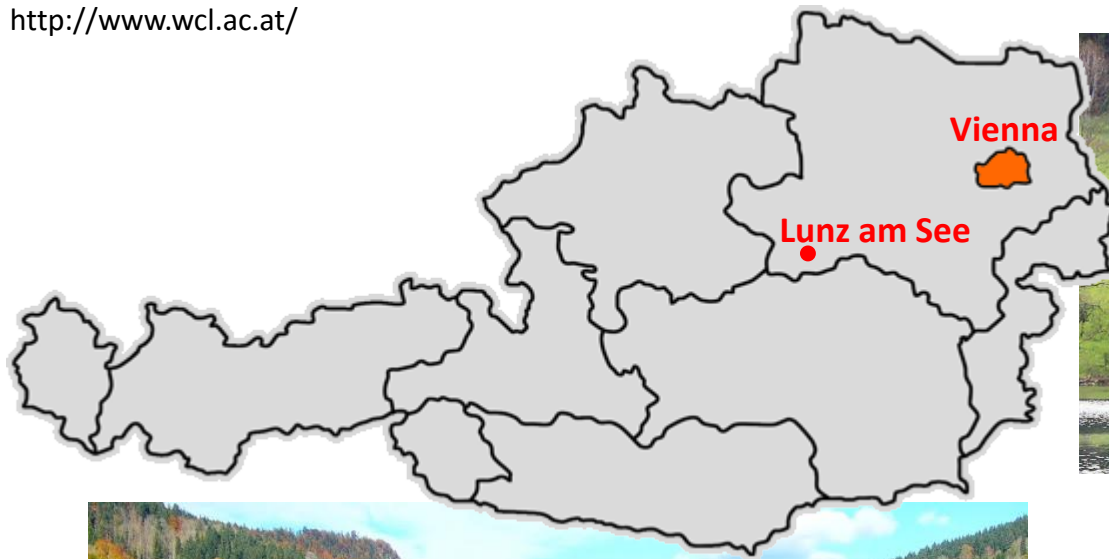
- Ecology and conservation value of ponds and their zooplankton  
→ Ponds are unique for biodiversity!
- Empirical studies





# WasserCluster Lunz

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





# International atmosphere



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



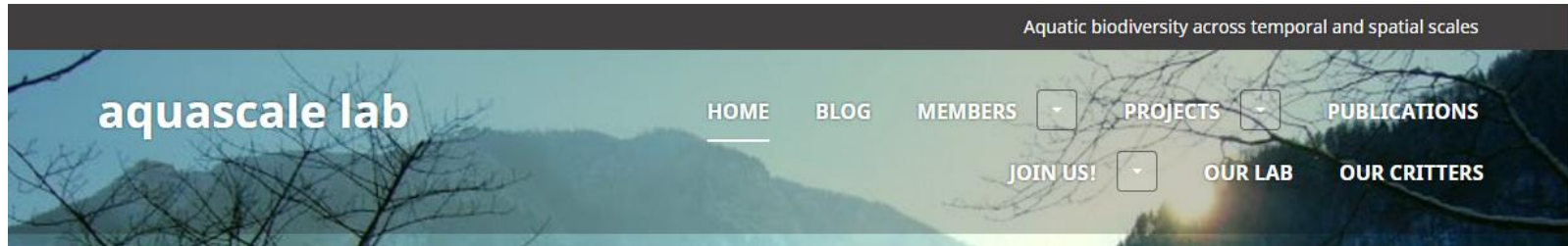
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<http://www.wcl.ac.at/>

# Biological Station

**Our lab:**

<https://aquascalelab.wordpress.com/>





# Biological Station



Well-equipped labs



Outdoor experimental facilities



Walk-in climate chamber



Lake lab with boat



© Attila Péntek



<http://www.ybbstaler-alpen.at/>



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Krampus/Perchtenlauf



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# Zooplankton



**Not only important for whales in oceans...**



# In freshwaters...



Tiny crustaceans

Rotiferans



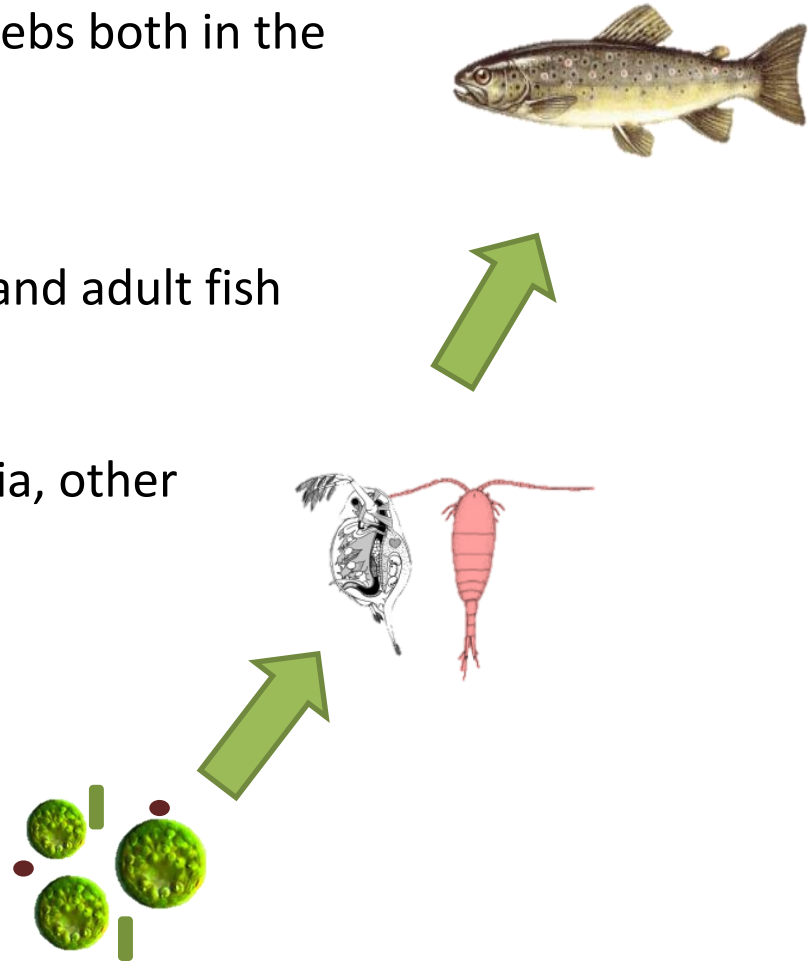
Even jellyfish...





# 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

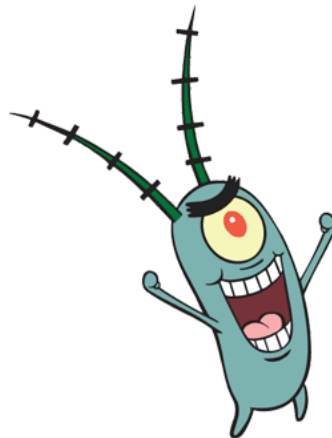


# Crustaceans in the zooplankton

- Water fleas:



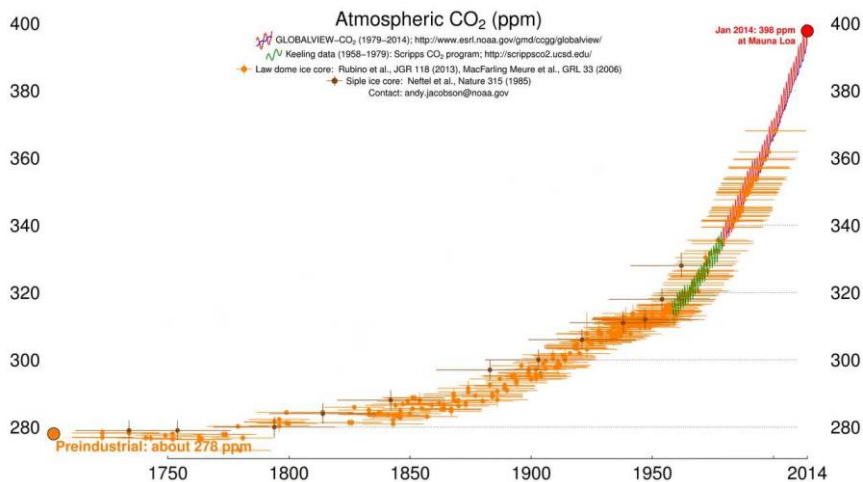
- Copepods





# 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



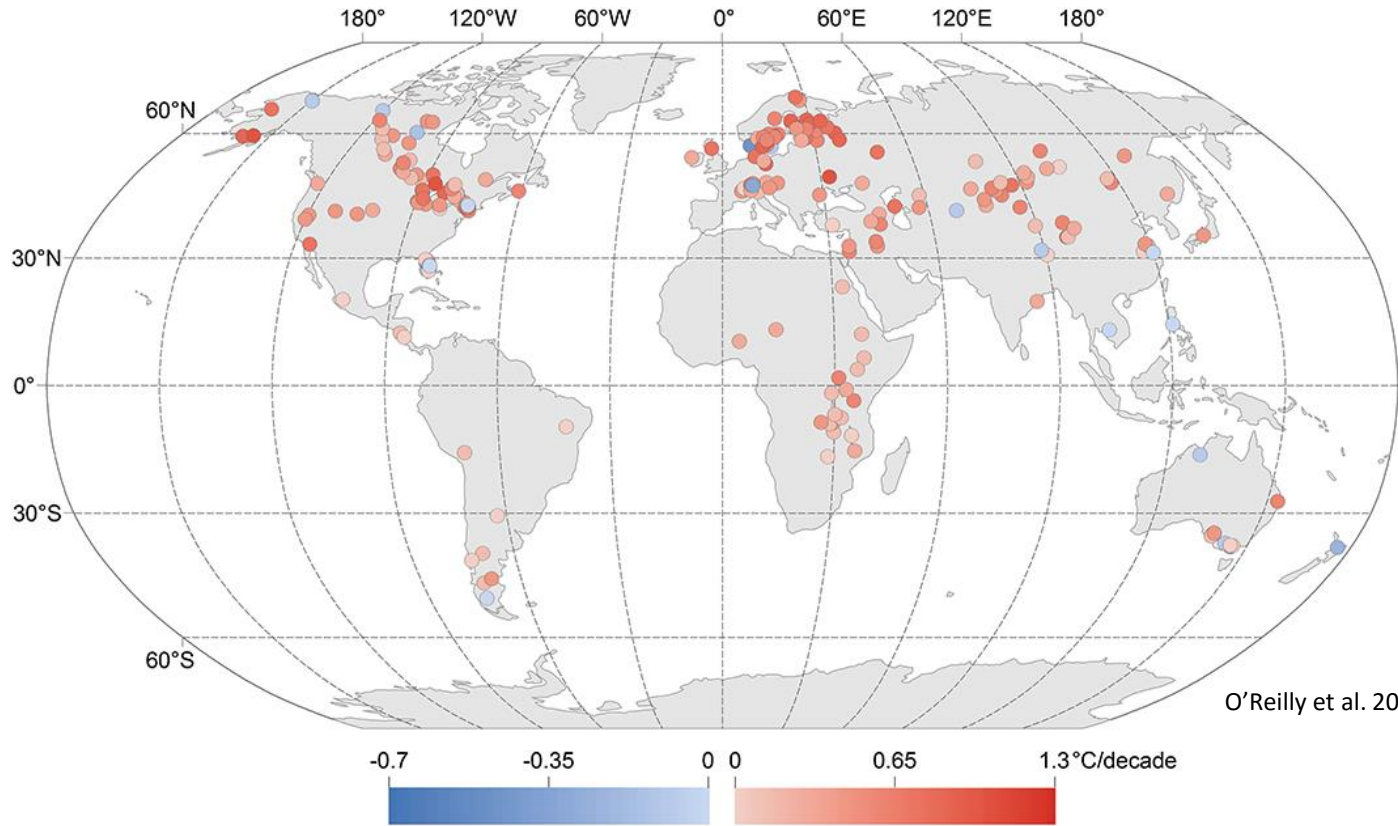
# Effects of climate change on lakes...

- 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!**



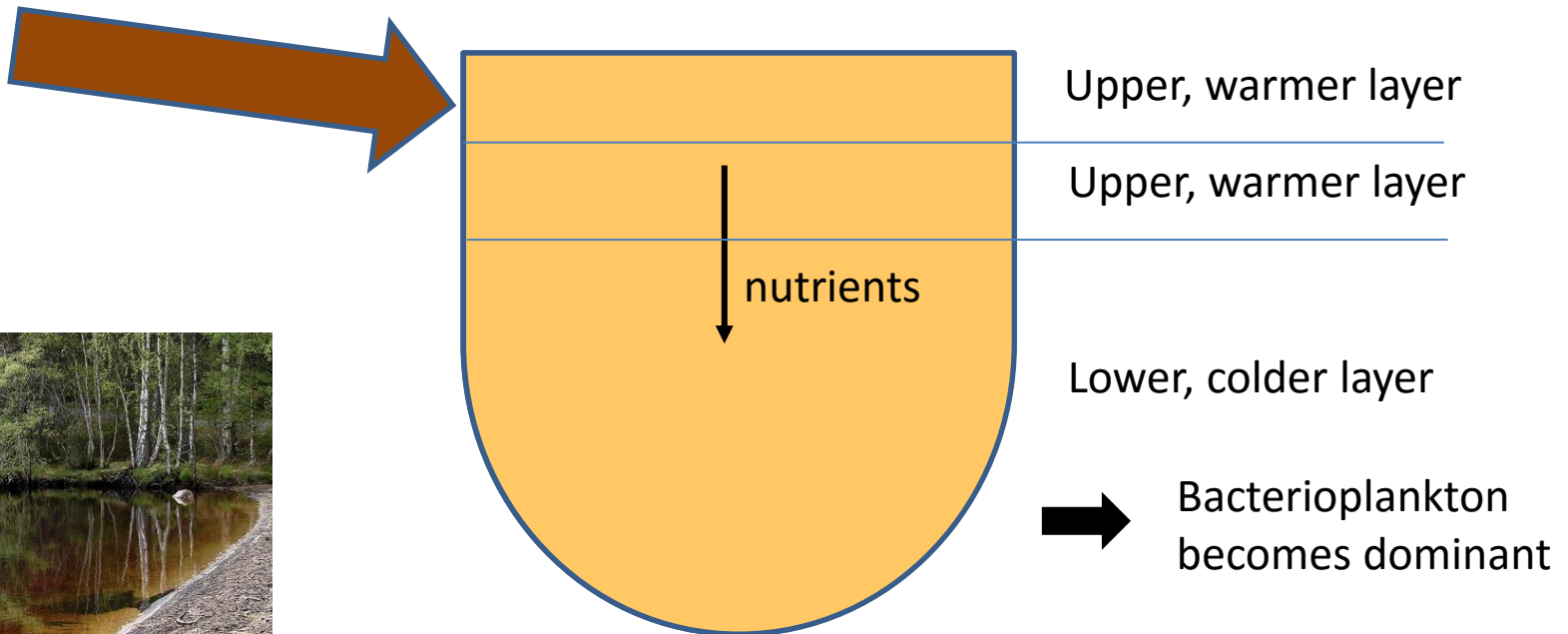


# Global increase in surface temperature



# Oligotrophic lakes

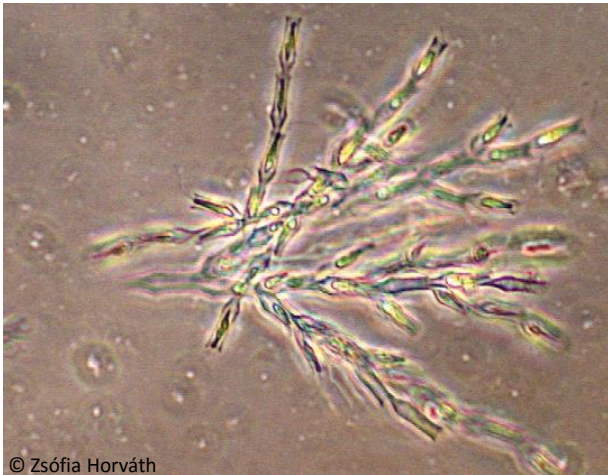
- The plankton of eutrophic (nutrient-rich) lakes are widely discussed, but much less attention is paid to oligotrophic (nutrient-poor) lakes, such as lakes in the Alps
- Warming – extended periods of summer stratification
- Browning – due to increased runoff of terrestrial organic matter



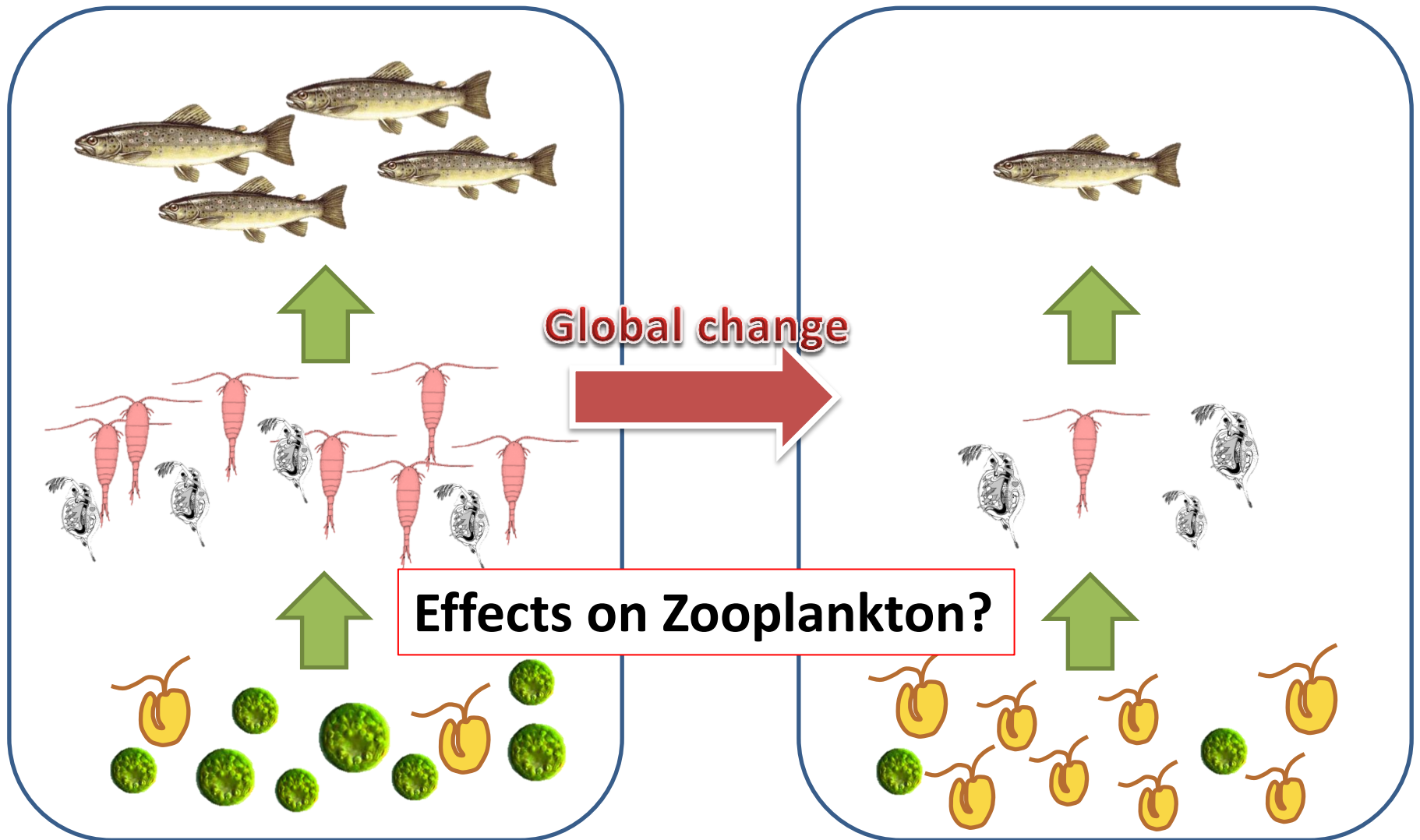


# Chrysophyte algae (=Golden algae)

- **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?





# Lake Lunz

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



© WasserCluster Lunz

In the 50s...



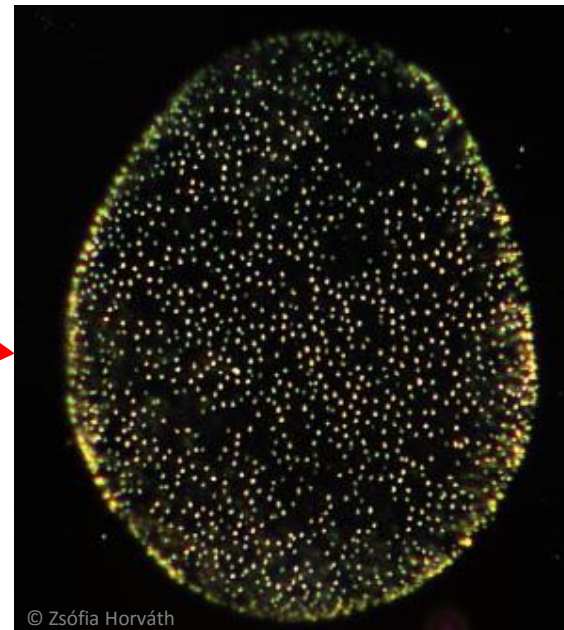
orf.at/

# Uroglena blooms in lake Lunz



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- Cloudiness of the water
- Fishy odour
- Effects on trophic structure?



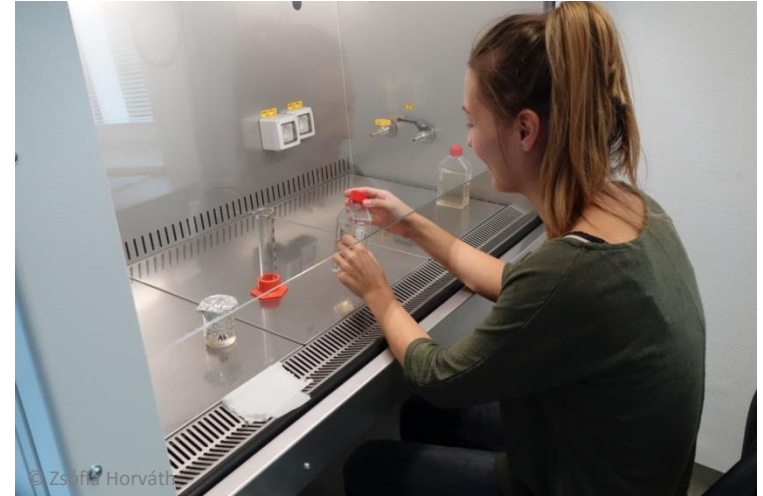
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# Isolating and maintaining cultures



Pure algal cultures

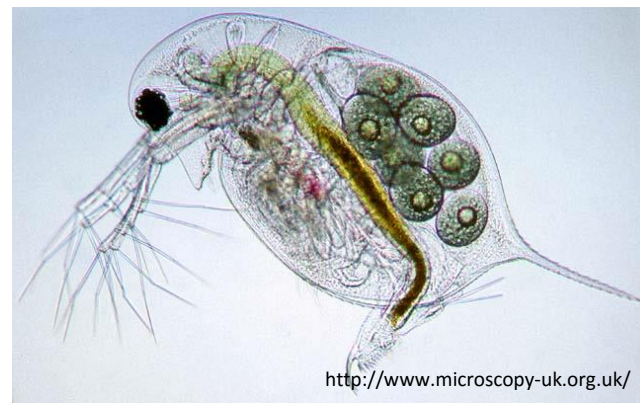
Zooplankton

# Feeding experiments



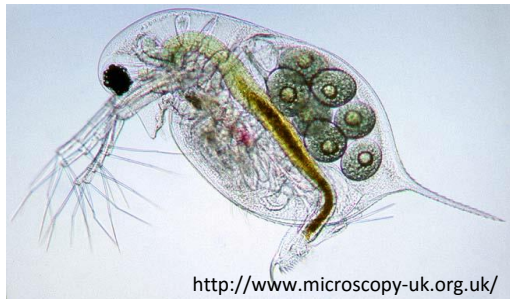


# Target species

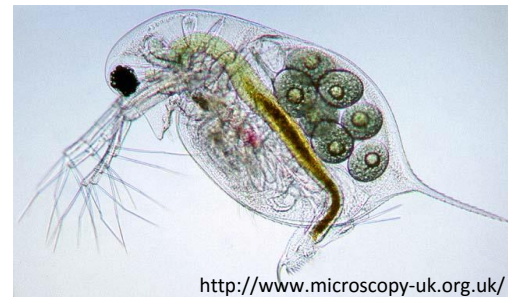


# Results

- Both algae have negative effects on zooplankton
- The effects were species-specific among zooplankters
- Food quality: water fleas are more tolerant

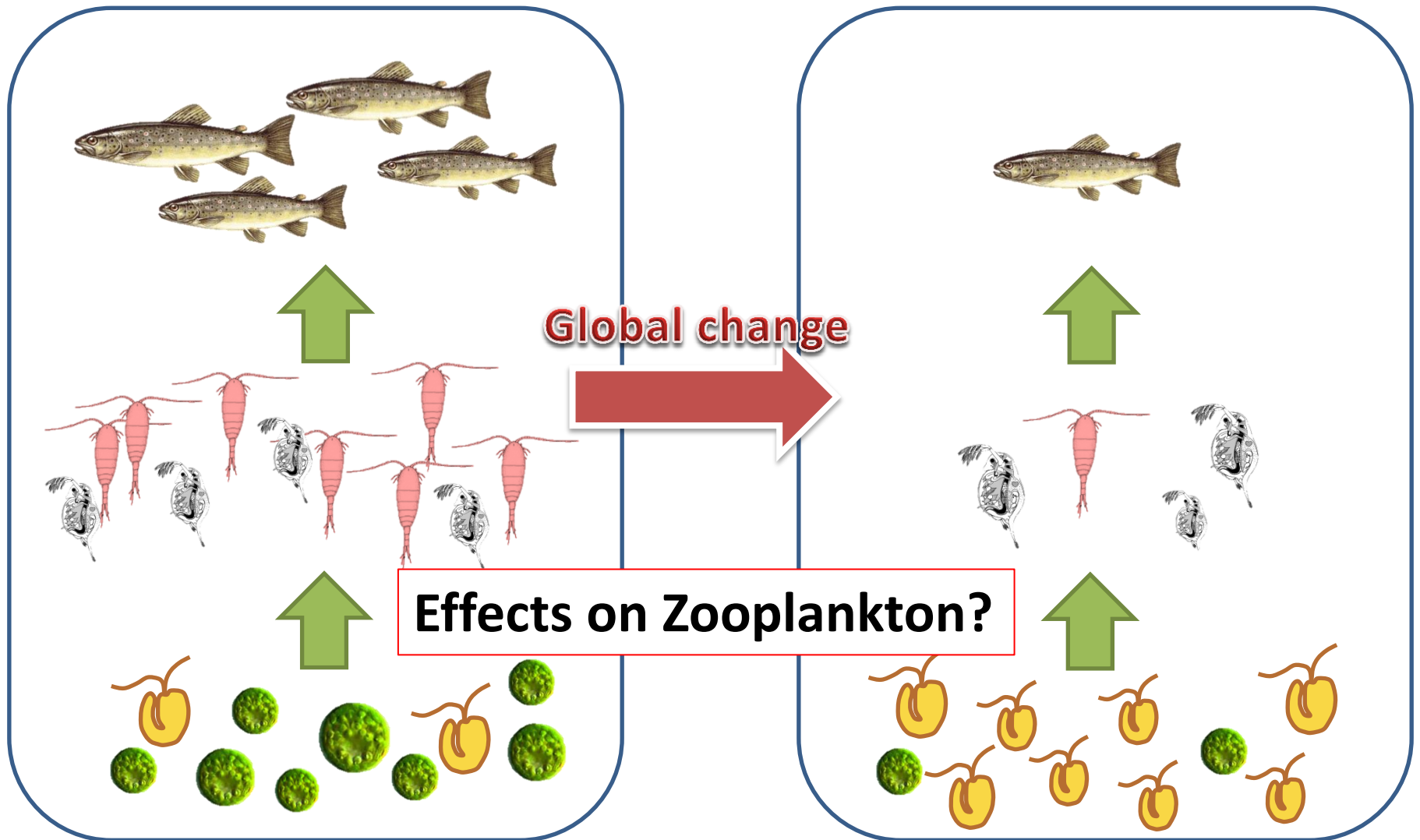


- Physical interference: copepods are more tolerant





# What are the implications of golden algae blooms in aquatic food webs?



THANK YOU FOR YOUR ATTENTION!