

The European Geosciences Union  
General Assembly 2020  
4 - 8 May 2020  
Vienna, Austria

# Eemian environmental changes recorded in the north located lakes (N Poland and Germany) - subfossil Cladocera data



**Pomeranian  
University**  
In Słupsk

**Monika Niska**

**Anna Hrynowiecka, Joanna Mirośław-Grabowska,  
Andreas Börner, Robert Sokołowski**



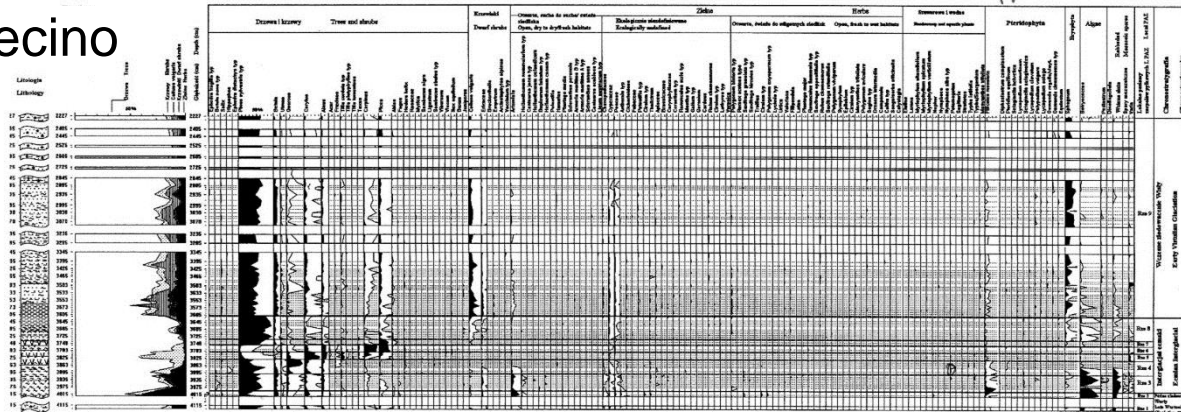
## A grayscale map of the world centered on the North Pole. The continents are shown in light gray, and the oceans are white. A grid of latitude and longitude lines is visible. The continent of Europe is highlighted in a solid dark green color, making it stand out from the rest of the map.



- Eemian profiles  
+ Cladocera analysis
- Cladocera analysis  
(M. Niska)
- ➡ Presented profiles:  
Hinterste Muhle,  
Rzecino, Łęczyce

# Pollen analysis

## Rzecino

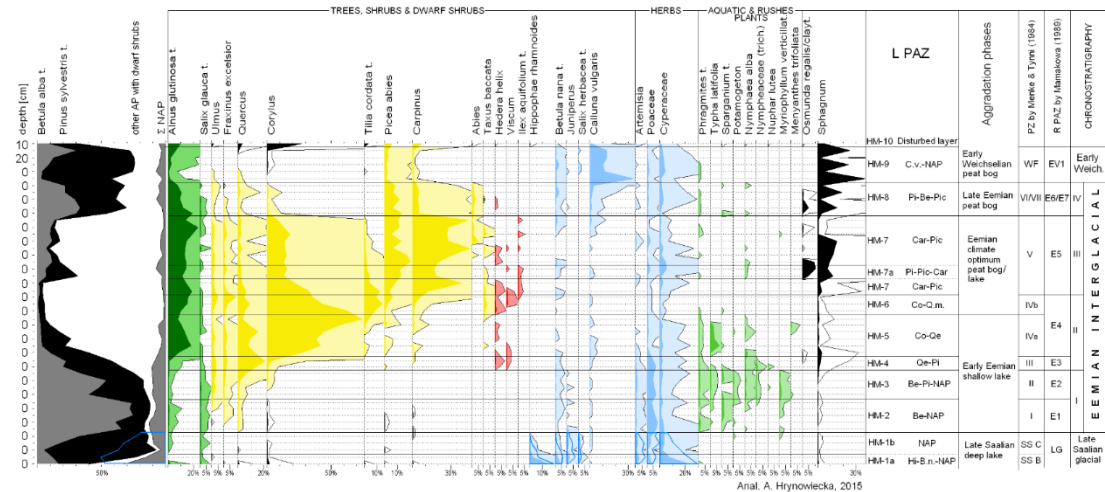
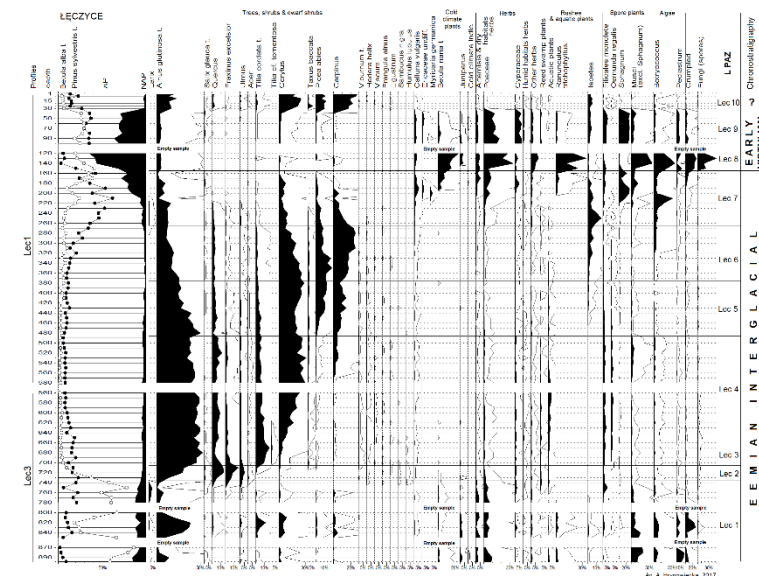


## Pollen analysis H. Winter (Winter et al., 2008)



## Hinterste Mühle

## Łęczycze

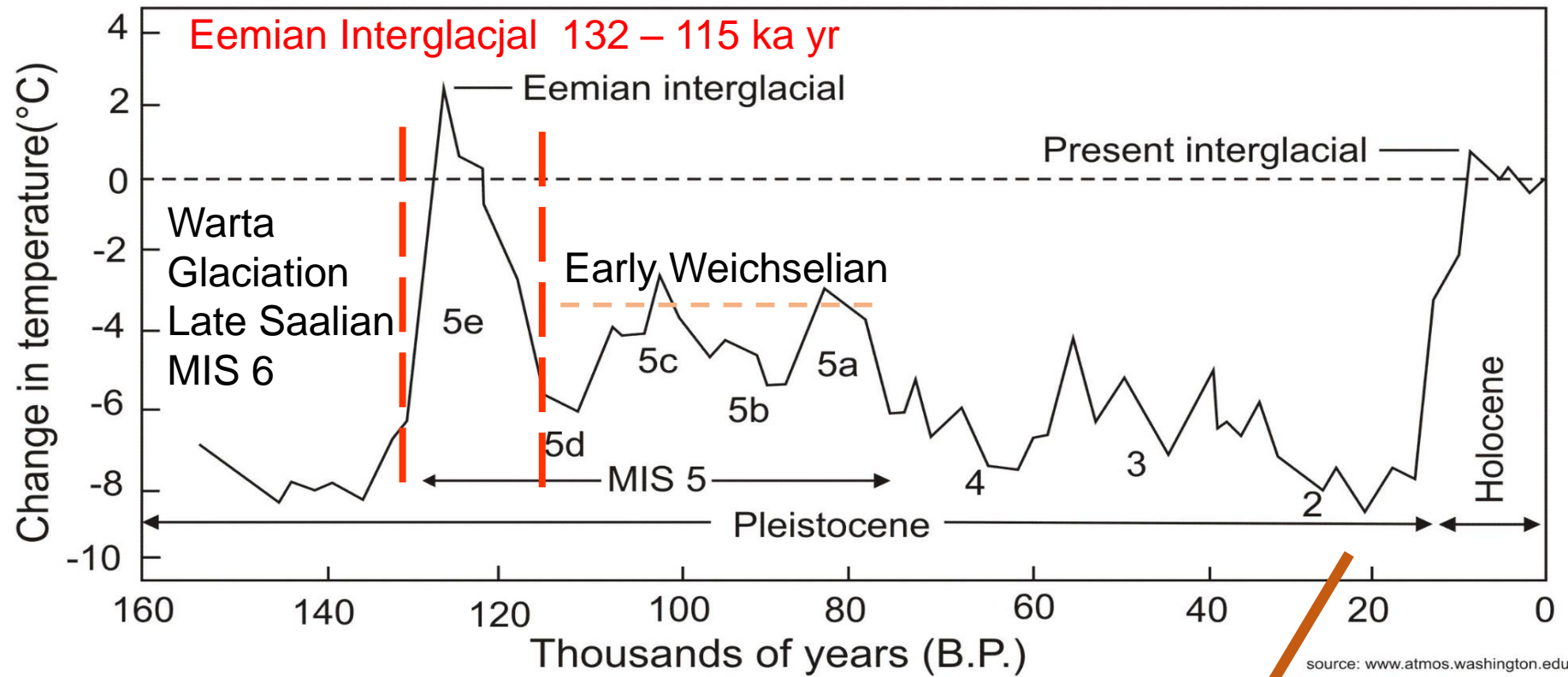


## Pollen analysis A. Hrynowiecka (Boerner et al., 2016)

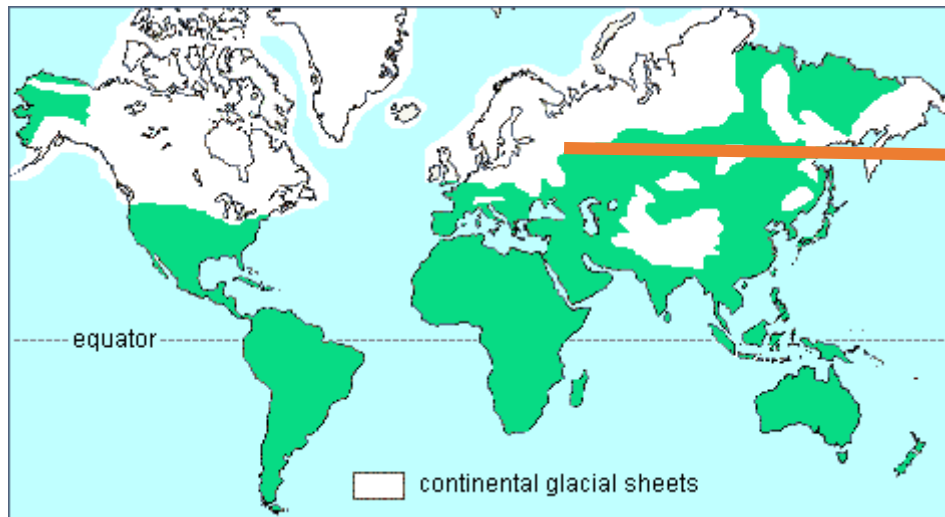
## Pollen analysis A. Hrynowiecka (2019)



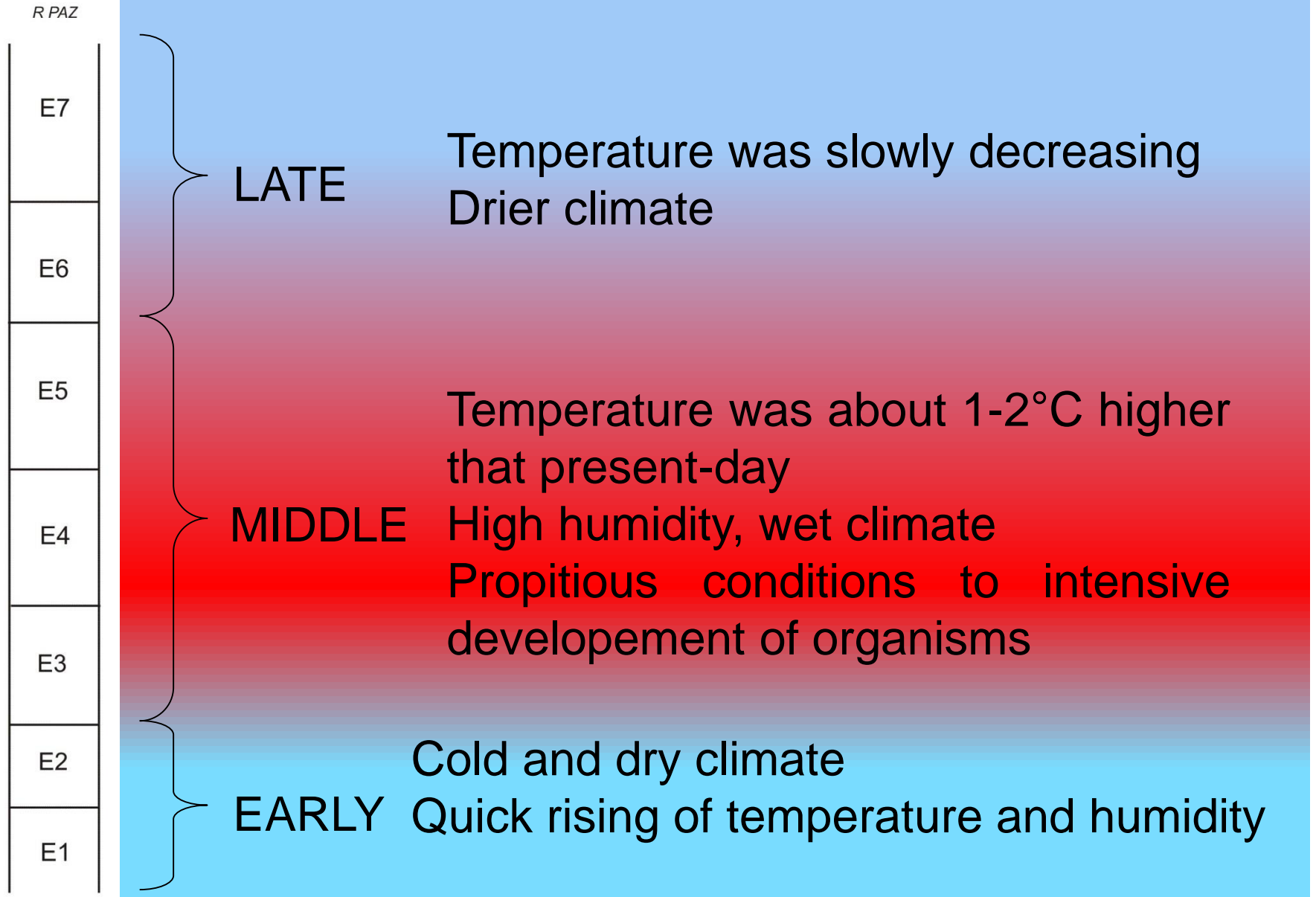
# Eemian Interglacial



source: [www.atmos.washington.edu](http://www.atmos.washington.edu)



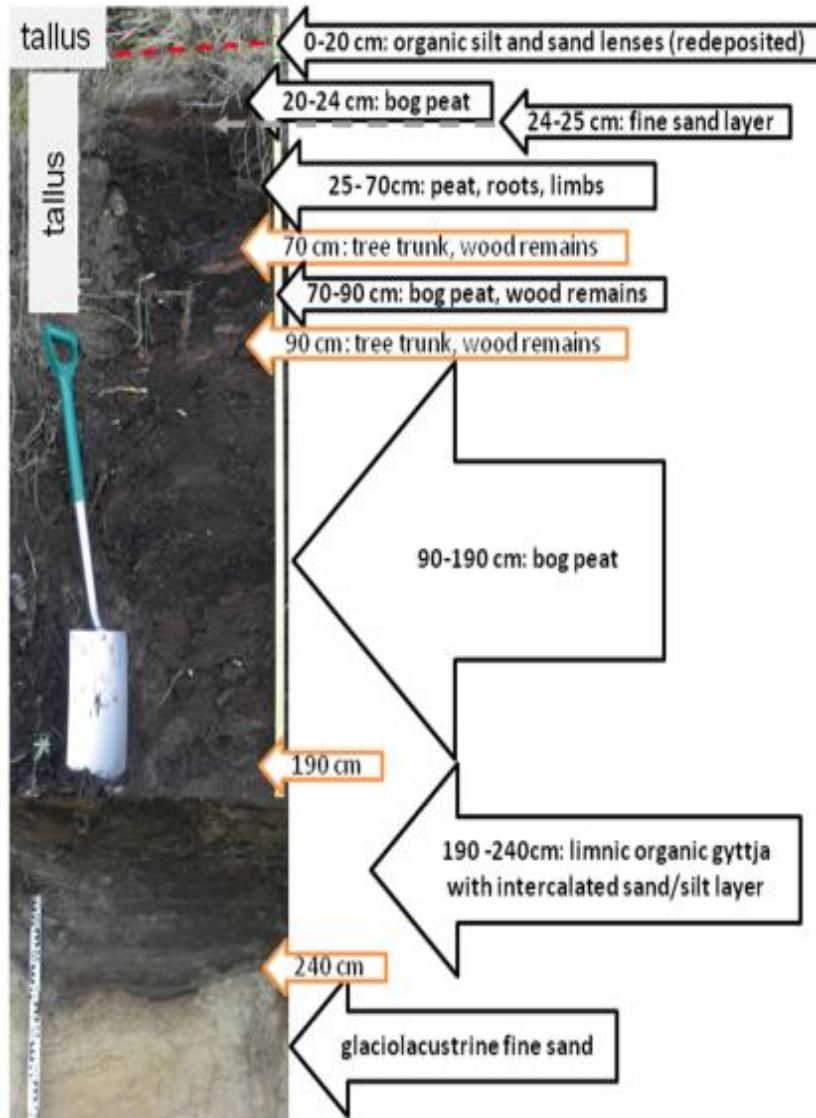
# Eemian Interglacial



# Lithology of the profiles

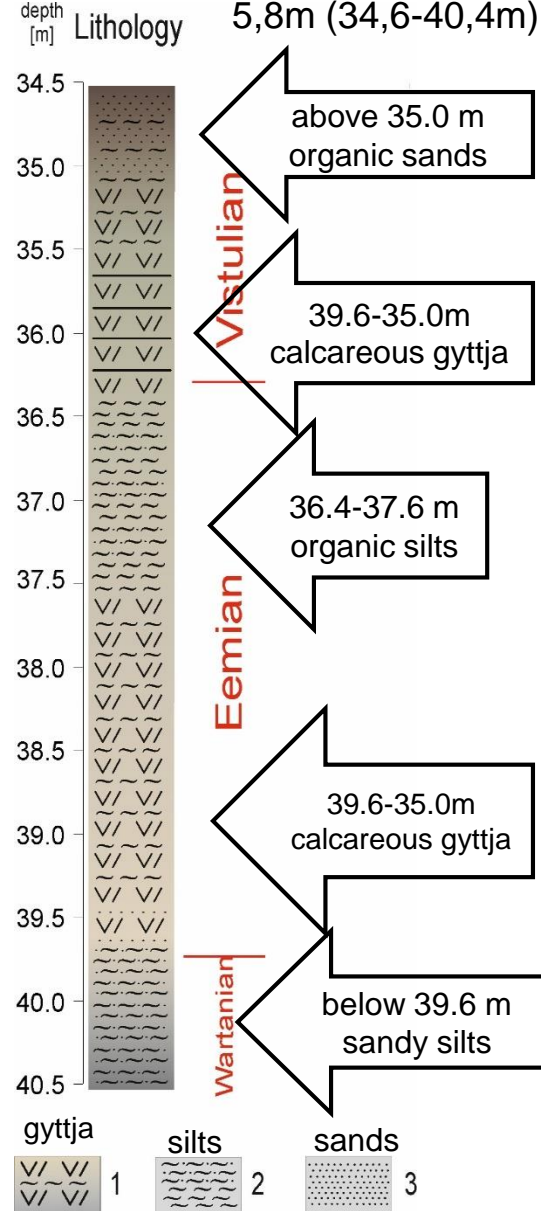
## HINTERSTE MUHLE

Length of profile: 2,1m  
(0,25 – 2,35m)



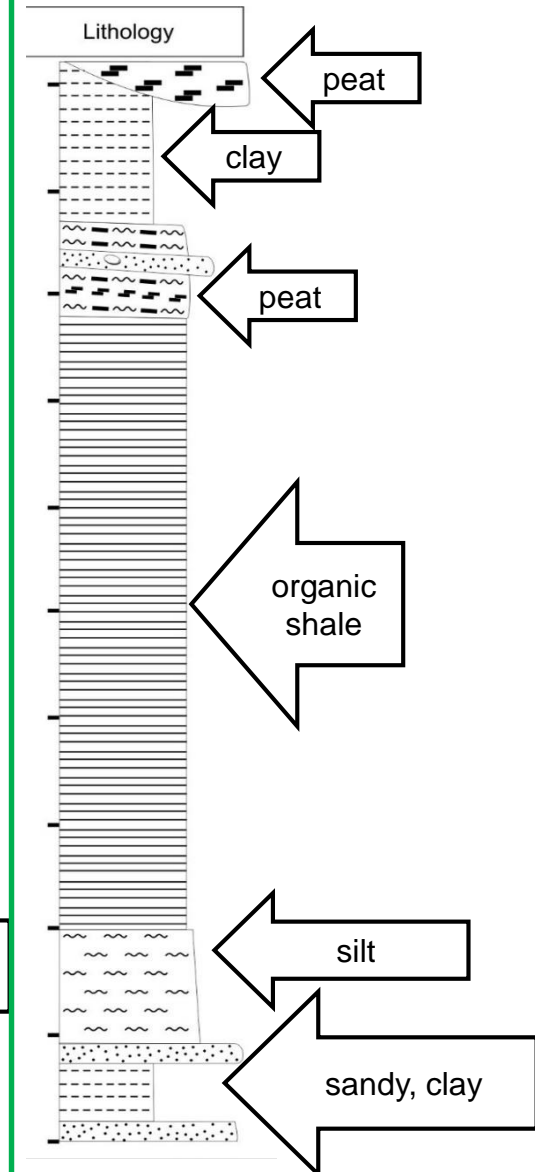
## RZECINO

Length of profile: 5,8m (34,6-40,4m)



## ŁĘCZYCE

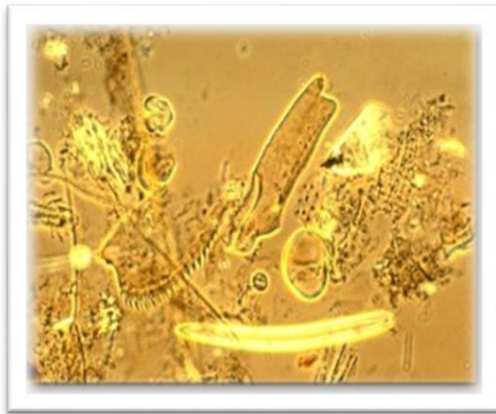
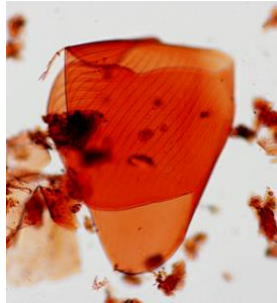
Length of profile: 8,9m (0,1- 9,0m)



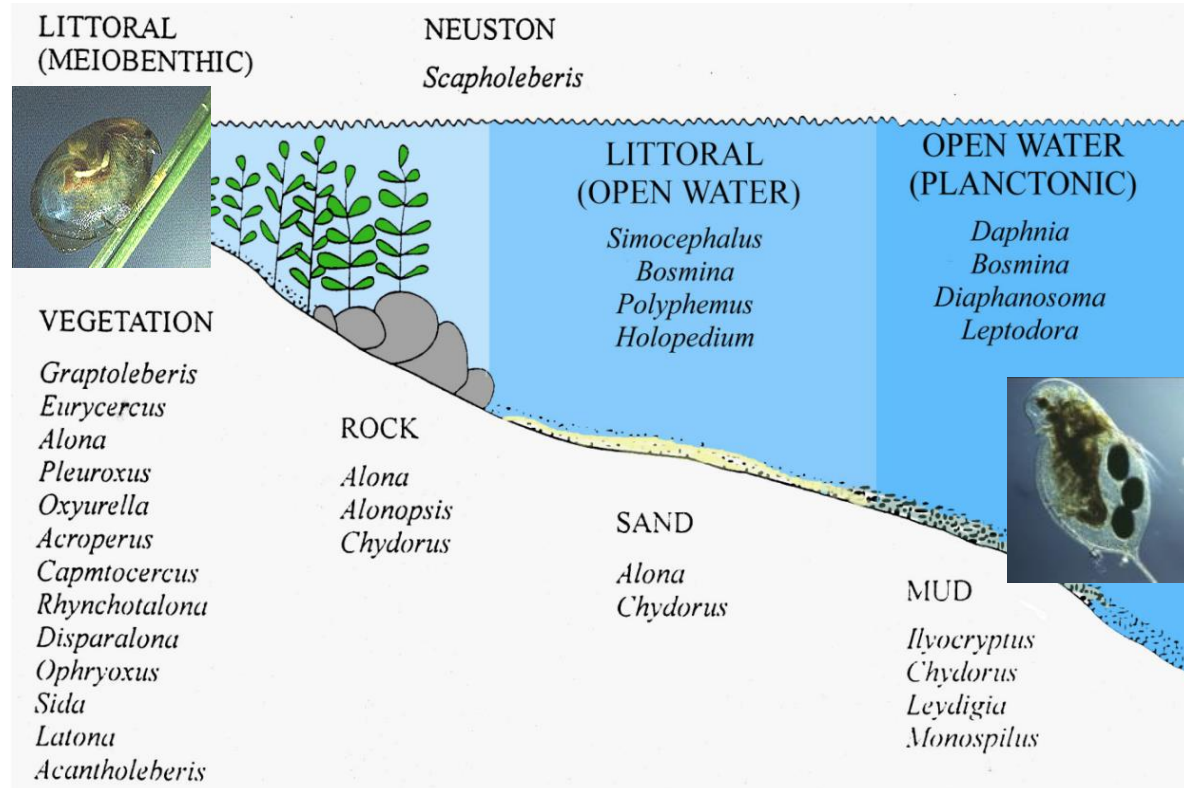


# Cladocera analysis

🐟 Cladocera (Crustacea) belong to the lake's zooplankton, their chitinous remains preserve in sediments thousands of years (more than 100k).



🐟 Cladocera have known ecological and climatic requirements. This allows to recreate the lake conditions in the past e.g: changes in trophic state, water level, pH, presence of planktivorous fish and macrophytes

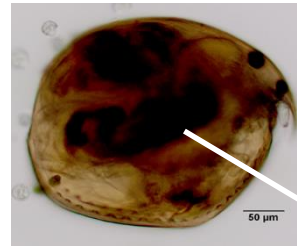
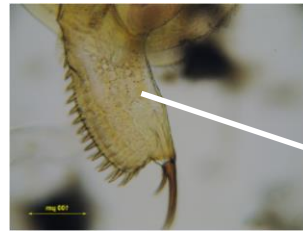


# Preservation of the Eemian Cladocera remains

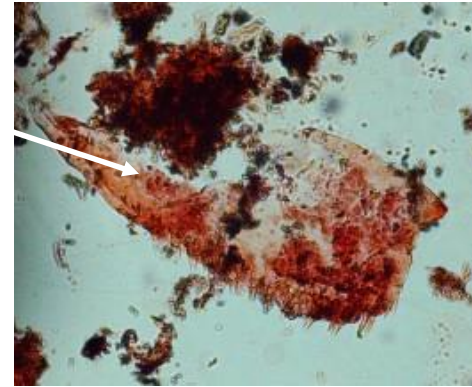
EEM

HOLOCEN

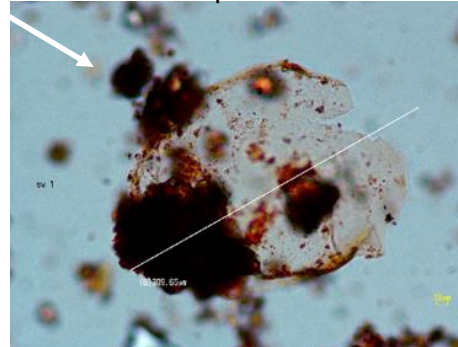
- Standard methodology (Frey, 1986), modified for older sediments
- Poor state of the remains preservation



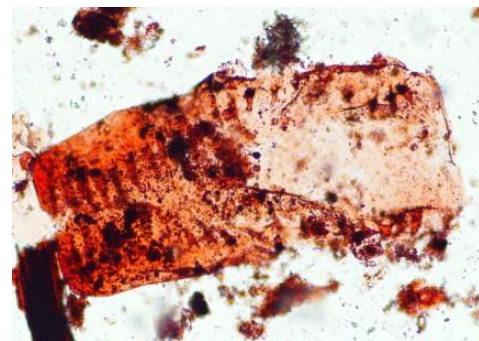
cfb.unh.edu



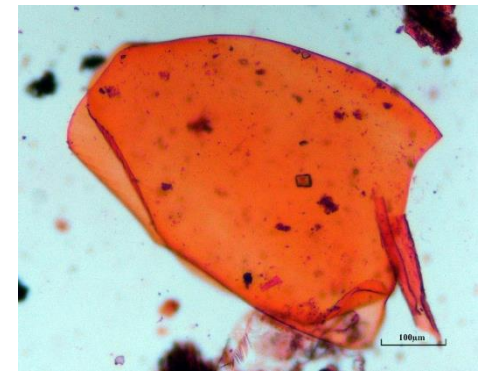
*Alona affinis* - postabdomen



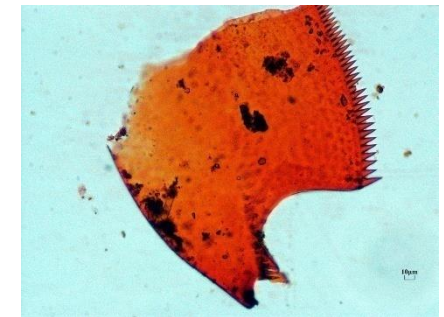
*Chydorus sphaericus* - headshield



*Sida crystallina* - postabdomen



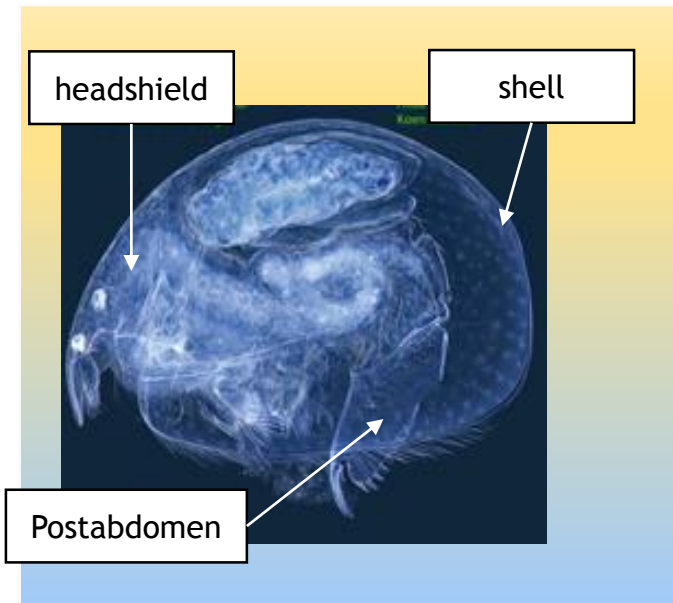
*Camptocercus rectirostris* - shell



*Eurycercus lamellatus* - postabdomen



*Graptoleberis testudinaria* - headshield



Age of the remains



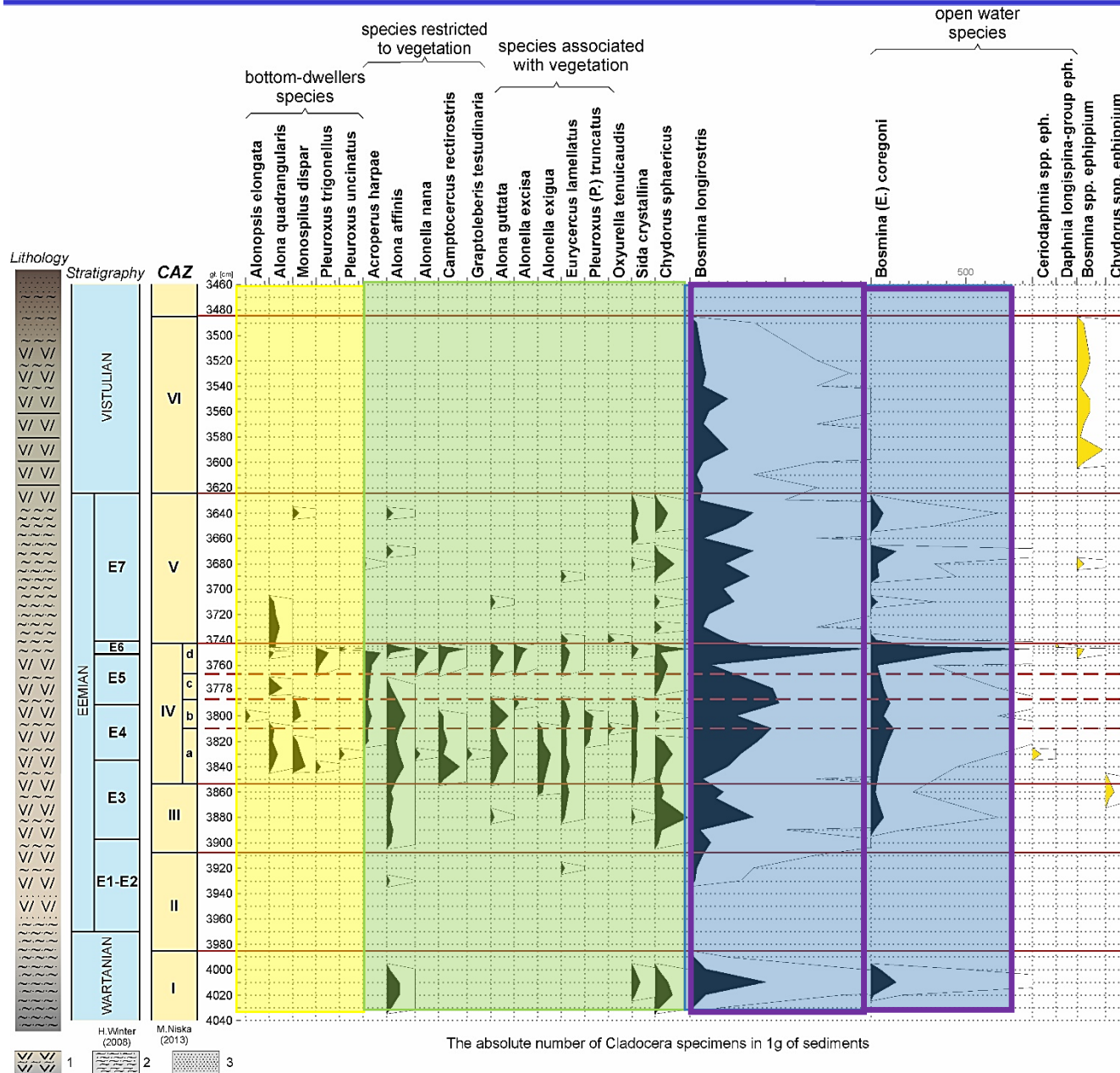
about 100,000 years



about 10,000 years

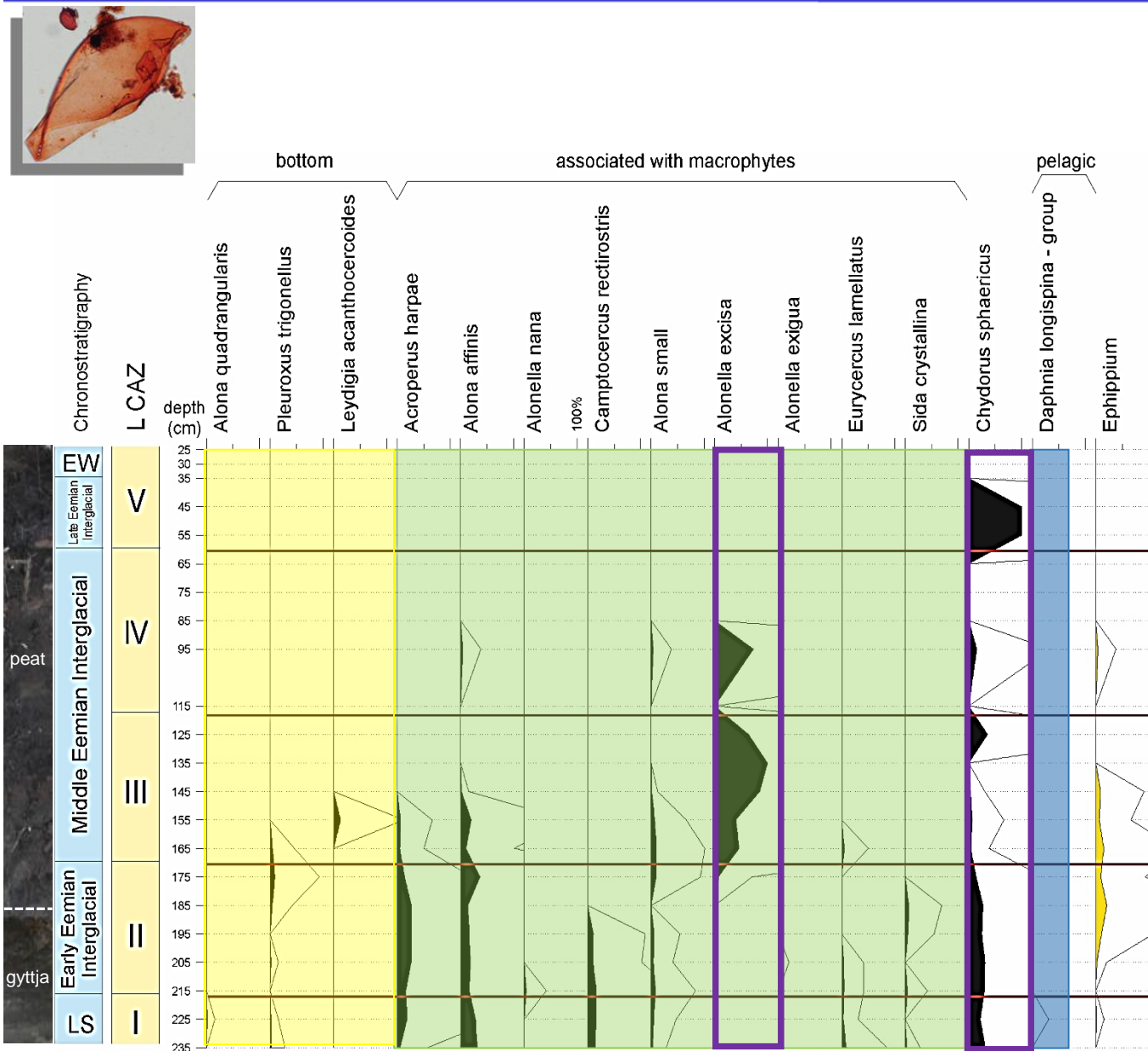


# Cladocera analysis – Rzecino profile



- **22 species, 4 families** Bosminidae; Sididae; Daphnidae, Chydoridae;
- **Predominant species** from open water zone *Bosmina* sp.
- **6 distinguished** Cladocera development zones
- **Max. number of specimens - 3700 ind./1g** – LE IE E6
- **Max. number of species** - Middle Eemian E3/E4 – **15**;
- **Numerous ephippia** from E3, max EV
- **Progressive cooling** - reducing the number of specimens;

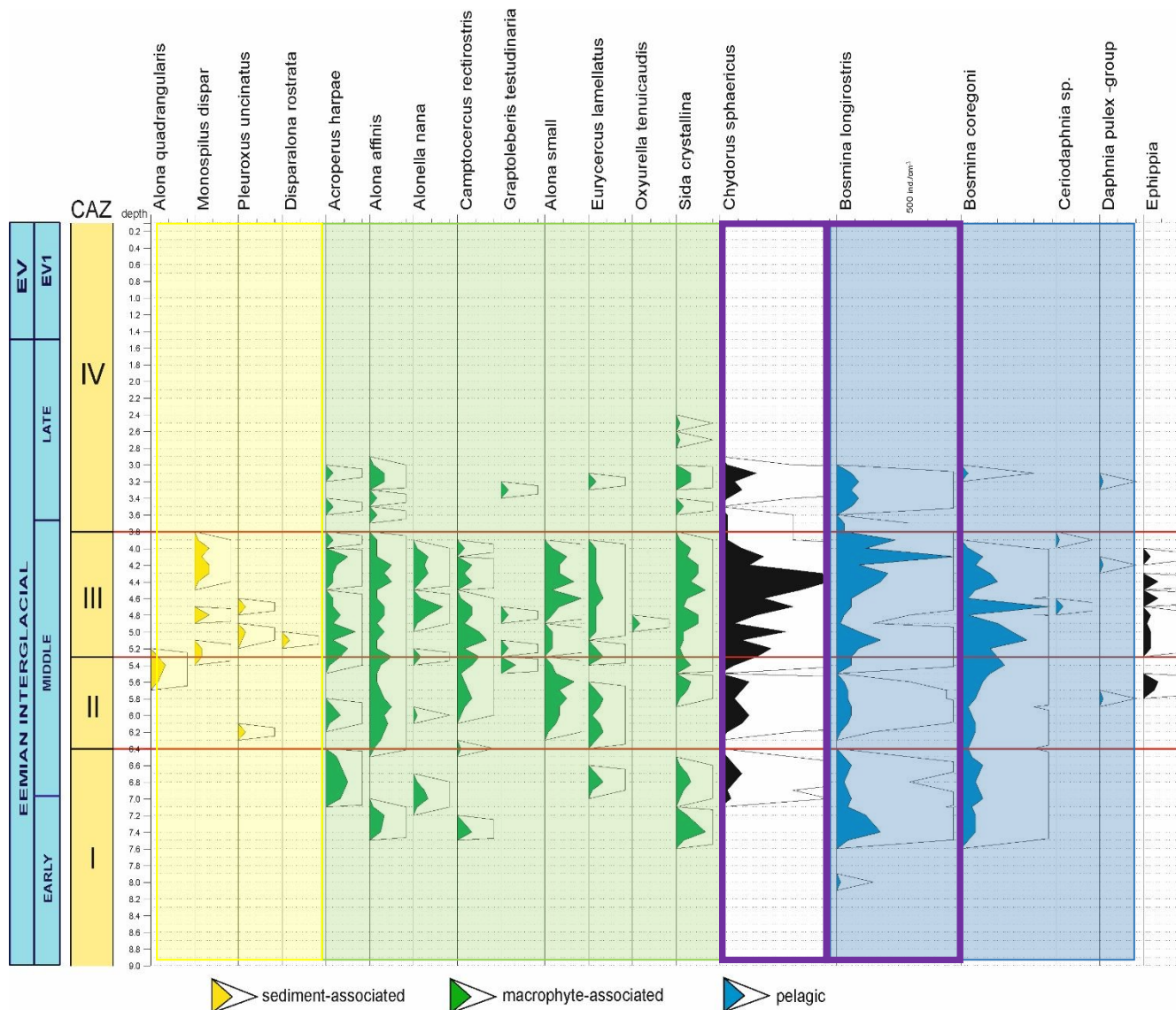
# Cladocera analysis – Hinterste Mühle profile



- **14 species; 3 families:** Daphnidae, Chydoridae; Sididae;
- Predominant littoral species associate with microphytes
- 5 distinguished Cladocera development zones
- Max. number of specimens - **2128 ind./1g** –late LS
- Max. number of species - **LS/EE -11 species**
- Progressive becoming land - reducing the number of specimens
- Cladocera with higher thermal requirements occurs from the LS



# Cladocera analysis – Łęczyce profile

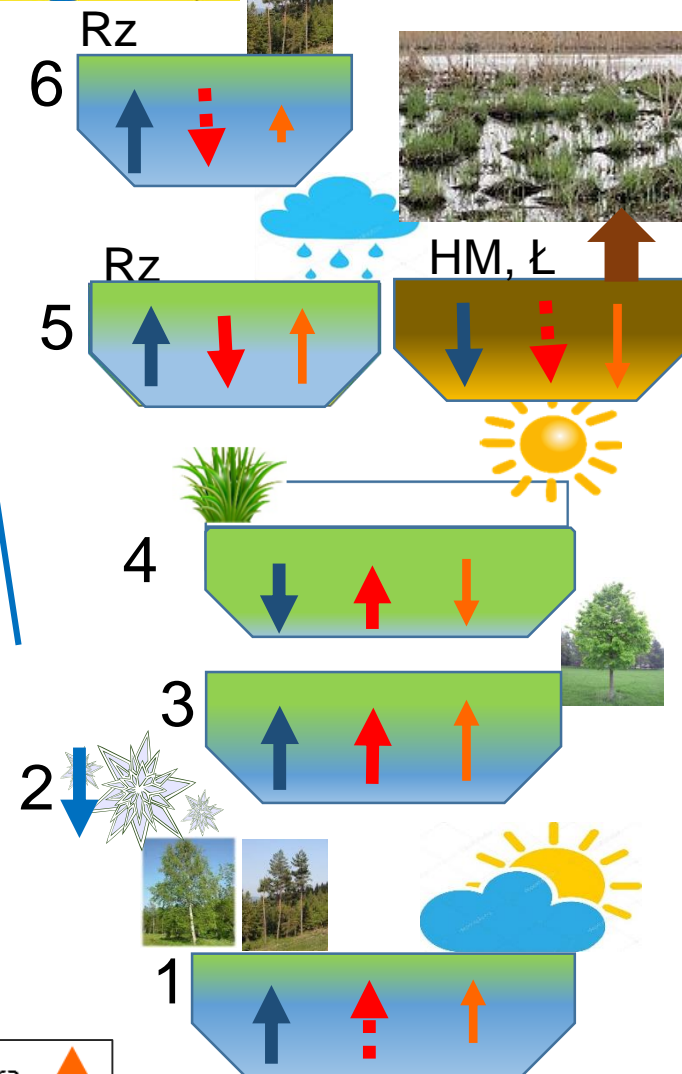
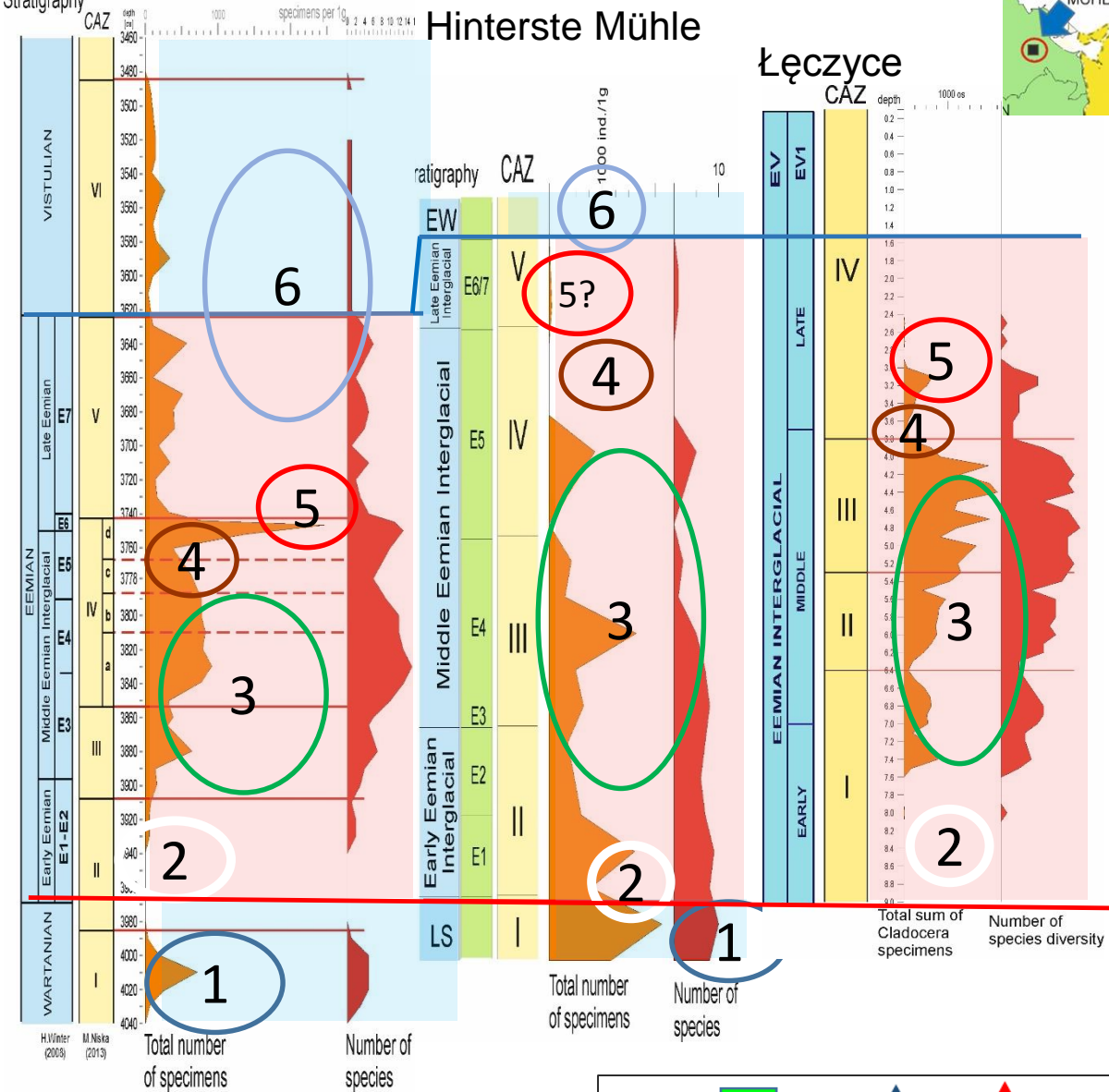


- **18** species; **4** families: Chydoridae, Sididae, Bosminidae and Daphnidae ;
- Predominant littoral species associate with microphytes
- 4 distinguished Cladocera development zones
- Max. number of specimens - **2125 ind./1g – ME (E5)**
- Max. number of species - ME (E5) -**18 species**
- Cladocera with higher thermal requirements occurs from the EE

# Environmental changes in the lakes

Rzecino

Stratigraphy



Vienna, 2020



# Conclusion

---

- Sedimentation at the paleolakes started in the Warta Glaciation (Late Saalian – MIS 6) then lasted continuously throughout the Eemian Interglacial and Early Vistulian (MIS 4).
- The examined reservoirs were different: Hinterste Muhle paleolake was shallow, Łęczyce and Rzecino much more deeper – and they react differently for regional climate changes.
- The best conditions for the development of zooplankton in lakes occurred at the end of Late Saalian and beginning of the Eemian (E1), and in E4 and the first part of the middle Eemian (E5) and the first part of the Late Eemian (E6) but only in Rzecino paleolakes.
- With the rise of temperature from the beginning of Middle Eemian, the trophies of the paleolakes were also gradually growing and from the E6 started to decrease with the progressive cooling and humidified.
- Conducting research on lakes that functioned in the Eemian Interglacial is important because they give the chance to follow the development of the lake in the long term (about 30,000 years and more), without the impact of human activity



Thank you for your attention