

# Testate amoebae as palaeohydrological indicators in peatland archives - the Polish experience

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# Presentation Outline

- Introduction (aims of the study, testate amoeba morphology and habitat)
  - Study area
  - Research methods
  - Results (Ecology & Palaeoecology)
  - Summary & Conclusions
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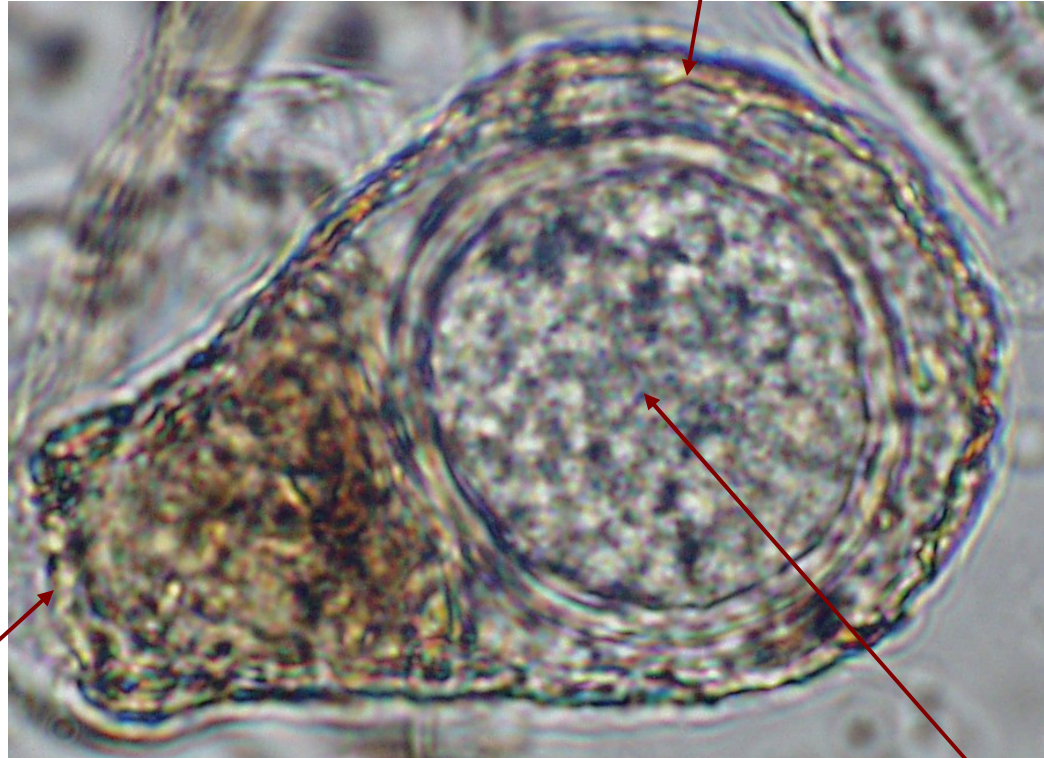
# Aims of the study

- Ecological studies of testate amoebae,
  - Development of testate amoeba based transfer functions (water table, pH),
  - Use of testate amoeba based transfer function in palaeoecological and paleoclimatological studies
  - Using testate amoeba analysis as a tool for the monitoring of peatlands
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# Structure

*Physochila (Nebela) griseola*  
(Penard 1911)

**The test** (shell)  
protects the  
cytoplasm



Pseudopodia  
emerge through  
the **aperture** ...

**Cyst**  
...but this specimen is  
**encysted**

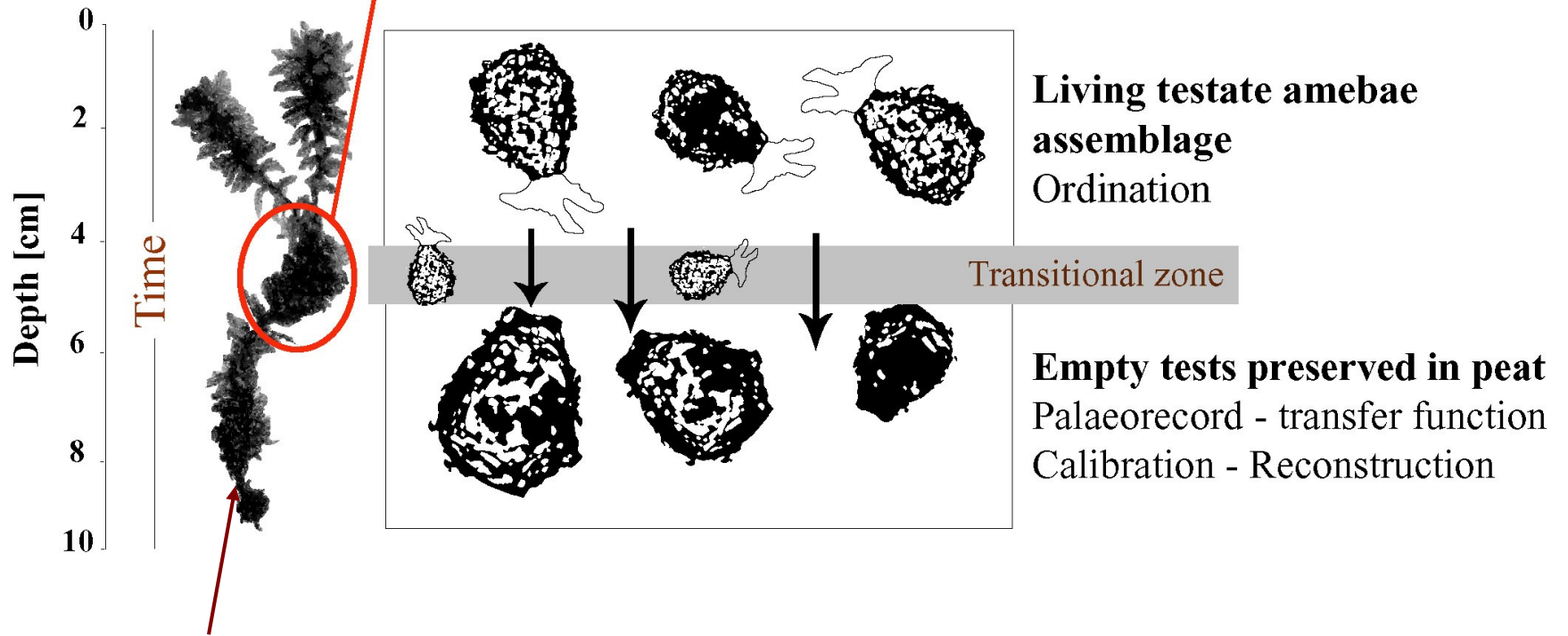
# Habitat and

# Taphonomy

*Where they live!*

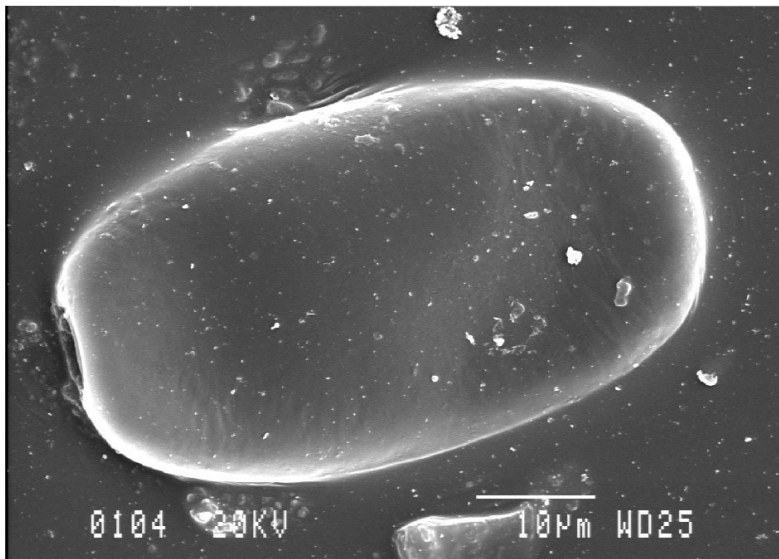
- *Sphagnum*
- lake sediments
- soils, etc ...

Last year capitulum of *Sphagnum papillosum*



*How are they incorporated into the peat?*

A



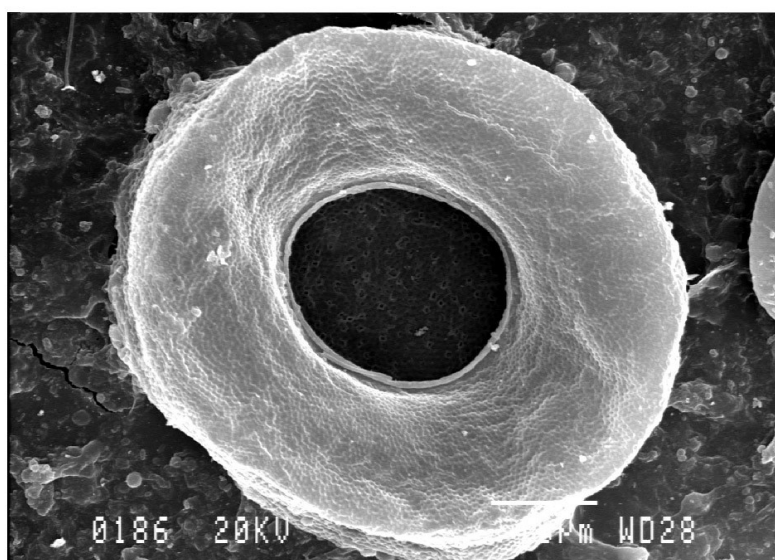
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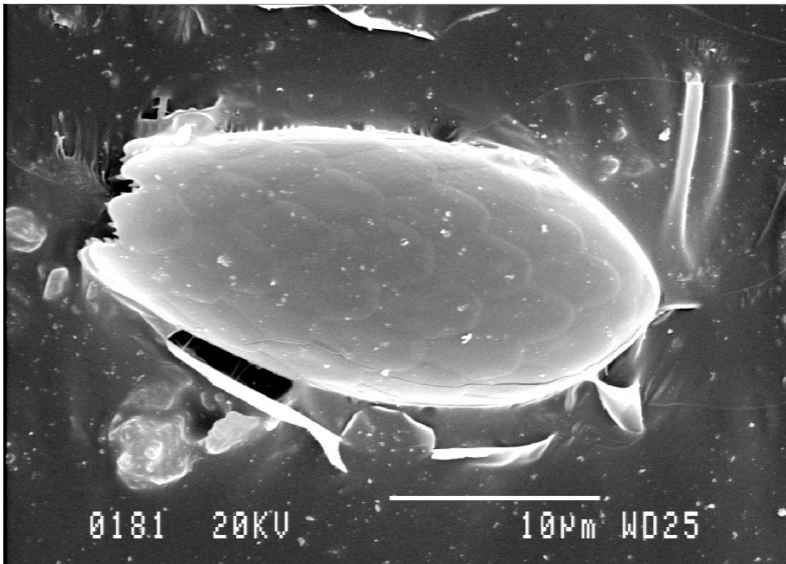
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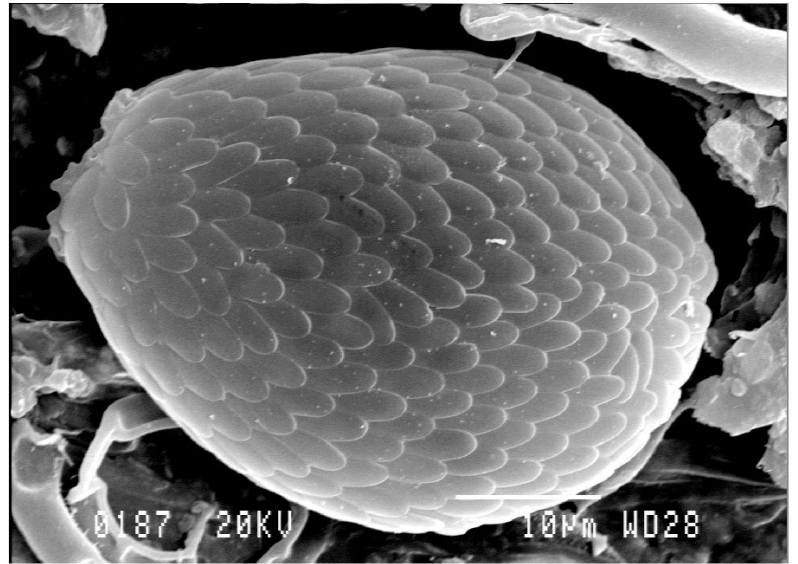
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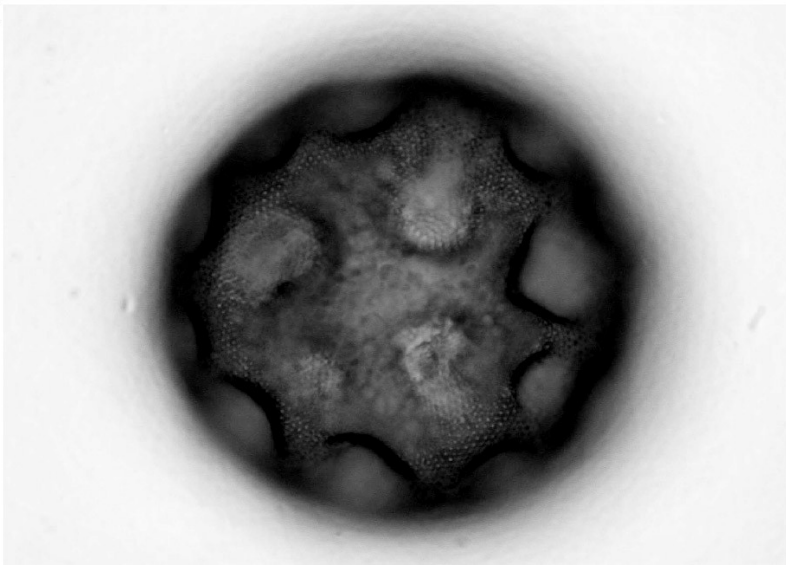
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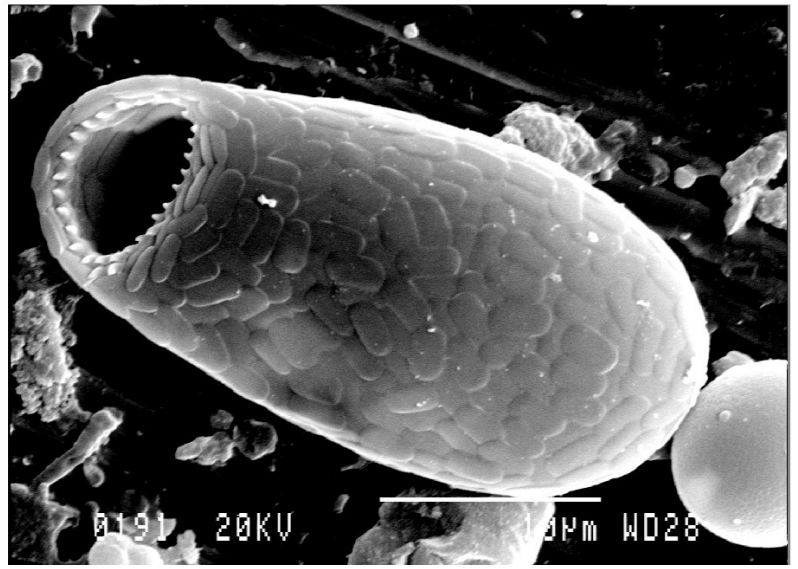
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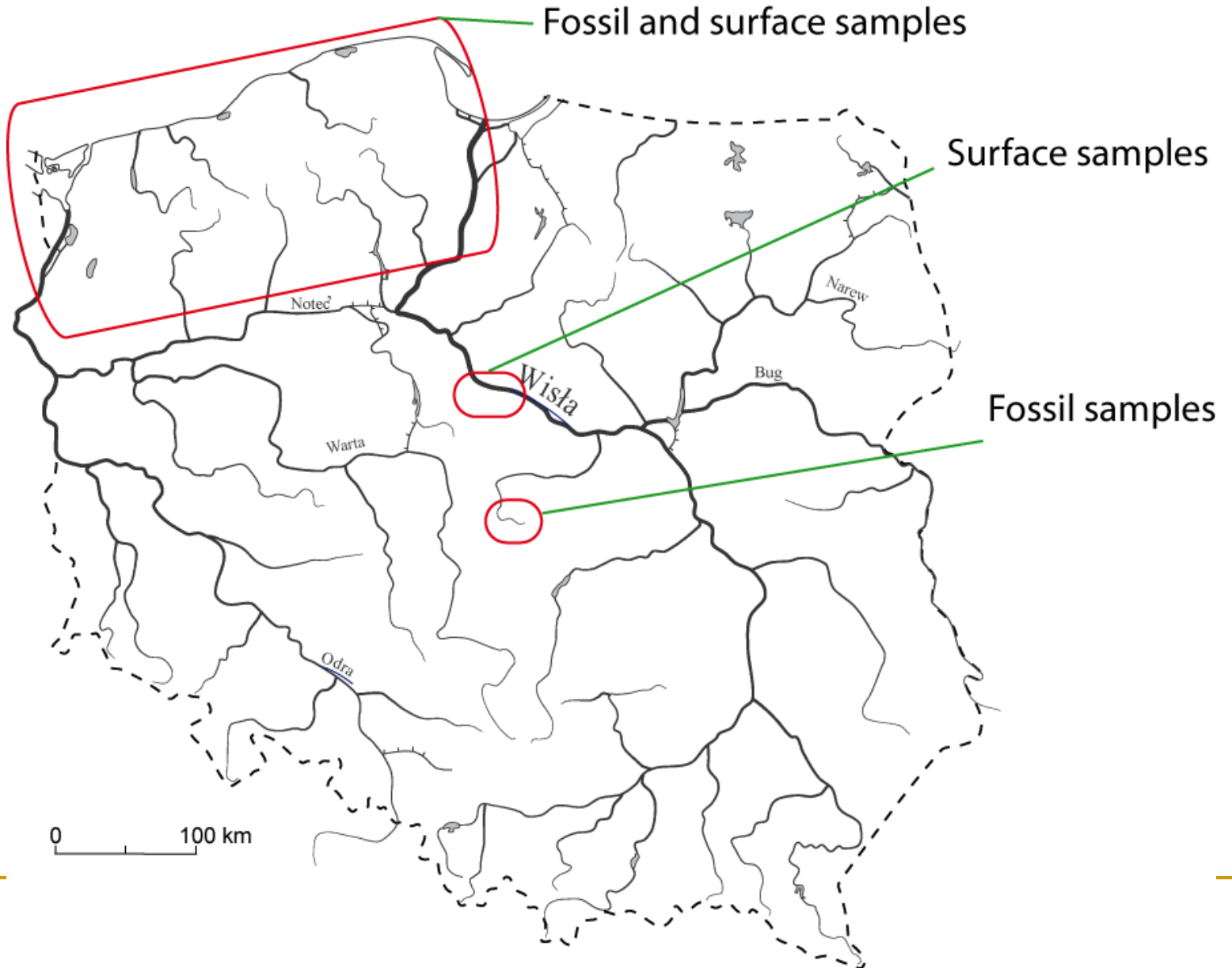
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H



# Research Area





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# Methods Stages of the research on testate amoebae

## **Stage 1. Ecological investigations**

- Field work: Surface sampling

## **Stage 2. Palaeoecological investigations**

- Field work: Coring - using a Russian and/or a Wardenaar sampler

## **Stage 3. Laboratory**

- Monolith/cores subsampling
- Surface samples preparation
- Preparation of fossil samples
- Microscopic examination - slides counting

## **Stage 4. Numerical analysis**

Where Ecology meets Palaeoecology !

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# SURFACE SAMPLING - two

## contrasted microhabitats for testate amoebae

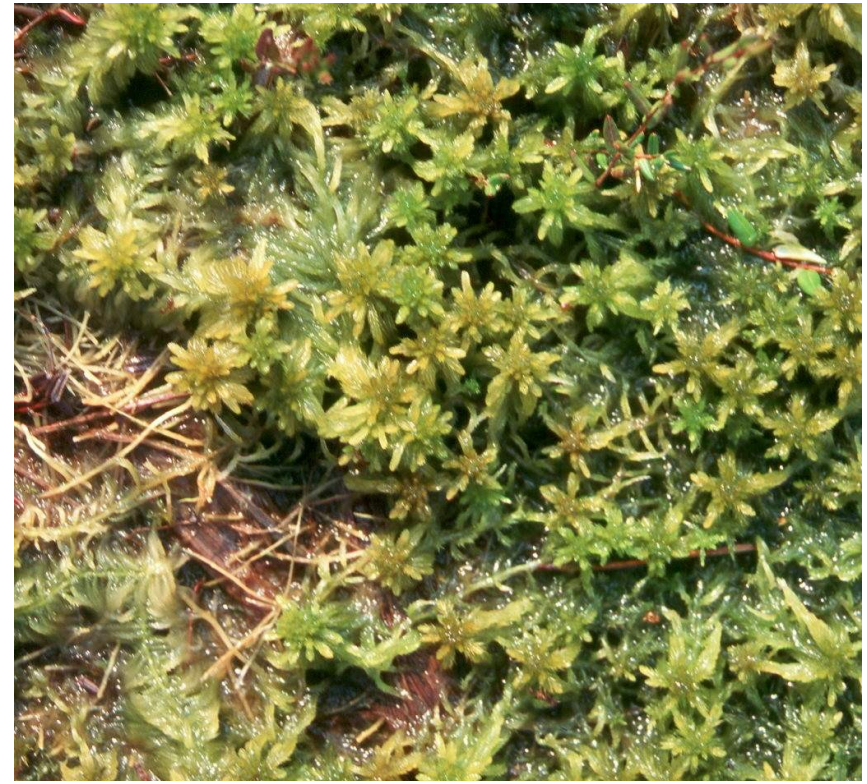
Hummock with *Sphagnum fuscum*

**JEL** Hollow with *Sphagnum cuspidatum* and *S. recurvum* **JEL 20**

11 **amoebae**



Low water table

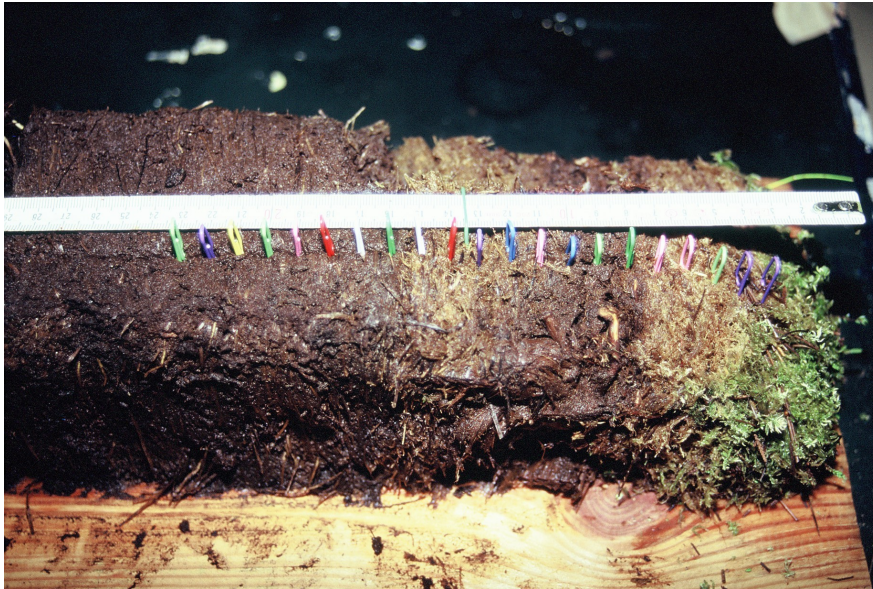


High water table

# PEAT SAMPLING in the field...



...and subsampling in the laboratory



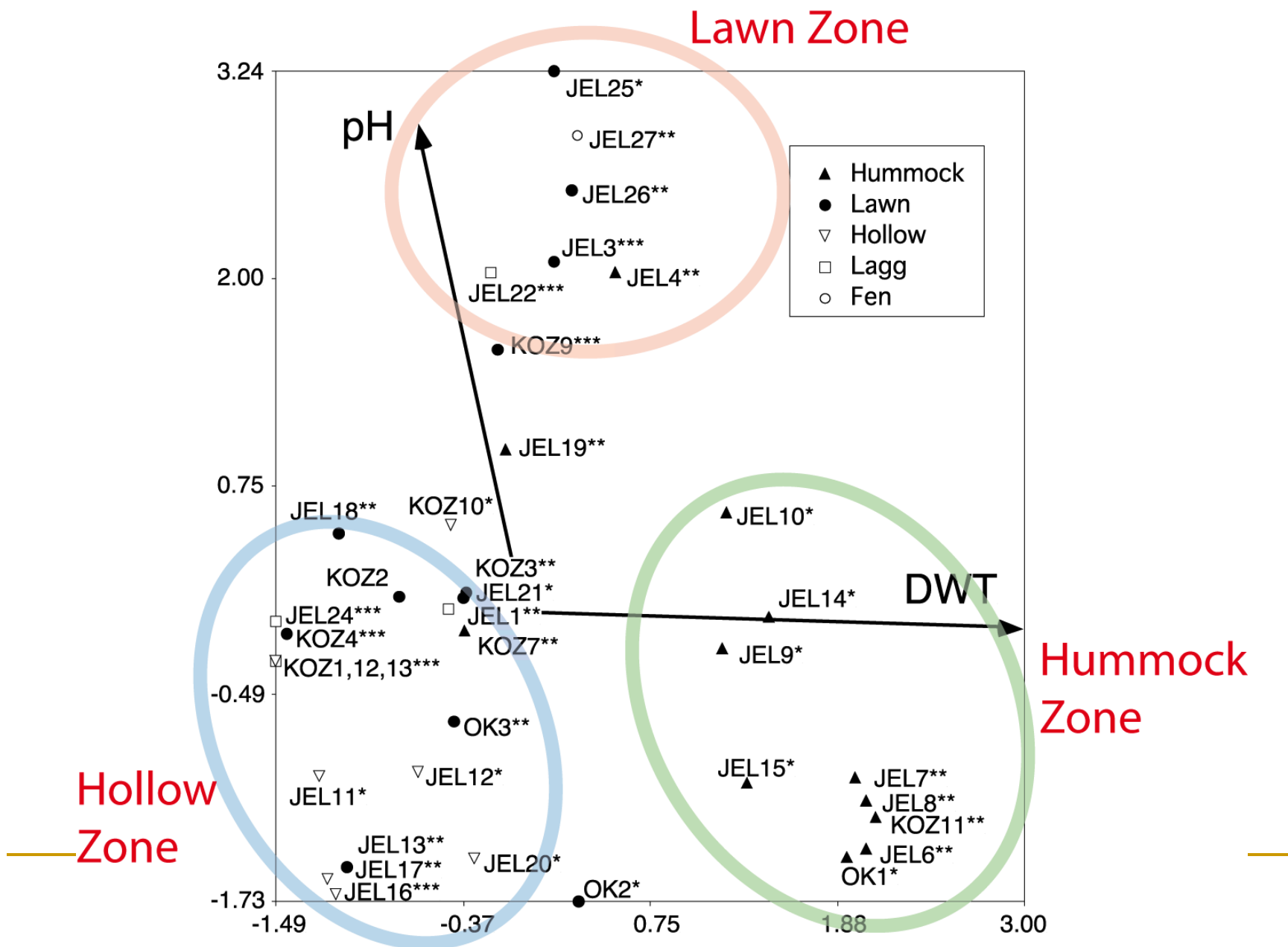
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# Ecology of testate amoebae

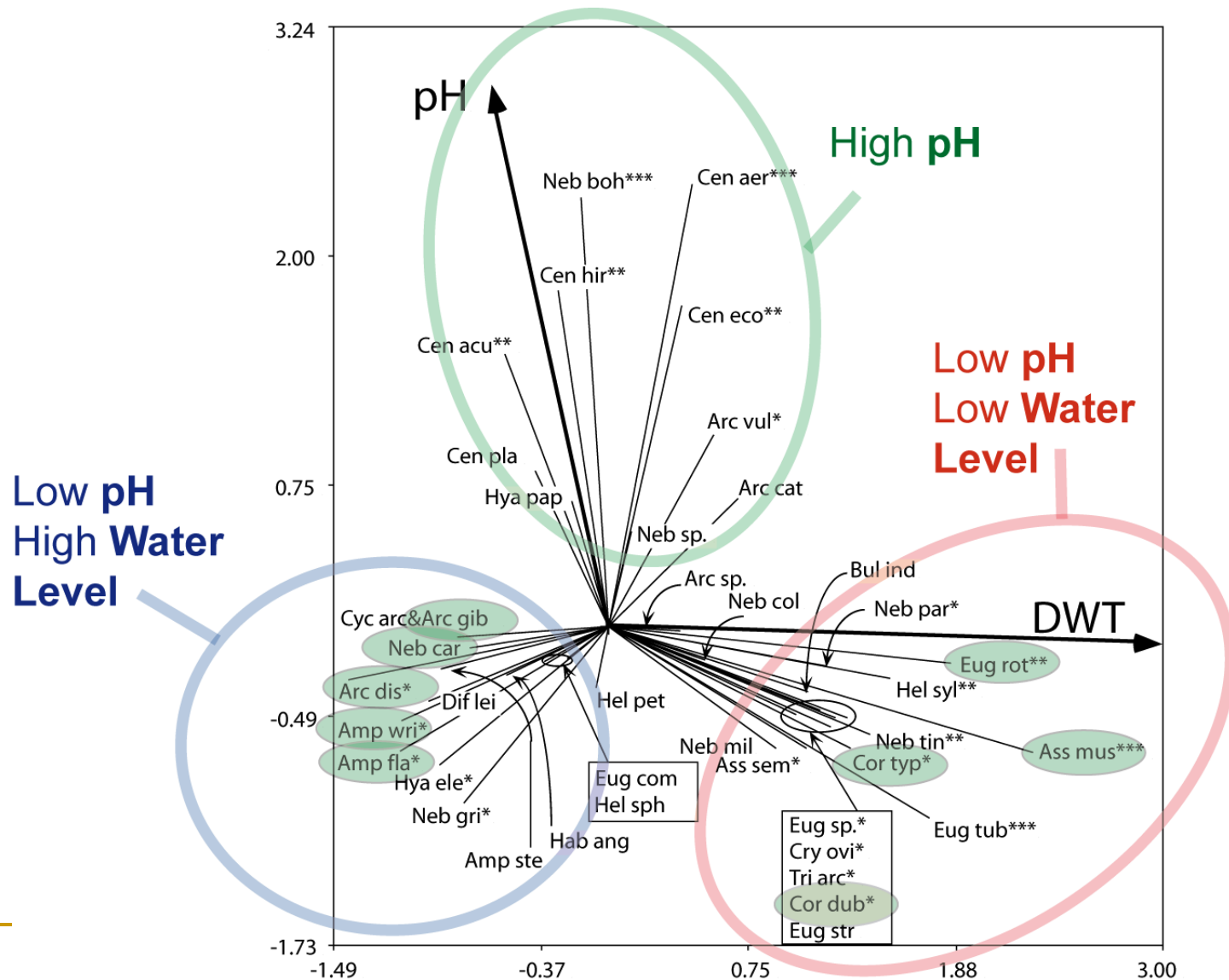
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**Environmental  
variables**

# Biplot of Redundancy Analysis **RDA** (samples)



# Biplot of Redundancy Analysis **RDA** (species)



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# Palaeoecological application of testate amoebae

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**Proxies**

**Reconstruction**

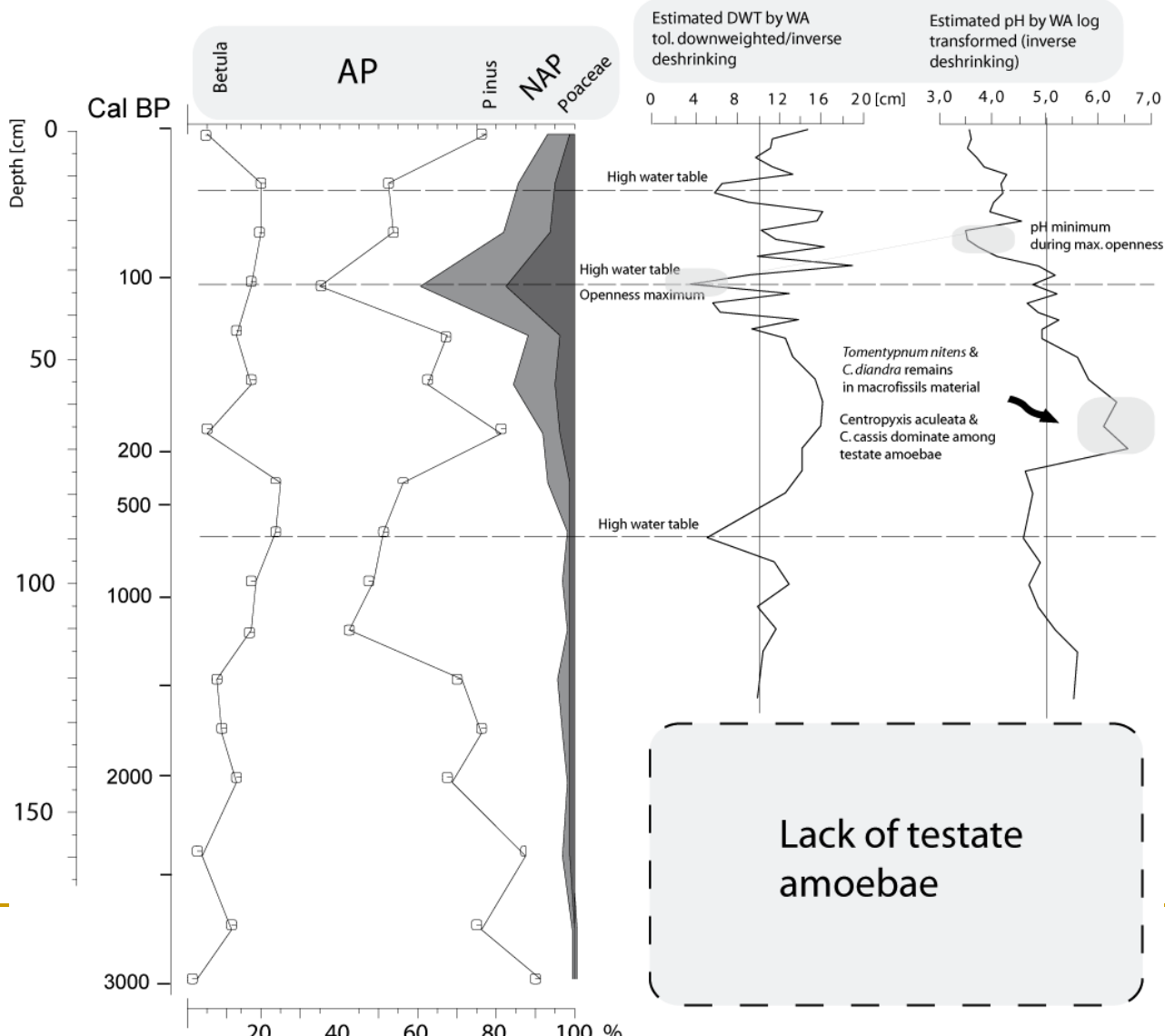
**Human impact**





# Example II - Jelenia Wyspa Mire

## Response of the mire to forest clearance



# Summary 1/2

- We provided new data on the **ecology of testate amoebae** in Poland,
- This data was used to produce a **local transfer function** (DWT & pH), filling a gap in central Europe,
- Testate amoebae were used, for **quantitative reconstruction of water table and pH** changes in Polish kettle-hole mires,
- ... together with other proxies (pollen, microfossils) - **multiproxy approach**.

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# Summary 2/2

- The results show that palaeomoisture data inferred from testate amoebae **can be correlated with other signals** in studies on Mukrza, Jelenia Wyspa and Tuchola peatlands.
  - In Jelenia Wyspa *Sphagnum* mire, **deforestation** (pollen analysis) caused an **rise** in the **water table** (testate amoebae analysis).
  - In Mukrza, testate amoebae and desmids responded to **water-logging** following the **damming** of the Wda River.
  - Further work is ongoing on kettle-hole mires and raised bogs from Pomerania and Central Poland.
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# Conclusions

- Polish data are exceptionally important because Poland is under **several contrasted climatic** influences - from oceanic to continental,
  - In view of the ongoing and future change in climate, we need more **high-resolution palaeoclimatological studies** in order to gain a better understanding of the response of natural ecosystems to past climatic changes,
  - Testate amoebae are very valuable indicators to study the **relationships among peatlands, climate, and human activities.**
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Thank you for  
your attention

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