



Aquatic ecosystem shifts in response to early human land-use change in two low-elevation lakes in northwestern Europe

Keechy Akkerman^{1*}, Wim Z. Hoek¹, Aleksandra Cvetkoska¹, Marjolein T.I.J. Gouw-Bouman¹, Gert-Jan Reichart^{2,3}, Frans P.M. Bunnik⁴, Marcel A.J. Bakker⁵, Timme H. Donders^{1,4}

¹Department of Physical Geography, Utrecht University; ²Ocean systems, Royal NIOZ; ³Department of Earth Sciences, Utrecht University; ⁴Petroleum Geosciences, TNO; ⁵Geomodelling, TNO

*Corresponding author: akkerman.keechy@gmail.com

Context

Eutrophication of (freshwater) aquatic systems calls for management and conservation measures
 → Adequate understanding of the causes and consequences of the shifts in nutrient availability
 → Proper pre-impact nutrient reference baselines

| Vegetation (Human impact) | Method | Biodiversity |
|---------------------------|--|---|
| Nutrients | Diatoms indicate trophic state (method 1, indicator values; Van Dam et al. 1994) and total phosphorus (method 2, transfer function; Battarbee et al. 2000) | Diatoms indicate biodiversity (rarefaction) |

Location: Sediment cores were obtained from two lakes in northwestern Europe, using a piston corer deployed from a floating platform:

Llangorse Lake (UK)

- Lateglacial basin
- Brecon Beacons, Wales
- (Hyper)eutrophic

Coring

- 12 meter sediment
- 7 meter water depth

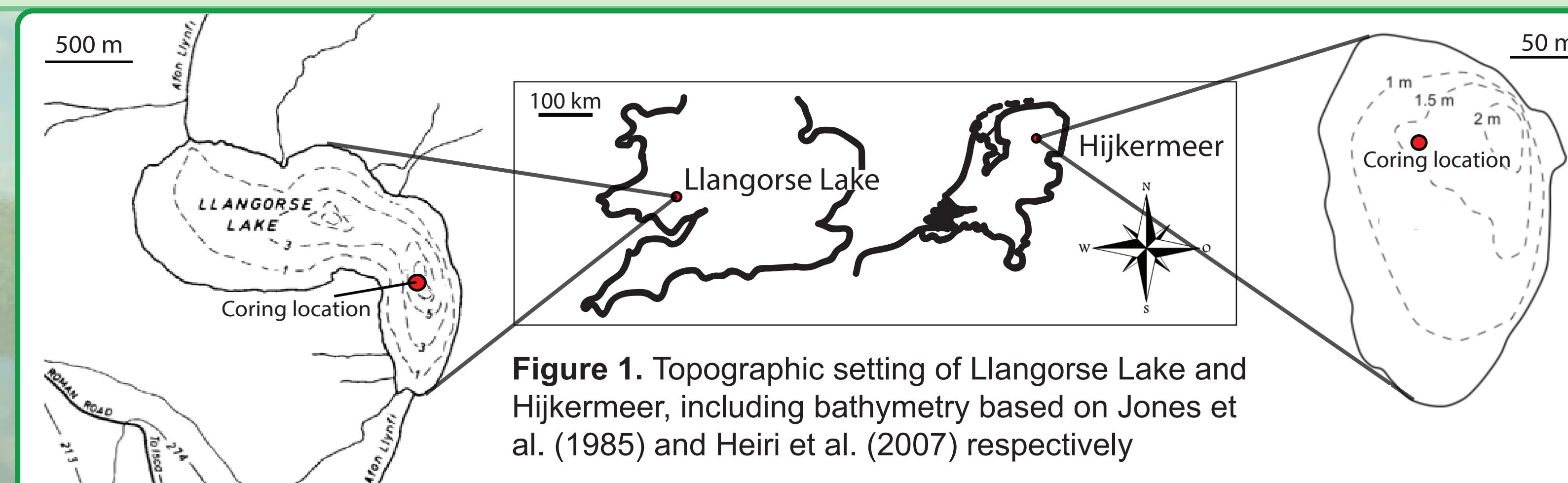


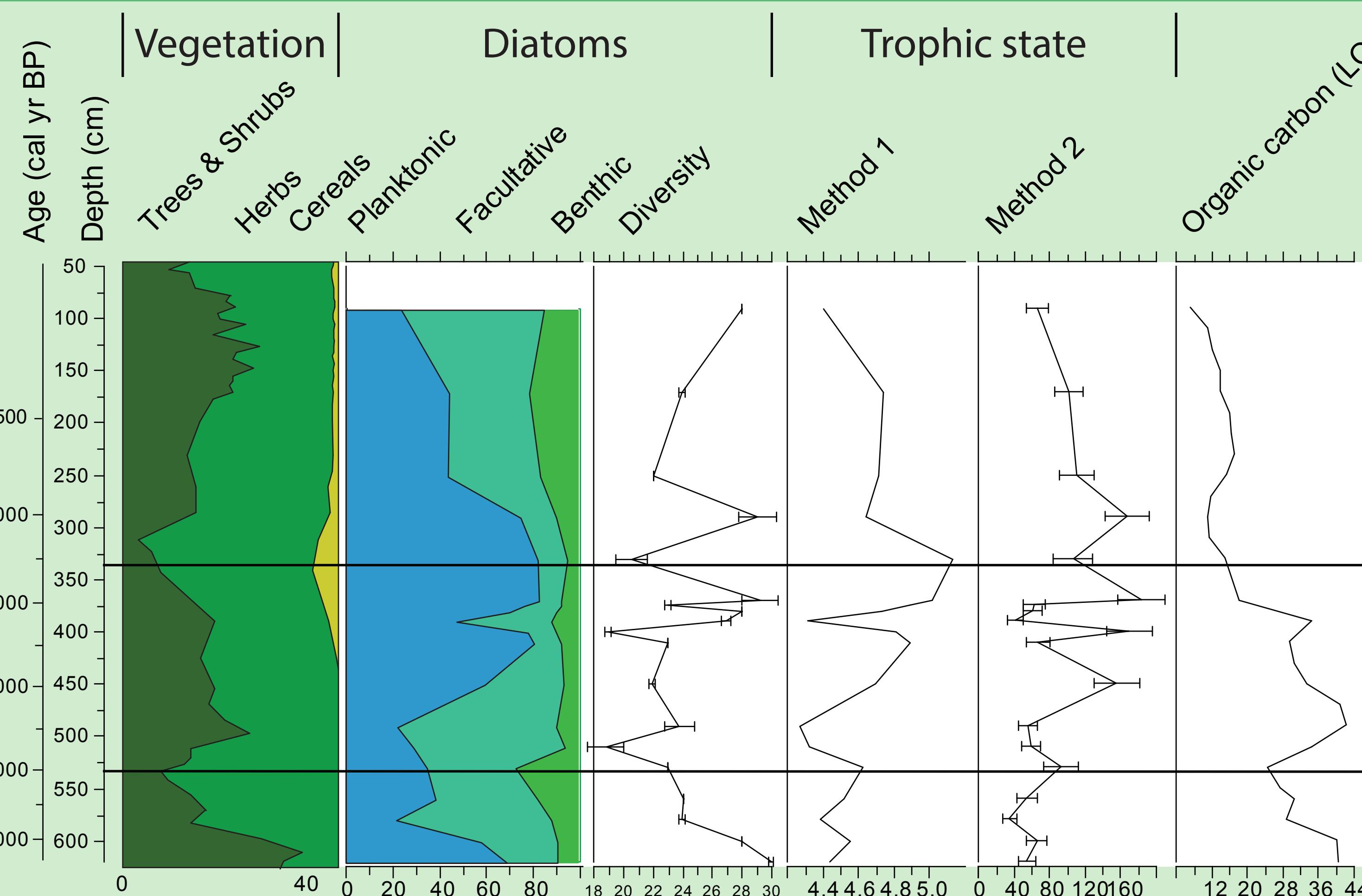
Figure 1. Topographic setting of Llangorse Lake and Hijkemeer, including bathymetry based on Jones et al. (1985) and Heiri et al. (2007) respectively

Hijkemeer (NL)

- Pingo-remnant
- Drenthe plateau
- Oligo- to mesotrophic

Coring

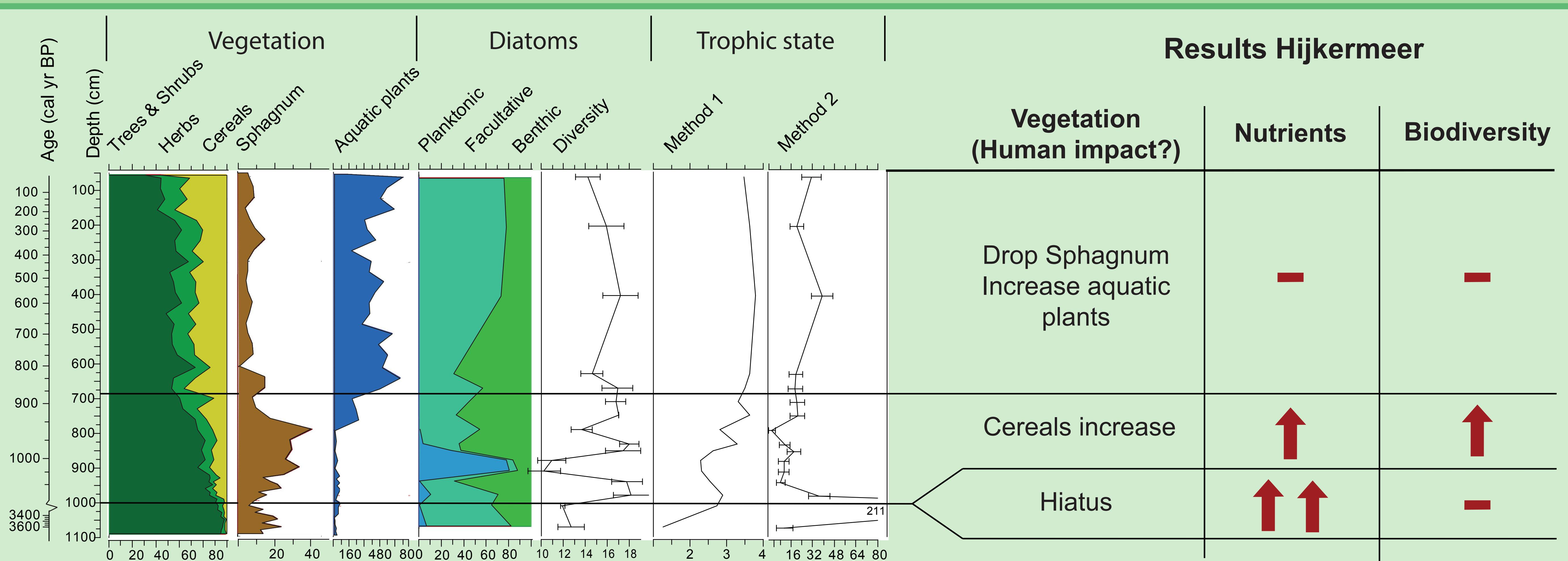
- 13.5 meter sediment
- 1.4 meter water depth



Results Llangorse Lake

| Vegetation (Human impact) | Nutrients | Biodiversity |
|---------------------------|-----------|--------------|
| Cereals decrease | ↓ | ↑ |
| Cereals increase | ↓↑↑ | ↓↓↑ |
| Deforestation | - | ↓ |

Figure 2. Sediment record of Llangorse Lake: Correlated with LOI to radiocarbon ages and summary pollen stratigraphy (Jones et al. 1985), summary diatom stratigraphy, rarefaction diversity, trophic state and LOI reconstructions.



Results Hijkemeer

| Vegetation (Human impact?) | Nutrients | Biodiversity |
|--|-----------|--------------|
| Drop Sphagnum Increase aquatic plants | - | - |
| Cereals increase | ↑ | ↑ |
| Hiatus | ↑↑ | - |

Figure 3. Sediment record of Hijkemeer: Radiocarbon ages, summary pollen stratigraphy together with Sphagnum and Aquatic plants, summary diatom stratigraphy, rarefaction diversity and trophic state.

Conclusion

- ★ Anthropogenic impact occurred on lake ecosystems at least 5000 years ago, in the form of deforestation
- ★ Diversity increases with increased nutrients in the oligotrophic lake, and decreases with increased nutrients in the (hyper)eutrophic lake
- ★ Llangorse Lake's diatom assemblage indicates recovery of the ecosystem after a period of maximum disturbance, highlighting resilience

References

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Acknowledgements

I wish to thank the Quaternary Research Association (QRA) for sponsoring the field campaign in the United Kingdom, as well as David Maas, Hans van Aken and dr. Alison McLeod for making it a success. Furthermore, I am grateful for the help dr. Holger Cremer and Alejandra Goldenberg gave me with the diatom analysis.