

# Climate Change Impact on Peatland Dynamics During the Holocene in Latvia, Northeastern Europe

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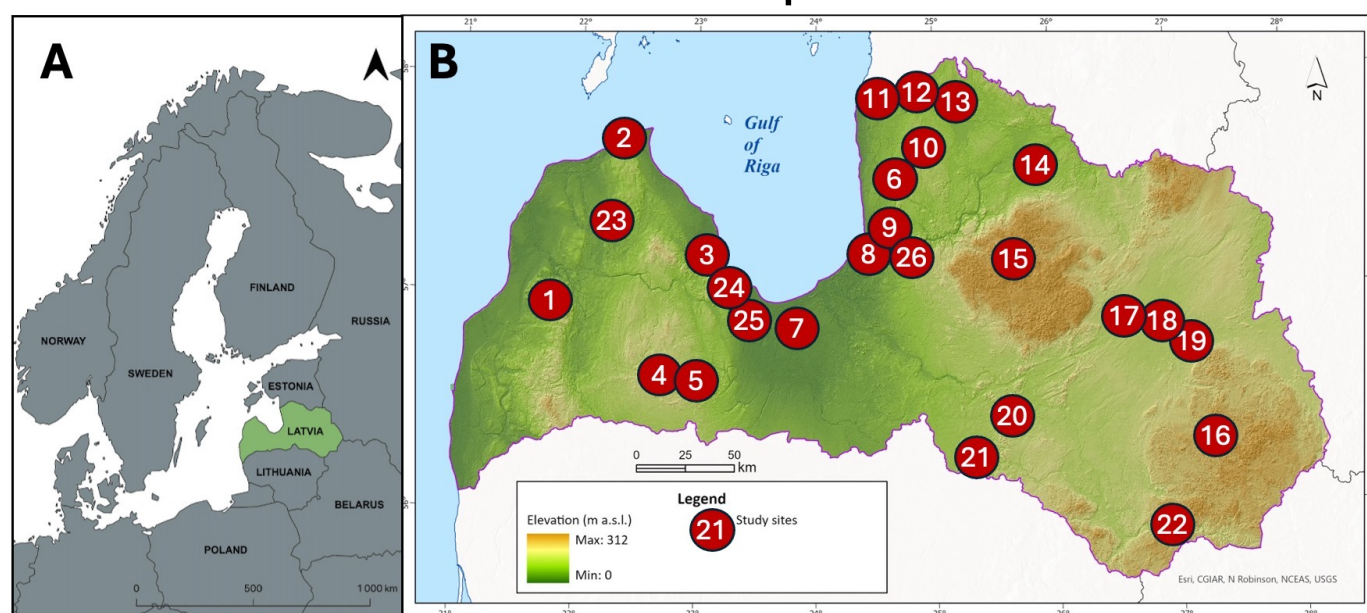
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## INTRODUCTION

Peatlands are essential ecosystems for climate regulation and biodiversity but are increasingly threatened by human activities and climate change. The geological record reveals that Northeastern Europe experienced period of warmer-than-present climatic conditions during the Holocene, offering valuable insights into past peatland dynamics during climate change. The aim of this study was to evaluate initiation and development of peatlands in Latvia (Fig.1) during the Holocene.

## MATERIALS & METHODS

We used available published and unpublished data (14C, lithology, loss-on-ignition) on fen and raised bogs in Latvia to take a closer look on characteristics of these processes.



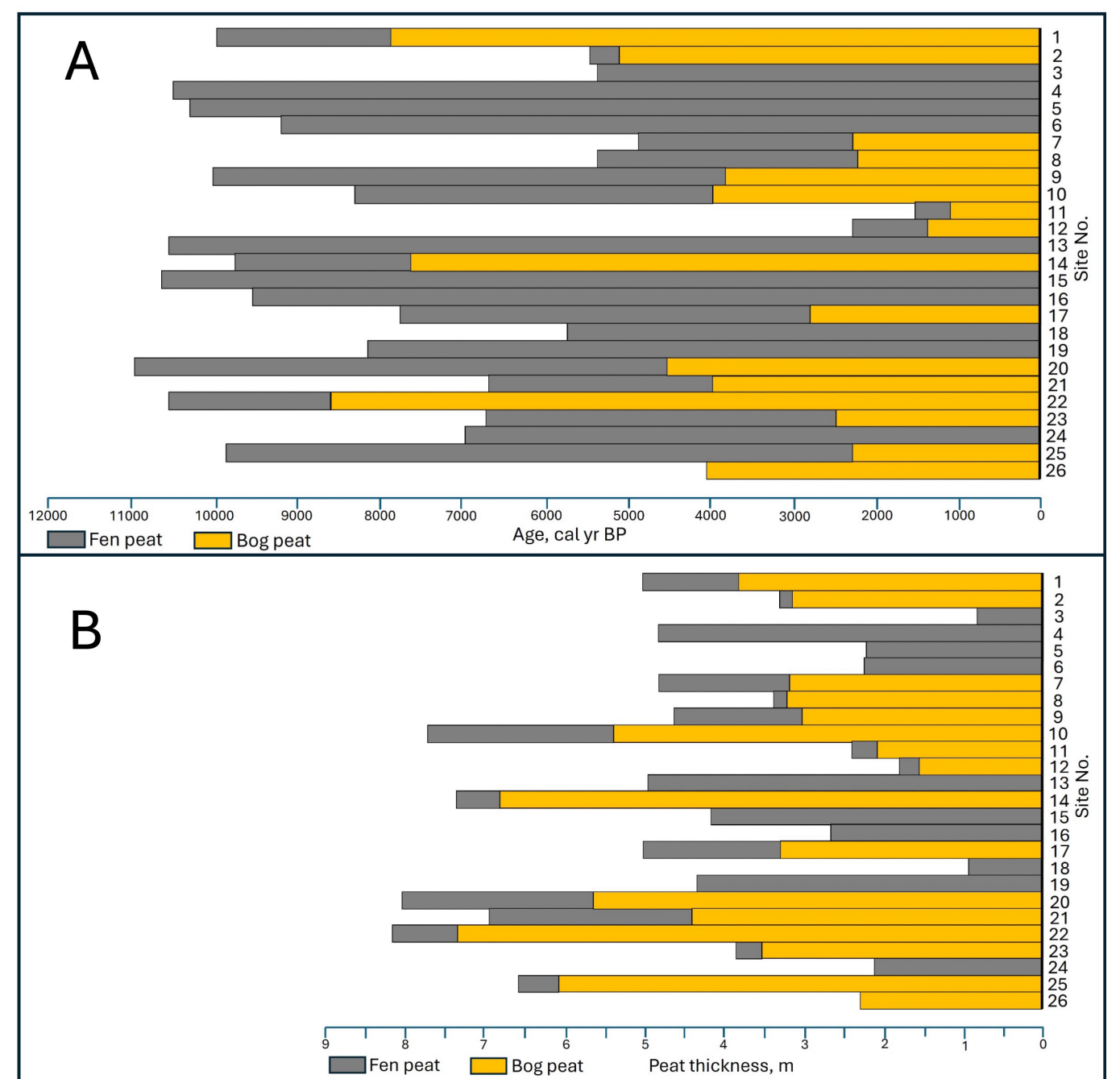
**Fig.1.** Location of Latvia within Europe (A) and sites used in current study (B): 1 – Tīrelis bog, 2 – Bažu bog, 3 – Engure mire, 4 – Blīdene mire, 5 – Elki mire, 6 – Svētupes mire, 7 – Cena bog, 8 – Dzelve bog, 9 – Eipurs bog, 10 – Puikule bog, 11 – Ķeru bog, 12 – Sakalaura bog, 13 – Pantene mire, 14 – Taure bog, 15 – Taurene bog, 16 – Zosu mire, 17 – Lielais bog, 18 – Eiņi mire, 19 – Mazais Svētiņu mire, 20 – Rožu bog, 21 – Stulvis bog, 22 – Tartaks bog, 23 – Sēmes bog, 24 – Apšuciems bog, 25 – Ķemeri bog, 26 – Roču bog.

## RESULTS

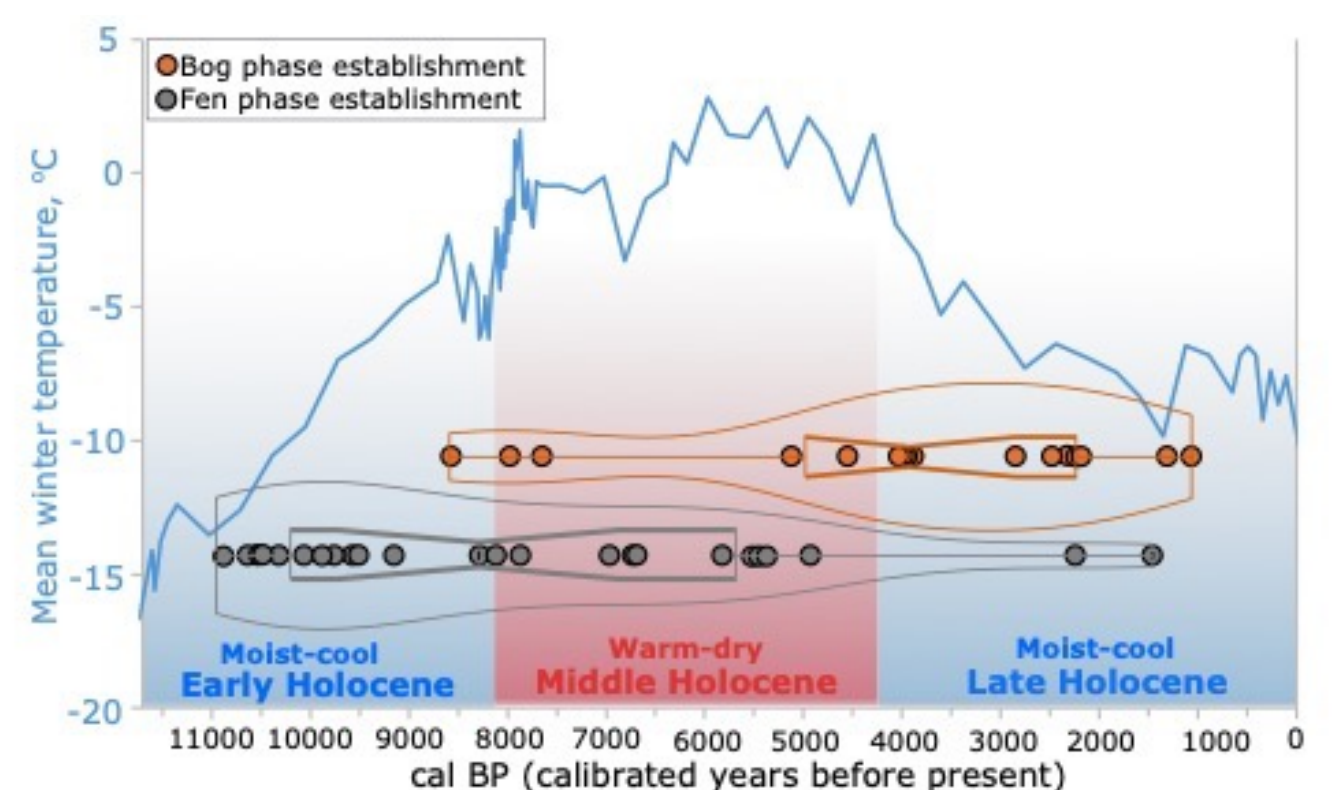
Our results show that the first peatlands that were established as early as 11 000 years ago were fens (Fig. 2). On average, 4 m of peat accumulate in Latvian peatlands during the Holocene. Higher peat accumulation for fen peat took place during the Early Holocene (11 700 – 8200 years ago) and Late Holocene (last 4200 years), i.e., under cool-moist/wet hydroclimate. Peatland establishment was the lowest during the Middle Holocene (8200-4200 years ago) when climate was warmer and dryer than today (Fig. 3).

## CONCLUSIONS

Peatland formation coincide with the general climate change pattern where the Early and Late Holocene characterized as cool-moist, but the Middle Holocene as warm-dry. Under possible future warming conditions, peatlands in the territory of Latvia might accumulate less peat and carbon than it has been observed during the last 4200 years.



**Fig.2.** Peatland establishment based on peat type (fen – grey, orange – bog) on temporal scale (A) and peat thickness (B) for all sites. Site names with associated numbers in the figure see from Fig.1.



**Fig.3.** Peatlands' (fen, bog) initiation ages in the territory of Latvia alongside long-term mean winter temperature change (Stivriņš et al., 2015). On x axis chronology, on y axis temperature (°C). Violin sample density distribution box plot (with median value indicated in the box plot): gray – fen; orange – bog.