Age structure and disturbance patterns in an oak - beech stand in Southern Sweden

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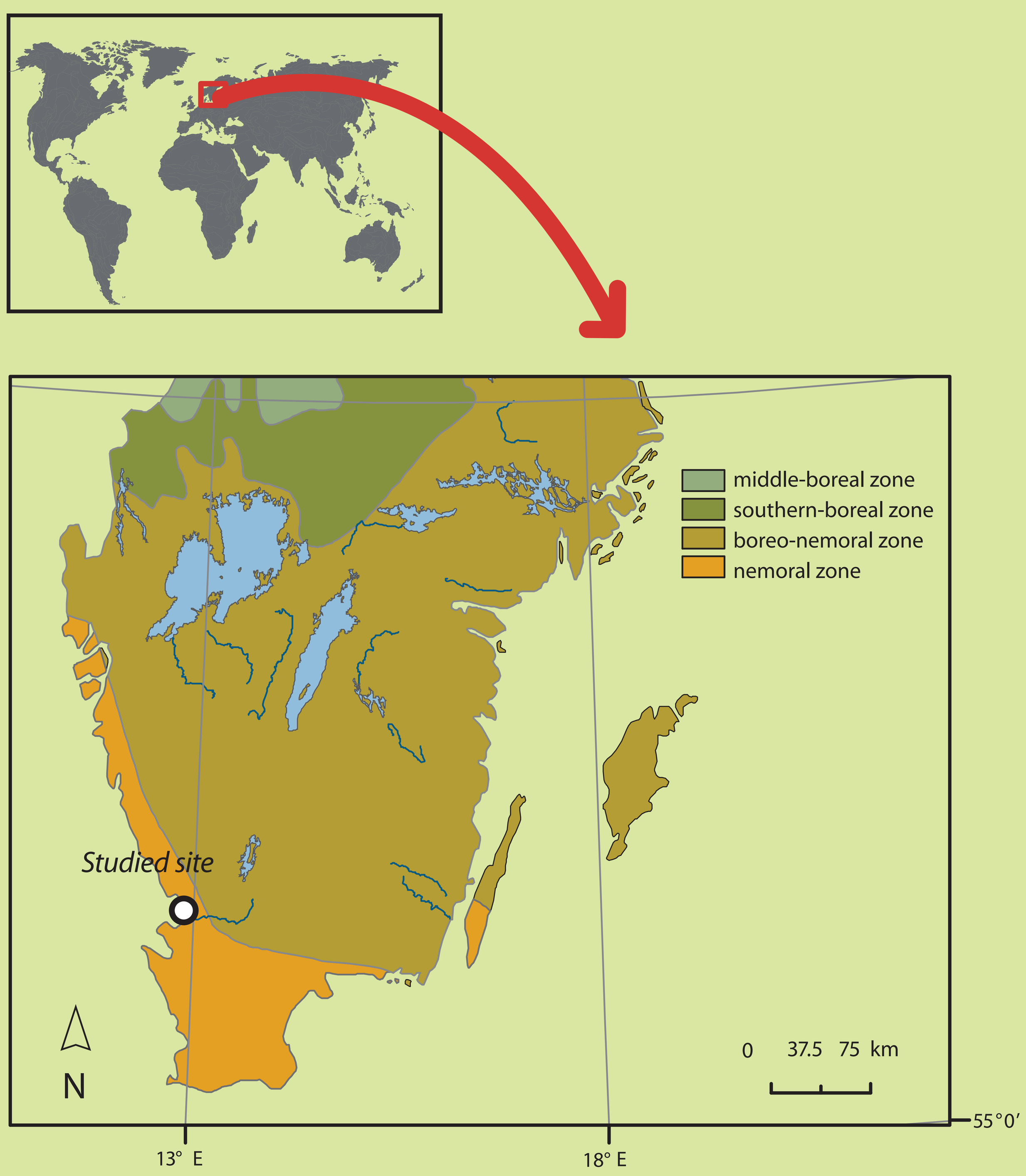


The studied oak forest is situated in the nemoral vegetation zone of Southern Sweden (Halland province, N 56 47'35'', E 12 51'53'').

Introduction

Old-growth oak forests experiencing little human impact are rare in Europe and there is a strong interest in preserving remnants of these species-rich communities in close-to-natural state.

Recent studies have been constantly showing that disturbance of the shade-tolerant understory by fire, windstorms and logging is an important prerequisite for successful recruitment of oak into the canopy.

In the past, low intensity ground fires appear to be an important factor controlling oak abundance at the landscape scale both in North America and in Europe.

Regionally oak became established in this part of the Europe around 6 000 BP followed by beech around 1400 BP.

Paleological data indicate that during the pre-beech period the area possessed species rich tree vegetation with linder (*Tilia*), alder (*Alnus*), and hassle (*Corylus*) as important components of the vegetation cover.

Today, a considerable proportion of landscape is covered by beech and spruce forests favoured by current land-use practices.

Rationale

Long history of human exploitation effectively eliminated legacies of natural disturbances in Europan oak-dominated forests. Oak stands have been commonly used for grazing, source of timber and firewood, and gathering of acorns. Fire was typically prescribed to keep these stands open.

In Sweden human-initiated fires in oak forests were common in the middle ages, however the practice of prescribed burning ceased in the second half of 17th century. Since the year 1830, when Swedish oaks lost their protection from the King, the amount of semi-natural oak-dominated stands has decreased dramatically in Southern Sweden. It is believed that beside higher cutting rates, oak disappearance from the landscape was facilitated by cessation of fires and the conversion of nutrient rich oak-dominated sites into agricultural fields or spruce monocultures.

Aim

In this project we analyse current structure and reconstruct impact of disturbance events upon tree regeneration in an old-growth oak - beech (*Quercus robur - Fagus sylvatica*) stand in Southern Sweden. **Our interest in the dynamics of this stand arose after discovery of traces of low intensity fire affected this stand in 1843, and later – a logging event around 1920-21.**

By linking pattern of tree regeneration to the history of dendrochronologically reconstructed disturbances, we hope to contribute to the discussion on the approaches to the biological preservation of European nemoral forests.

Preliminary results

Fire in 1843. Fig.1.

An important feature of the history of this stand was a fire event dated back to 1843. All recorded oak trees which were alive at the time of fire (n = 8) survived this disturbance event. It was not possible to assess exact germination dates for the most of the oak trees due to wood rot and sampling at the height above germination point. However, among all oak trees which had their innermost tree-rings dating after fire (23 trees), 13 trees (57 %) were present on the site already 25 years after this disturbance event. No beech trees were found which were older than the time since fire (159 years in 2002).

Tree age data suggests that oak regeneration pulse was associated with the fire event and lack of its recruitment over the last two hundred years may be directly attributable to the absence of fire and/or other disturbances during this period.

Cutting in early 1920es. Fig. 1

The degree to which cutting affected oak regeneration was difficult to assess. Assuming the amount of calendar years missed in the oak chronologies being approximately 10-30 years, the available data may indicate miner regeneration pulse of oak after cutting (22% of all oak trees with their innermost tree-rings dating after fire). In case of beech, age structure of its population did not suggest any regeneration pulse after the cutting.

Growth reaction to cuttings. Fig. 2.

Growth of both oak and beach increased as a result of cutting in the beginning of the 1920s (Fig. 6). Increase was significantly larger in beech (317% on average), as compared to oak (164%). At least for the oak, this was not a result of climatically favourable conditions during that period.

Diameter distribution and mortality. Fig. 3

Beech mortality mostly occured in the small dbh classes, indicating competition-related effects on mortality pattern.

Oak mortality was observed in larger-than-average dbh classes, pointing to the dominance of extrernaly controlled mortality.

Fig. 1. Age structure and regeneration patterns of oak and beach in the studied stand. Line represent lifespans of single trees.

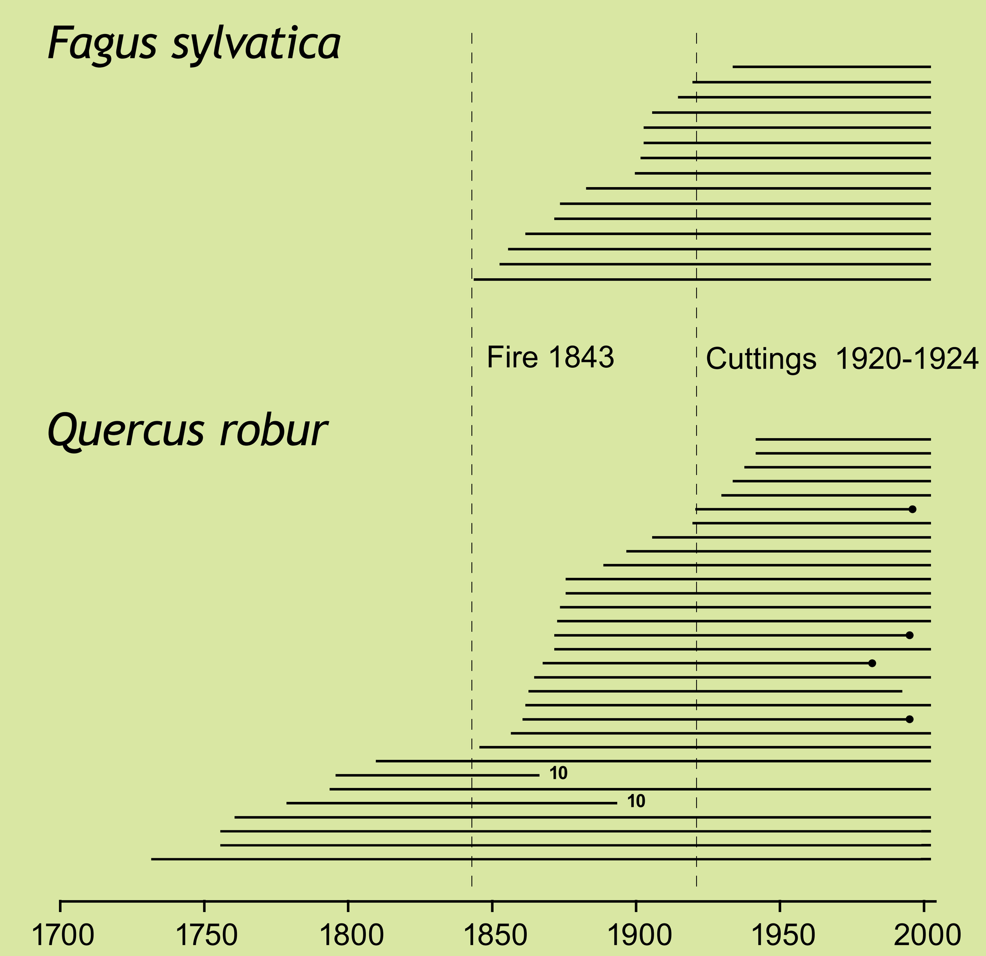


Fig. 2. Change in diameter increment in oak and beech trees after cutting in the beginning of 1920es. Change was calculated as proportion of ten years' cumulative increments before and after the cutting event.

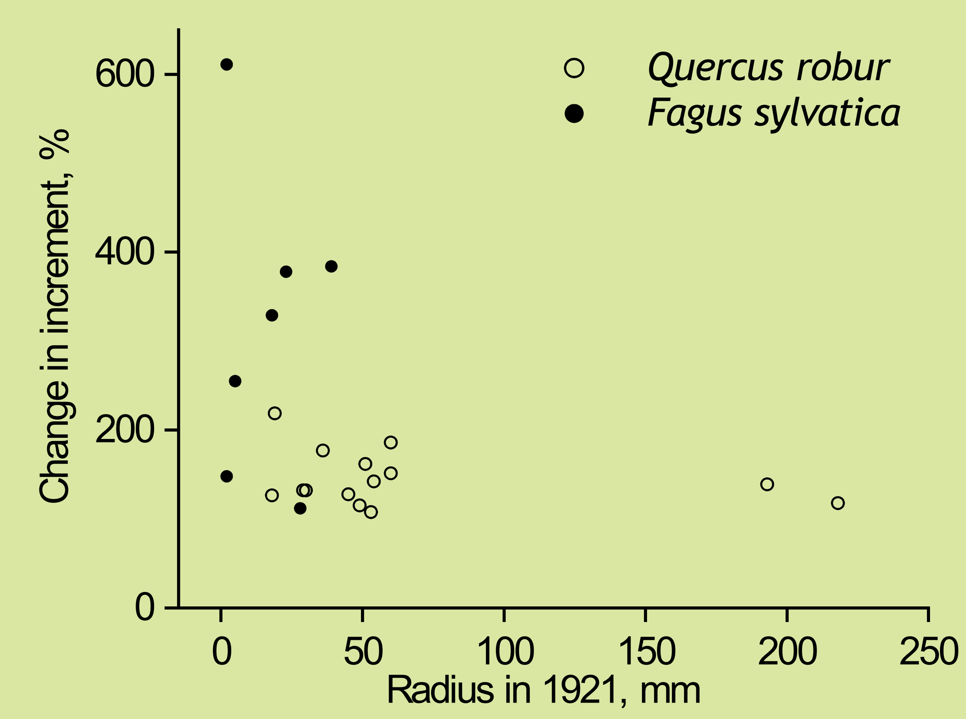
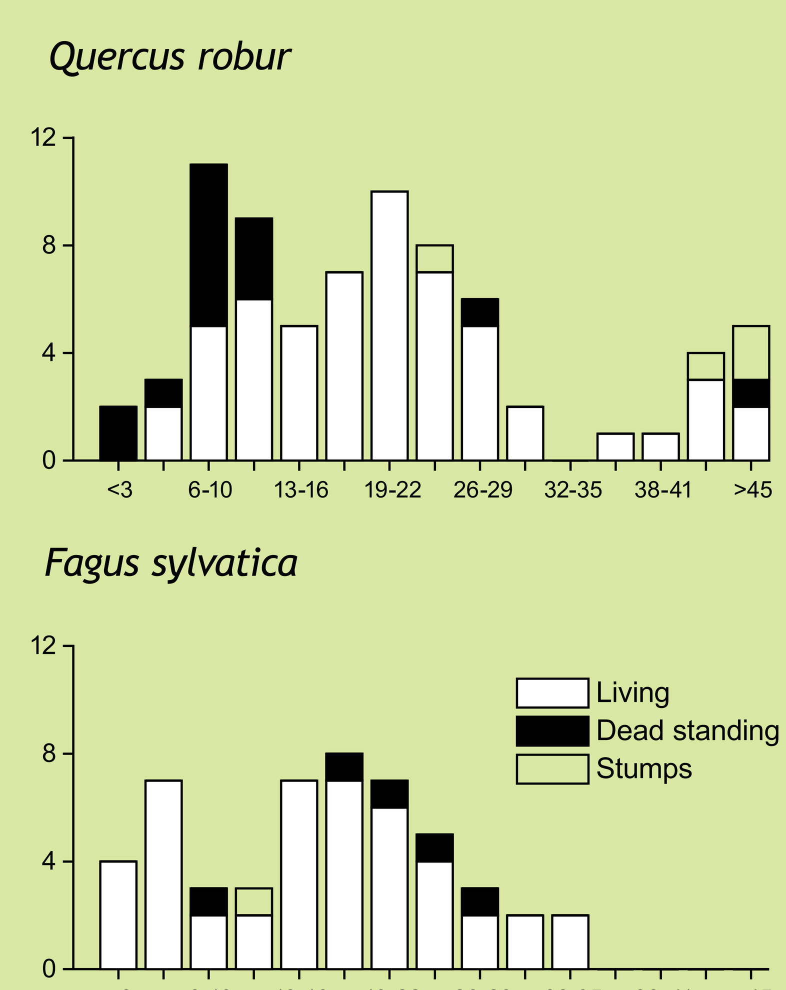


Fig. 3. Diameter distribution of canopy oak and beach in the studied plot.



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