

Decreases in Beech Pollen in the Prealpine Foreland : the Potential of Varved Sediments

In pollen diagrams from several small basins of the northern prealpine foreland at least five marked pre-Roman decreases in the beech pollen curves are found (Fig. 1). They are recorded in several cores throughout a single basin (Ammann, 1989). Troels-Smith (1981) at Egelsee/Thayngen attributes similar decreases to the percentage effect resulting from the increased flowering of other trees in forest openings, but in the present case both the beech pollen concentrations and the influx decrease as well as the percentages (Ammann, 1988). In large sites like Lake Geneva, Lake Biel, or Lake Zürich these changes in *Fagus* are not recorded, implying that small-scale vegetation patterns are blurred or cancel each other out when cores representing large pollen-source areas are studied.

The *Fagus* peaks preceding the declines are about 300 to 600 years apart, but the time control is not very good at most sites, an exception being the annually laminated sediment at Faulensee (Welten, 1944 ; Ammann, in prep.). However, we do not expect that the five pre-Roman beech declines are synchronous over the 300 km covered, as indicated by archaeological and radiocarbon datings of western and eastern sites.

The *Fagus* declines (Fig. 1) are all synchronous with increases of NAP (especially anthropochors and apophytes) and of the heliophilous shrubs *Alnus*, *Betula* and *Corylus*. This suggests landnam phases such as shown by Iversen (1941) for the *Quercus* decline and TroelsSmith (1981) for five pre-Roman *Fagus* declines. *Fagus minima* would thus reflect either maximum density of human population or the closeness of the prehistoric deforestations and abandoned fields to the coring site.

An alternative hypothesis for the *Fagus* declines is based on the mosaic-cycle theory (Müller-Dombois, 1987 ; Remmert, 1987, 1991, which was also modelled for Central European beech forests by Wissel (1991) : in very old

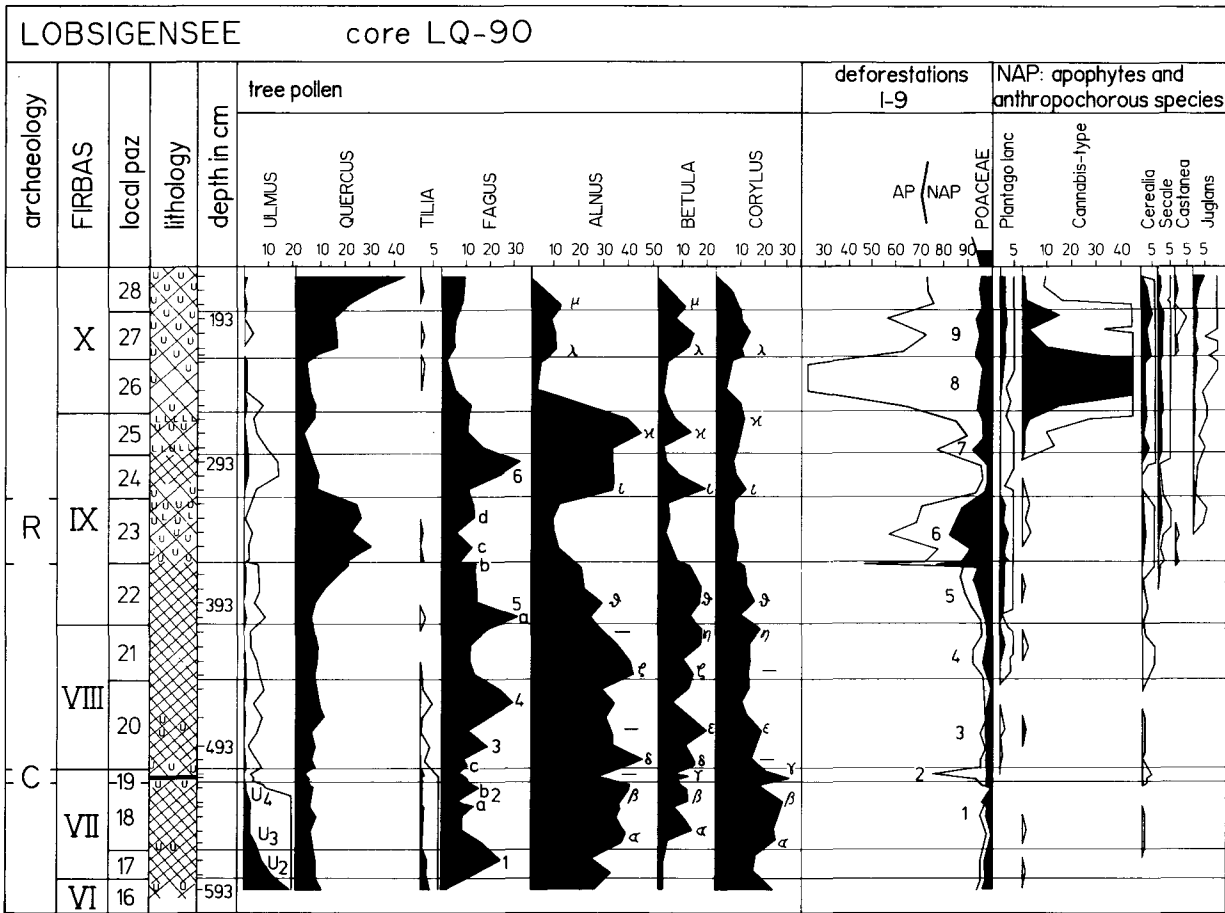


Fig. 1. The mid and late Holocene pollen record for the major trees at Lobisensee/Swiss Plateau shows that the beech declines correspond to increases in pollen of herbs (NAP) and of the heliophilous shrubs: alder, birch and hazel. Lithology according to Troels-Smith. C = Cortailod culture (neolithic), R = Roman colonization.

even aged beech forests (*Hallenbuchenwald*) the areas breaking down can be larger than the gaps or patches that are assumed in forest succession models. The cycle would last the duration of a life cycle of beech (up to about 300 years) plus the duration of the heliophilous shrub phase and the mixed forest phase, i.e. a total of about 550 years (Remmert, 1987). Mechanisms for the formation of even aged stands may involve blowdowns, forest fire, landslides and clear cuttings. Wissel (1991) postulates that small gaps can be enlarged by the damage caused by solar radiation on the exposed trunks of beech (Nicolai, 1986).

Thus dense prehistoric human populations may not have been the primary cause of the beech declines. However, they may have used naturally decaying old forests, which were more easily cleared than healthy ones. In this latter case the beginning of a beech decline would precede by some years the human impact to be recorded by anthropogenic pollen indicators (Behre, 1981, 1986), high charcoal influx and anthropogenic lake eutrophication. Thus the detailed chronology made possible by annually laminated sediments may shed light on such a question of ecological, palaeoecological and archaeological interest: Are the beech declines natural or anthropogenic? Or, in other words, did prehistoric people clear healthy beech forests or did they select decaying old evenaged stands for clearance?

The first beech decline at five of the six sites (the exception being Egelsee/Thayningen) is found before the first known local Neolithic settlement. This fact could be used as an argument for natural *Fagus* declines (Müller, 1961). On the other hand, findings of sporadic cereal pollen grains in these early core sections may point to archaeologically unknown early agricultural use of the landscape.

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