

**EARLY SIGNS OF A FUNDAMENTAL SUBALPINE ECOSYSTEM
SHIFT IN THE SWEDISH SCANDES-THE CASE OF THE PINE
(*PINUS SYLVESTRIS* L.) TREELINE ECOTONE**

**JÜNGSTER WANDEL DES BAUMGRENZÖKOTONS
(*PINUS SYLVESTRIS* L.) IM SUBALPINEN ÖKOSYSTEM
DER SCHWEDISCHEN SKANDEN**

LEIF KULLMAN

SUMMARY

Significant climate warming subsequent to the Little Ice Age has initiated a fundamental transformation (ecosystem shift) of the forest-alpine tundra in the Swedish Scandes. The present paper illustrates and analyses this course of change at two sites with contrasting climatic character and separated by c. 140 km. Increased pine seed viability and enhanced late-summer soil drought, as a consequence of more complete and earlier snow melt at high elevations, appear as the main causes of ongoing biogeographic reorganization. The most conspicuous change of the past few decades is the tremendous rise of pine reproduction, coinciding with relatively high temperatures and variable degrees and rates of regression of the subalpine birch forest belt. Accordingly, the balance of *Betula pubescens* ssp. *czerepanovii*/*Pinus sylvestris* is shifting towards the favor of the latter species. This course of change is most pronounced in the southernmost Scandes (Province of Dalarna), where relatively low mountains, a sparse subalpine birch belt and local continental and a snow-poor climate prevail. Further north (Province of Jämtland), the alpine snow cover retention is still enough to support a fairly dense and competitive birch forest, restricting any widespread expansion of light-demanding subalpine pine stands. Also in this part of the Scandes some pine rise is evident, although restricted to minor sites where the birch cover is locally reduced. The pivotal role of climate change in the context of present pine progression is evident from the striking congruence and synchrony of age structure patterns between the two study areas, both expressing virtually identical signatures of increased pine recruitment in recent decades. Given the assumption (uncertain) that climate warming will continue, a new zonation pattern, of early Holocene type may gradually spread, south to north along the Swedish Scandes, Pine may thereby take the role as the main constituent of a patchy and species rich treeline ecotone, located much higher than today.

Keywords: Treeline ecotone, climate change, ecosystem shift, age structure, *Pinus sylvestris*, *Betula pubescens* ssp. *czerepanovii*, Swedish Scandes