Past vegetation dynamics of Vltavský luh, upper Vltava river valley in the Šumava mountains, Czech Republic

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Received November 13, 2000 / Accepted July 7, 2001

Abstract. Six pollen diagrams from peat bogs in the Vltavský luh (upper Vltava river valley) provide new information about vegetation reconstruction, woodland dynamics, and local development of mires during the Late-glacial and Holocene. Vegetation development began in the Oldest Dryas/Bølling with open park plant cover. In the Allerød, woodland with Pinus and Betula developed, and in the Younger Dryas there was a steppe tundra with plants of open habitats. In the Pre-boreal, woodland tundra grew. In the Boreal, Corylus spread, and a major expansion of Picea began in the early Boreal. Picea spread during the Atlantic probably by two different migration routes. Fagus immigrated earlier than in the Bayerischer Wald and Oberpfälzer Wald in the adjoining parts of Germany, and had its major expansion in the early Atlantic. Abed expanded in the late Atlantic. The great abundance of Abeds in this area is remarkable, forming Abeds or Abeds-Fagus woods in less extreme habitats. Human occupation started in the Sub-boreal, as shown by both archaeology and palynology. However, human impact is recognized from anthropogenic indicators which appear in the early Atlantic. At the end of the later Sub-atlantic the development of natural woodland was interrupted by plantation of Picea, according to historical and palynological evidence.

Key words: Pollen analysis – Woodland history – Late Glacial – Holocene – Šumava Mts – Czech Republic

Introduction

The Šumava is a medium high mountain range in the southern Czech Republic on the borders of Germany and to a lesser extent of Austria, and it continues to the southwest as the Bayerischer Wald in Germany. The range belongs to the Hercynian Mountains. On the abundant mire complexes, endemic plant populations and communities co-exist together with immigrants from the Alps. From a central European point of view this region seems to be a key area for a better understanding of vegetation development during the Late Glacial and the Holocene.

The Šumava mountain chain is an elongated ridge, the highest peaks forming the border with Germany, such as Plechý (1378 m asl), Tristolčnik (1312 m), and others. The vast valley of Vltavský luh (upper Vltava river valley) studied in this paper lies just east this range. West of this valley in the central part of the mountain range stretches Šumavské pláně (Šumava plains). Šumava has no natural tree line today. Open rocks are exceptional in Šumava and are the traces of former glaciation.

In Šumava a marked gradient in climate from oceanic to continental and a complex geomorphology have resulted in a large diversity of mire complexes, remarkable for such a southern position in Europe (Schreiber 1924; Holubičková 1960, Pohořal 1964; Sofron and Šandová 1972; Sofron 1980). Most mires lie between 600 m and 1370 m asl, and those in Vltavský luh between 730 m and 1000 m. The mires were of such great importance in the past that they had their own names in the local dialects: raised bogs at high altitudes are called slat’ in Czech, Filz or Höhenhochmoor in German; subcontinental raised bogs in valleys with Pinus rotundata are called Niva in Czech, Au or Talhochmoor in German (Rudolph 1928).

Very few palynological and palaeoecological studies have been made in these undisturbed mire ecosystems in the Czech part of Šumava during the last thirty years. The late Holocene vegetation succession of waterlogged meadows in the northeastern foothills has been studied by pollen analysis at seven sites (Moravec and Rybníčková 1964, Rybníčková 1973, Rybníček and Rybníčková 1974). Kral (1979) presented a pollen diagram from Boubín forest from the central part of the mountain range and from the nearby Lenora site. Two lakes (Čertovo lake and Černé lake) in former glacier cirques in the western higher parts of Šumava and one mire (Ježerní slat’, short core) were studied palynologically, recording human impact during the last two centuries (Břízová 1993; Veselý et al. 1993; Vile et al. 1995). Earlier palynological studies in Šumava are sketchy (Müller 1927; Klečka 1928; Rudolph 1928; Ruoff 1932; Trautmann 1952; Kriesl 1968).

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The lack of modern pollen work in this key area of Šumava was the only reason why this region was not included in the list of reference areas of the European Pollen Network (Lang 1994; Berglund et al. 1996), and new palynological investigations were therefore begun three years ago. The region of Vltavský luh, with valley raised bogs at the confluence of Teplá Vltava and Studená Vltava (Warm and Cold Vltava) in the south of Šumava, was studied first, followed by the central part of Šumava with mountain raised bogs, and finally the western part of Šumava, and 17 mires in total were studied for pollen. This study discusses the results from Vltavský luh.


The region of study

Bedrock and climate

The study region lies in the oldest part of the Bohemian Massif (Moldanubicum), built up of crystalline and silicate rock complexes in which injected gneiss, arêtes, and granulite gneiss predominate. The granite core is exposed only in the highest parts of the mountains (Cháběra 1965). The mires are underlain by green or grey-green clay or sand. Montane brown forest soils are formed at higher altitudes on weathered paragneiss. Mountain ridges and plateaux are covered with typical montane gravel podsol. Alluvial soils cover the bottoms of river and brook valleys (Němeček et al. 1990). The river Vltava with its tributaries drains the Šumava region.

The climate of the valley between 700 and 1000 m asl is moderately cold and wet. The mean annual temperature varies between 3.5 and 4.5°C (Nekovář 1969). The predominant winds are from the west, northwest, and southwest. Snowfall is abundant in winter, comparable with that of the northern Alps. The mean annual precipitation follows a gradient from 729 mm in the lower parts (Zátoň, 790 m) to 1552 mm in the highest parts (Březník mire, 1150 m) (Nekovář 1969). A typical climatic feature of the region is thermal inversion in winter, with cold air lying in the basins and much higher temperatures in the surrounding hills and mountains. This climatic anomaly has a great influence on the vertical zonation of vegetation.

During the Würm glacial maximum, Šumava had at least twelve small firn glaciers (of compacted snow) on slopes exposed to the northeast (Kunský 1933). The former glaciers are shown by moraines, lakes and mires in former glacier cirques, and glacial erosional features on exposed rocks.

Flora and vegetation

The following description of the natural vegetation follows the geobotanical maps of Moravec (1968, 1969 in Míkyška et al. 1968-1972) and Neuhäuslová (1998).

The valley of the upper Vltava belongs to the floristic and phytogeographic unit of the Hercynian subprovince. This region is relatively uniform and generally poor in species, with acidophilous taxa dominating most types of vegetation, although the Abies-Fagus woods are richer in herbs. Temperate trees prevail (Fagus sylvatica, Abies alba, Quercus robur, Acer pseudoplatanus, etc.), with boreal and montane species in natural open vegetation and in the woodland undergrowth (Vaccinium myrtillus, Vaccinium vitis-idea, Deschampsia flexuosa, Nardus stricta, etc.). Specialties of Šumava of supposed alpine origin are Solidana montana, Calicocorus stipitatus, Phyteuma nigrum, and Alnus viridis.

The climax wood in the study region belongs to the following phytosociological associations:
- Dentario eneaphylli-Fagetum, herb-rich beechwoods dominated by Fagus sylvatica with admixture of Abies