

## Book review

F. Kral. **Spät- und postglaziale Waldgeschichte der Alpen auf Grund der bisherigen Pollenanalysen.** 1979. 175 pp., 72 figs., 3 tables. Veröffentlichung des Institutes für Waldbau an der Universität für Bodenkultur in Wien. Anton Riegelnik, Wien. Price O. Sch. 160.

When in 1949 and 1952 Firbas's 'Spät- und nacheiszeitliche Waldgeschichte Mitteleuropas nördlich der Alpen' was published, accumulating and integrating all the pollen diagrams known at that time, the Alps were excluded, among others because dating was, in the absence of the radiocarbon method, very unreliable. In the following 30 years much has happened. Since 1920, 1200 pollen diagrams in 250 publications from 70 authors appeared. At the moment the rate of publications is ca 10 diagrams per year. Many of these diagrams have radiocarbon dates, short sampling intervals and a fair differentiation of non-arboreal pollen types. Kral's book is an attempt to integrate a coherent picture of the vegetation development from ca. 200 pollen diagrams, for 5/6 from post-1951.

His main conclusions are that in the Lateglacial the Bølling and Allerød interstadials can be recognized. In the Bølling *Pinus* expands everywhere in the Alps and, *Quercus* already has a continuous pollen curve in pollen diagrams from the Southern Alps. The Late Dryas stadial is also usually present. However, the 'Older Dryas' (zone 1c) is difficult to recognize, often only by a rise in the values of *Betula* and *Juniperus*. In the Allerød the NAP values decrease to 20% and *Pinus* becomes the dominant pollen type.

The postglacial part of the diagrams are zoned and averages of each zone are calculated. The forest types are reconstructed on the basis of the 'Quercetum Mixtum', *Fagus*, *Abies* and *Picea* and their areal extent is traced. However, unlike Firbas's work, no pollen precipitation maps are included. Essentially Kral's book deals with the subalpine-montane and submontane-colline vegetation belts in the mountains, not the alpine belt. In this the author does not take advantage of the often high resolution in the non-aboreal pollen types. The calculations are on a basis of a tree pollen sum, possibly obscuring an interpretation in terms of

non-forest vegetation. However, Kral is well aware of this in that he states (p. 34) that this aspect must be cleared by special NAP analyses.

The main results are displayed in diagrams that depict the forest belts in five regions (northern foothills, northern Alps, central Alps, southern Alps, and southern foothills) in relation to altitude for eight postglacial periods (p. 41, 43). From this, seven types of montane forest development are extracted (p. 51, 52). Finally the development of the areal distribution of spruce, fir, beech and oak is discussed and illustrated (p. 66, 67). Between 10 000 and 7 500 years ago *Abies* and *Picea* began to expand, resulting in forests dominated by *Picea* in the east, by *Abies* in the west. The forest belts came into existence from the late Atlantic onwards, when *Abies* and *Fagus* began to replace the elements of the 'Quercetum mixtum'. Later *Abies* and *Fagus* were pushed from the central Alps by *Picea*, which, as we know, is the main tree at the forest line today. The *Picea* expansion is, apart from climatical changes, also due to the influence of man, as is true everywhere else in Europe. Man's actions are specially dealt with in a concluding chapter where it is shown (table 3) to what extent the proportions between *Picea*, *Abies* and *Fagus* have changed and to what extent (in the Dachstein massiv) the forest line was depressed (fig. 15). It goes without saying that data like these are of much importance for forest management in that they are a reconstruction of vegetation before man's interaction with nature. This 'Ur-Vegetation' in turn may give us insight in the potential natural vegetation today.

It is, in a way, astonishing that in a large mountainous region like the Alps, a rather restricted number of developments of types can be recognized. After all, each chain in the mountains constitutes a formidable geographical barrier and the vegetation development must have been much more divers than shown here. However, it would be all too easy to criticize details of Kral's integration. I agree with the author that his book is basically more a starting point for discussion than an exposition of final conclusions on the vegetation development of the Alps.

Kral has done a remarkable job in bringing order into the wealth of data resulting from more than 30 years of palynology in the Alps. In that it certainly will stimulate research in the future.

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