Late Pleistocene vegetation from the Thimi Formation, Kathmandu Valley, Nepal

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The Thimi Formation is characterized by alternation of fine to medium-grained sand, silt, silty clay and clay, deposited by distal fluvial system. Radiocarbon ages of two wood samples from middle part of the section (13 m from the top) and from the basal part (21 m from the top) are found to be $41,700 \pm \frac{5600}{3200}$ and >37,900 yrs BP, respectively. Altogether 40 samples were taken

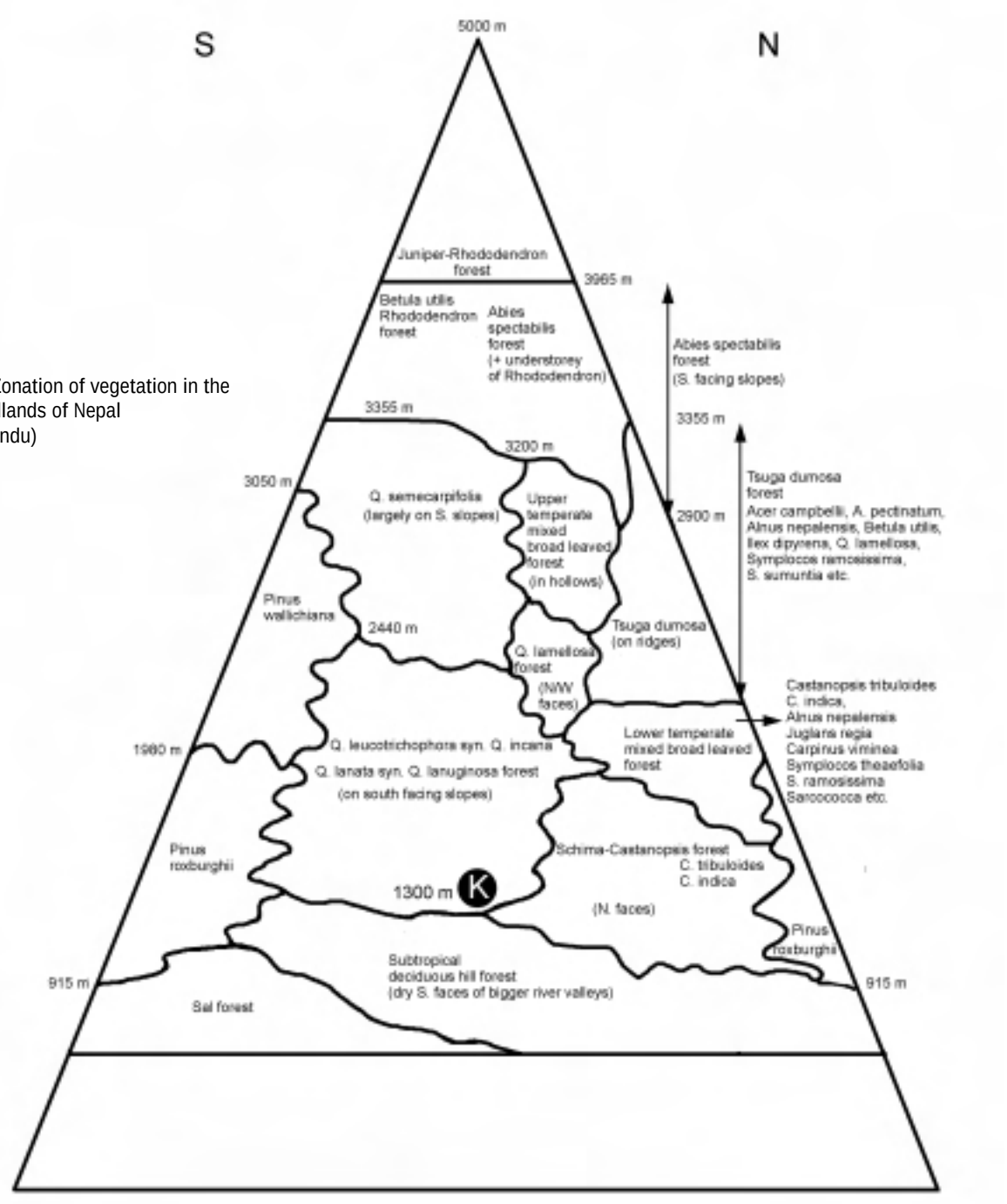

FIGURE 1. Zonation of vegetation in the Central Midlands of Nepal (K=Kathmandu)

from 23 m thick type section of the Thimi Formation for palynological study. The pollen display only minor fluctuations in their assemblages without having any major break (**Figures 1 and 2**). On the basis of these minor changes this section is divided into seven pollen zones. The small-scale changes from one pollen zone to another can be explained as ''cold", ''fairly cold" or ''moderately warm" climatic conditions. For example the presence of *Castanopsis* together with high amounts of *Quercus* and small amounts of *Abies* and *Picea* can be assigned to a moderately warm climate. This is followed by an increase in *Pinus, Picea, Abies* and *Tsuga* along with the contemporaneous decrease of *Castanopsis* and *Quercus* indicating a colder climate. In general the pollen assemblages of the Thimi Formation are dominated by cold elements such as *Pinus wallichiana* and different *Quercus* species that grow in the warm to cool temperate zone of Nepal. This is confirmed by high percentages of Poaceae and other herbaceous plants with very little woody angiosperms. Gymnosperms such as *Pinus wallichiana* (along with *Abies spectabilis*, *Tsuga dumosa* and *Picea smithiana*) were the dominant over the woody angiosperms (*Quercus lanata, Q. lamellosa* and *Q. leucotrichophora* and *Q. semecarpifolia*). An attempt was made to quantify the climatic change by plotting the present altitudinal ranges of all available pollen taxa from a single horizon. It would appear that the vegetation in the Kathmandu Valley shifted to a lower altitude by approximately 1000 m during the late Pleistocene. If we allow for a temperature lapse rate of 0.6 °C/100 m in the Nepal Himalayas this must indicate a lowering of the temperature by 6 to 7 °C.

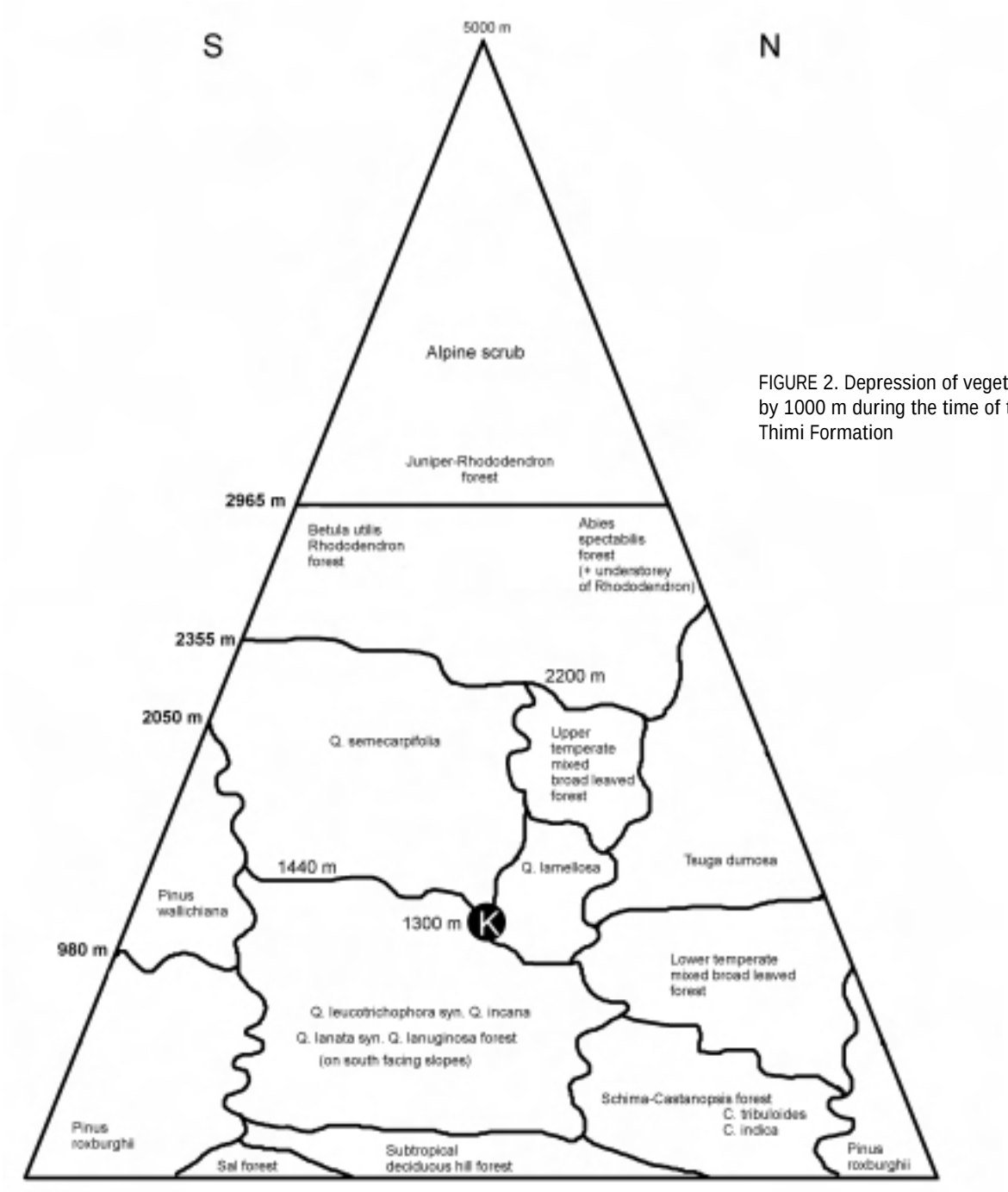

FIGURE 2. Depression of vegetation by 1000 m during the time of the Thimi Formation