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## CONTRIBUTIONS TO THE EUROPEAN POLLEN DATABASE

### 38. Peat bog Vapsko-1, Rila mountains (Bulgaria)

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#### Site details

The peat bog Vapsko-1 (42° 04' 34.04" N, 23° 31' 25.84" E; 2143 m above sea level) is situated in a depression in the lower part of the subalpine belt, just above the present tree-line, in the southern part of the Rila Mountains (2925 m). The peat bog has a nearly rectangular shape and is about 50 m long and 10–15 m wide. It is surrounded by groups of *Pinus mugo* Turra and *Juniperus sibirica* Burgsd. within patches of herbaceous vegetation. Single trees of *Pinus peuce* Griesb., *Pinus sylvestris* L. and *Picea abies* (L.) Karst. are found to the east and west of the coring site. Stands of *Betula pendula* Roth. and *Sorbus aucuparia* L. grow close to the tree-line. The bog surface is overgrown by hummocks of *Sphagnum* spp., *Carex nigra* (L.) Rchb., *Carex rostrata* Stokes, *Nardus stricta* L., *Agrostis capillaris* L., *Eriophorum latifolium* Hoppe, *Veratrum lobelianum* Bernh., amongst others. The coniferous forest belt in this part of the mountains is dominated by *Pinus peuce*, admixed with *Picea abies* and *Pinus sylvestris*. The recent distribution of *Fagus sylvatica* L. is fragmented and restricted to lower altitudes below 1200–1000 m together with the oak forests (Bondev 2002). The climate above 1000 m is montane and at the tree-line, the mean January temperature is –6 °C and the mean August temperature is 11.4 °C. The highest precipitation, much of it snow, reaches 2000 mm in the 1300–2400 m zone (Bozilova & Tonkov 2011).

#### Sediment description

The sediment profile is 150 cm deep and was collected with a hand-corer from the central part of the peat bog. The sediments are:

0–40 cm: slightly decomposed *Sphagnum*-Cyperaceae peat  
40–135 cm: dark brown Cyperaceae peat  
135–150 cm: fine sand with clay

#### Dating

The radiocarbon age of four bulk sediment samples was determined at Belfast (UBA) and Brussels (RICH) laboratories. The calibration (95.4% probability) was performed with the OxCal v4.3.1 program (Bronk Ramsey 2009). Results are:

23–26 cm: RICH 23 864, 2171 ± 28 BP (2060–2310 cal BP or 110–360 BC)  
47–50 cm: UBA 21 556, 4046 ± 33 BP (4420–4790 cal BP or 2470–2840 BC)  
97–100 cm: UBA 21 557, 6143 ± 40 BP (6930–7170 cal BP or 4980–5220 BC)  
147–150 cm: UBA 21 558, 8867 ± 52 BP (9740–10180 cal BP or 7790–8230 BC)

#### Interpretation

The pollen sum (100%) comprises all terrestrial pollen types except Cyperaceae, spores of mosses and pteridophytes. Pollen percentages of selected taxa are shown in Figure 1. Four local pollen assemblage zones (LPAZs), which reflect successive stages of vegetation history, can be recognised:

#### LPAZ V-1, 150–92 cm

The vegetation in the near surroundings of the peat bog c. 10 000 cal BP was dominated by *Betula* forests with stands of pines (*Pinus mugo*, *Pinus sylvestris*,

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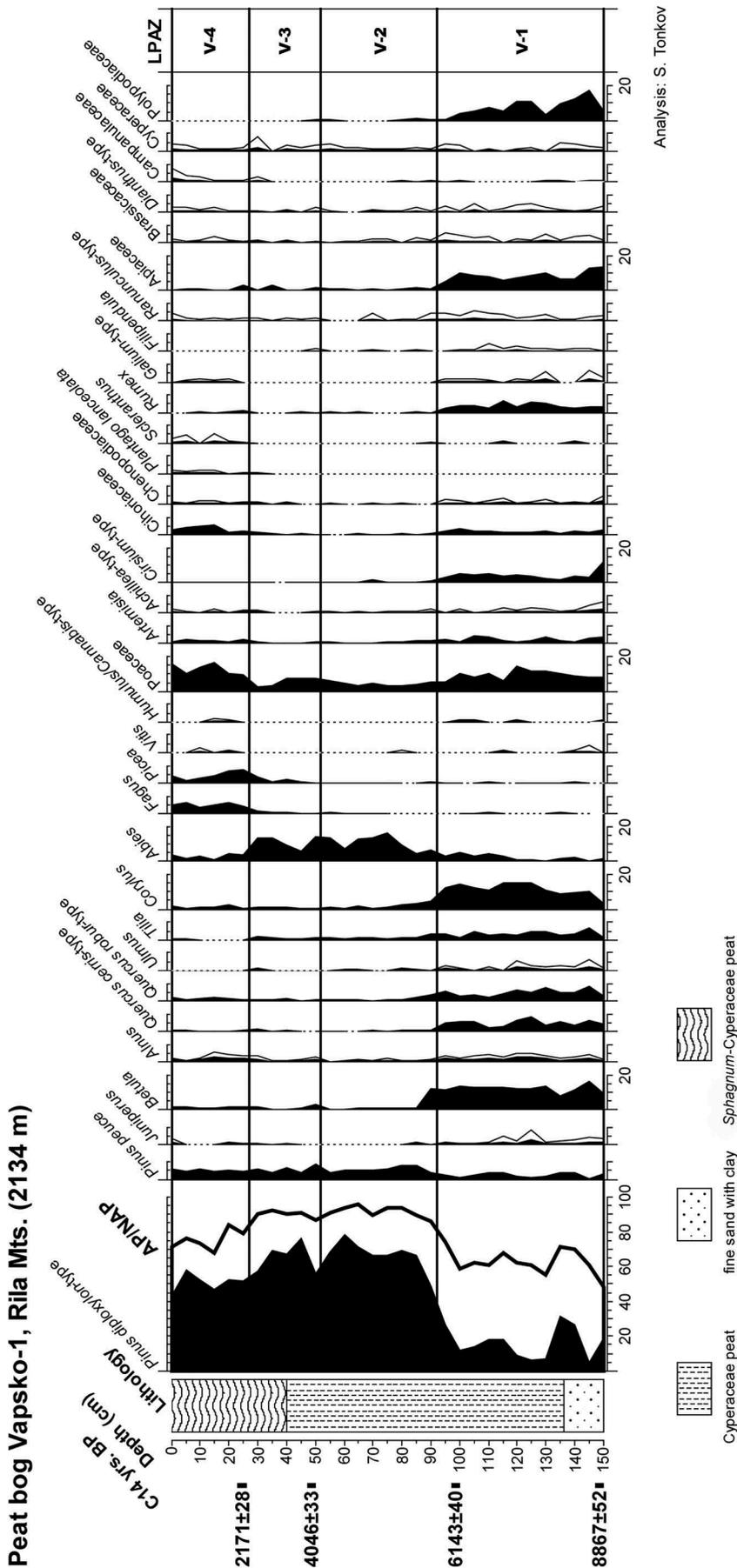


Figure 1. Percentage pollen diagram from peat bog Vapsko-1.

*Pinus peuce*) and *Juniperus*, a few *Abies alba* Mill., and undergrowth of ferns. At lower altitudes, below the birch zone, *Quercus* forests with *Ulmus* and *Tilia* were distributed, while *Corylus* occupied more open terrains. The herbaceous vegetation of the peat bog and the nearby areas was composed of grasses, sedges and various representatives of Asteraceae (*Artemisia*, *Achillea*-type, *Cirsium*-type), Cichoriaceae, Apiaceae, *Rumex*, Brassicaceae, *Dianthus*-type, etc. After c. 8300 cal BP, *Abies alba* started gradually to increase in the study area while the occurrence of *Picea abies* and *Fagus* remained sporadic.

#### LPAZ V-2, 92–52 cm

The forest composition and the altitudinal vegetation zonation started to change after 6760 cal BP. During a few centuries, pines (*Pinus sylvestris*, *Pinus mugo*, *Pinus peuce*) and fir quickly attained dominant positions, replacing at many areas the birch forests, and pushing down-slope the oak forests and hazel. The occurrence of *Picea abies* and *Fagus* remained restricted. The open area of the peat bog shrank, probably overgrown in parts by *Pinus mugo*, and the herbaceous vegetation became reduced as indicated by a substantial decline of Apiaceae, *Artemisia*, *Rumex*, *Cirsium*-type, Cichoriaceae, and partly Poaceae. Ferns nearly completely disappeared.

#### LPAZ V-3, 52–27 cm

In this zone, *Abies alba* retained its maximal participation. Pines with the exception of *Pinus peuce* showed a gradual decline. There was a continuous occurrence of pollen of *Picea abies* after 4800 cal BP, followed by that of *Fagus*, whereas both tree species expanded after 2500 cal BP. The deciduous trees

(*Quercus*, *Tilia*, *Ulmus*) and *Corylus* remained with scattered to low percentages at lower altitudes.

#### LPAZ V-4, 27–0 cm

In historical times, the anthropogenic intervention in the natural vegetation cover resulted in openings in the coniferous forests. Indication of human impact in the study area, mainly of pasture activities, is documented by the presence of pollen of *Plantago lanceolata* L., *Scleranthus*, *Artemisia*, Cichoriaceae, and increased percentages of grasses. Both *Picea abies* and *Fagus* slightly expanded and the coniferous belt became dominated by *Pinus peuce* and *Picea abies*, with some *Pinus sylvestris* and comparatively less *Abies alba*.

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#### Disclosure statement

No potential conflict of interest was reported by the authors.

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