# Contribution to the European Pollen Database. 47. Mlaca Tătarilor peat bog, Southern Transylvania (Romania)

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https://doi.org/10.1080/00173134.2020.1737216

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# 47. Mlaca Tătarilor peat bog, Southern Transylvania (Romania)

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## Site details

The peat bog Mlaca Tătarilor (45° 43′ 00" N, 24° 39′ 07" E, 540 m a.s.l.) is located in the southern part of the Transylvanian Depression, near Arpaşu de Sus village, on a higher terrace of the Arpaşu Mare River. This *Sphagnum* peat bog occupies an area of about 3 ha and it has developed above fluvial Pleistocene deposits.

From a phytogeographical point of view, the peat bog from Arpaşu is located at the borderline between the Transylvanian and Carpathian provinces. The regional vegetation is characterised at low altitude by the presence of small patches of mixed oak-hornbeam forests (*Carpinus betulus, Quercus robur, Q. petraea, Tilia cordata*), scattered mainly across vast agricultural areas. To the south, the Făgăraș Mountains slopes are largely forested with mixed deciduous forests (*Fagus sylvatica, Carpinus betulus, Betula pendula*) in the lower reaches, followed by a mixed coniferous-broadleaved zone (*Fagus sylvatica, Picea abies, Abies alba*), then, at higher altitudes, a coniferous zone (*Picea abies, Abies alba*) and an upper sub-alpine zone with *Pinus mugo, Rhododendron* and *Juniperus*. The local vegetation is typical for peat bogs, with the main association being *Sphagnetum magellanici* Malcuit, 1929, dominated by *Sphagnum magellanicum* and *Eriophorum vaginatum* species. Other species that can be found here are *Alnus glutinosa, Salix* sp., *Betula pubescens, Betula hybrida, Populus tremula, Rhamnus frangula, Menyanthes trifoliata, Eriophorum gracile, E. angustifolium, Bruckenthalia spiculifolia, Carex lasiocarpa, Scirpus sylvaticus, Peucedanum palustre, Epilobium palustre, Myosotis palustris, Caltha laeta, Ranunculus flammula, Thelypteris palustris, Alisma plantago-aquatica, Scutellaria galericulata, Vaccinium vitis-idaea, V. myrtillus, Rhynchospora alba, Riccardia chamaedryfolia, R. multifida, R. palmata, Cephalozia connivens, Calypogeia sphagnicola, Lophocolea bidentata, Aneura pinguis*, and *Cephaloziella rubella* (Ştefănuţ 2004). The region is characterised by a temperate continental climate with cold winters and cool summers. The annual precipitation is > 850 mm. The mean annual air temperature is 5 °C and the mean summer temperature is 17 °C (Ştefănuţ 2005).

## Sediment description

A 910-cm-long sedimentary core was obtained from the centre of the peat bog with a Russian corer. The litostratigraphic units are the following:

0–5 cm: *Sphagnum* peat, poorly decomposed
5–405 cm: light brown peat, slightly humidified, with macro-remains
405–800 cm: brown peat, fibrous, moderately humidified, decomposed
800–910 cm: dark brown peat, fibrous, very humidified, decomposed

## Dating

Ten AMS $^{14}$C measurements were performed on bulk peat at the Poznan Radiocarbon Laboratory (Poland). The $^{14}$C ages were converted into calendar years BP using the Intcal13 database (Reimer et al. 2013) and an age–depth model was constructed with the smooth-spline method, as implemented by the Clam software (Blaauw 2010). Results are:

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*(Received 24 September 2019; accepted 22 January 2020)*

34–36 cm: Poz-40 720, 645 ± 30 BP (387–549 cal BP), peat
141–143 cm: Poz-40 721, 1730 ± 30 BP (1650–1878 cal BP), peat
293–295 cm: Poz-40 722, 3480 ± 30 BP (3679–3802 cal BP), peat
309–311 cm: Poz-40 724, 3635 ± 35 BP (3904–4029 cal BP), peat
449–451 cm: Poz-40 725, 5125 ± 40 BP (5789–5937 cal BP), peat
534–536 cm: Poz-40 726, 6055 ± 35 BP (6711–6907 cal BP), peat
729–731 cm: Poz-40 727, 7620 ± 40 BP (8390–8653 cal BP), peat
794–796 cm: Poz-40 728, 8090 ± 40 BP (9040–9466 cal BP), peat
845–847 cm: Poz-40 729, 9110 ± 50 BP (9515–10 087 cal BP), peat

## Interpretation

The frequencies for each taxon were calculated as percentages of the total terrestrial pollen sum, which included the arboreal pollen (AP) and non-arboreal pollen (NAP) (Figure 1). Percentages of excluded taxa from the total terrestrial pollen sum, for ecological reasons (Cyperaceae and *Sphagnum*), were calculated as a proportion of their own sum added to the total pollen sum. The pollen diagram was divided into five Local Pollen Assemblage Zones (LPAZ 1–5).

### *LPAZ 1, 910–790 cm (9970–8960 cal BP)*

In this zone, the pollen spectra indicate a vegetation characteristic of the early Holocene with a well-developed mixed forest dominated by *Ulmus* (20–40%), and a low contribution of herbs. Coniferous (*Pinus* and *Picea abies*) and deciduous broadleaf tree *(Ulmus, Fraxinus, Quercus, Tilia, Betula, Alnus*) species make the AP curve reach 90% at the beginning of the sequence. A decreasing trend in AP from 90% to *c.* 70% can be observed throughout the zone. Pollen percentages of herbaceous species mainly include Poaceae and xerophytes such as *Artemisia*. Hydro-hygrophytes have Cyperaceae as the main component.

### *LPAZ 2, 790–450 cm (8960–5860 cal BP)*

This zone shows an increase in AP percentages with *Ulmus* remaining the dominant tree species in the first part of the zone. The main change in the canopy composition is represented by the increase in the amount of *Corylus avellana, Alnus* and *Picea abies* and the decreasing pollen percentages of *Ulmus, Betula, Tilia. Pinus* and *Corylus avellana* became the dominant taxa at *c.* 8500

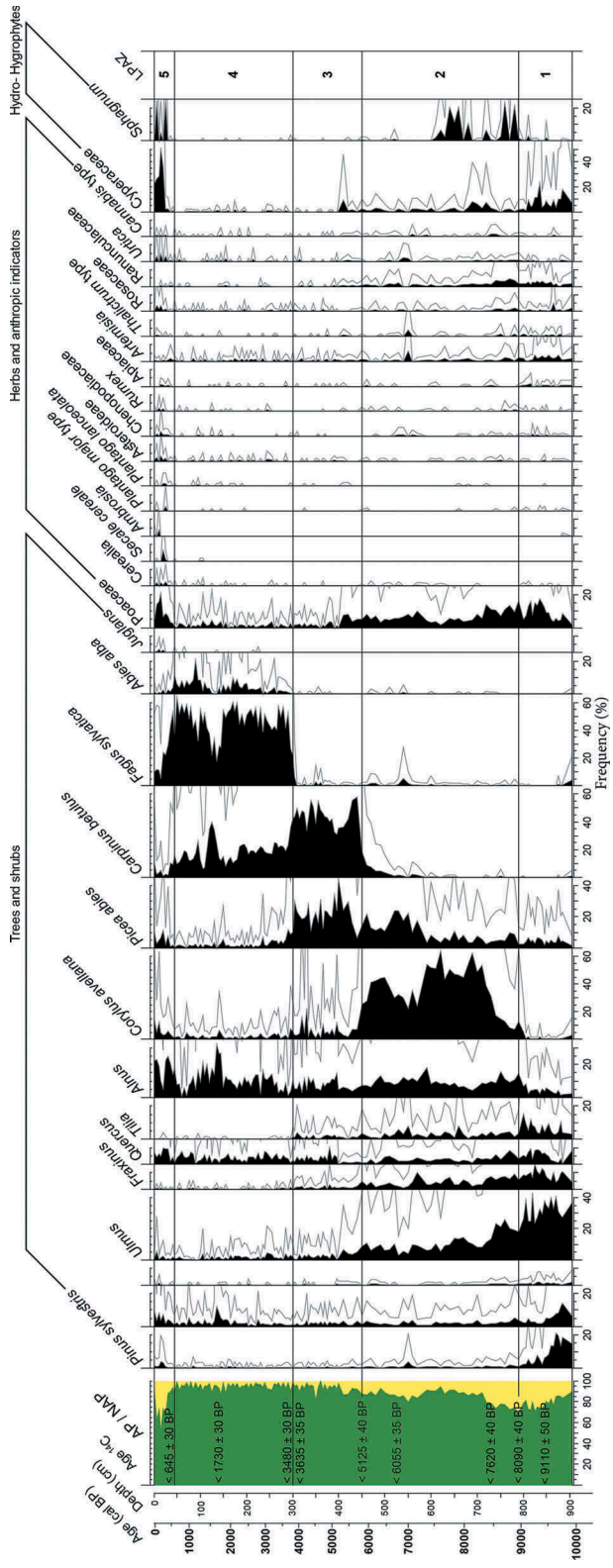

Figure 1. Pollen diagram from Mlaca Tătarilor sequence (Transylvanian Depression). Hollow curves are exaggerated 10 ×.

cal BP. Towards the end of this zone (*c.* 7200 cal BP), the establishment and the expansion of *Carpinus betulus* can be observed. Herbaceous communities expanded

and diversified, and include indicators of open landscape (e.g. Poaceae, Apiaceae, Chenopodiaceae, Asteroideae, *Artemisia*) as well as regular occurrences of cultivated plants (*Cerealia*) and pasture indicators (*Rumex, Plantago lanceolata*). *Sphagnum* replaces sedges as the main component of wetland communities.

*LPAZ 3, 450–300 cm (5860–3820 cal BP)*

The vegetation of this interval is characterised by extensive mixed forests of *Carpinus betulus* (30–50%) and *Picea abies* (20–40%) and by the significant regression of *Corylus avellana*. The relative abundances and overall diversity of herbs (especially Poaceae) decline to values below 15%.

*LPAZ 4, 300–45 cm (3820–613 cal BP)*

The vegetation of this interval is characterised by extensive mixed forests of *Fagus sylvatica* (40–60%) and *Carpinus betulus* (20–40%). Significant changes in this zone include: (i) a reduction in pollen percentages of *Picea abies* and *Corylus avellana*; (ii) the establishment and the expansion of *Abies alba;* (iii) increased relative abundances of *Alnus* and *Betula*; constant pollen percentages of *Quercus, Ulmus* and *Betula*.

*LPAZ 5, 45–0 cm (613–−43 cal BP)*

Significant changes in this zone include a decrease in pollen percentages of *Fagus sylvatica, Carpinus betulus* and *Abies alba*, and increased pollen percentages of *Picea abies, Alnus, Corylus avellana* and *Betula*. The herbaceous percentages rise markedly and are dominated by grass pollen (Poaceae) along with ruderal and pasture indicators (*Plantago lanceolata*, Cichorioideae, Asteroideae, Chenopodiaceae, Urticaceae, *Rumex, Artemisia*) and pollen of cultivated plants (Cerealia and *Secale cereale*). All these changes are more evident at the top of the sequence and reflect the effects of anthropogenic pressure in the area, mainly through deforestation.


## Acknowledgements

The authors acknowledge financial support through a grant of the Romanian National Authority for Scientific Research, UEFISCDI (PN-III-P4-ID-PCE-2016-0711). We thank the anonymous reviewers and the Editor for their careful reading of our manuscript and their valuable comments and suggestions.

## Funding

This work was supported by the Unitatea Executiva pentru Finantarea Invatamantului Superior, a Cercetarii, Dezvoltarii si Inovarii [PN-III-P4-ID-PCE-2016-0711].


## Disclosure Statement

No potential conflict of interest was reported by the authors.


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## References


Blaauw M. 2010. Methods and code for 'classical' age-modelling of radiocarbon sequences. Quaternary Geochronology 5(5): 512–518. doi:10.1016/j.quageo.2010.01.002.

Reimer PJ, Bard E, Bayliss A, Beck JW, Blackwell PG, Bronk Ramsey C, Buck CE, Cheng H, Edwards RL, Friedrich M, Grootes PM, Guilderson TP, Haflidason H, Hajdas I, Hatté C, Heaton TJ, Hoffmann DL, Hogg AG, Hughen KA, Kaiser KF, Kromer B, Manning SW, Niu M, Reimer RW, Richards DA, Scott EM, Southon JR, Staff RA, Turney CSM, van der Plicht J. 2013. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4): 1869–1887. doi:10.2458/azu_js_rc.55.16947.

Ştefănuţ S. 2004. The peat bogs from Arpaşu de Sus. Acta Horti Botanici Bucurestiensis 31: 73–77.

Ştefănuţ S. 2005. Raport de Cercetare: Viitoarea rezervaţie naturală "Lacul Tătarilor". Revista de Politica Ştiinţei şi Scientometrie, Nr. special: 1–11.