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CONTRIBUTIONS TO THE EUROPEAN POLLEN DATABASE

58. Ammer River Valley (south-western Germany)

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Site description

The pollen profile was obtained from the floodplain of Ammer River Valley, west of Tübingen in south-western Germany. Underground water from a Triassic limestone aquifer feeds the small modern-day Ammer River, which is a tributary of the Neckar River (Schwientek et al. 2013). The climate is humid-temperate with highest air temperatures from June to August (mean 21–24 °C) and lowest temperatures during December to February (mean −1 to 0 °C). The nature reserve Schönbuch north of the Ammer River Valley is characterised by thermophilous and drought-adapted vegetation on south-facing slopes (Arnold 1986). Pleistocene and Holocene sediments cover the Ammer River Valley consisting of brown alluvial clays, Tufa, grey clays, and fluvial and colluvial gravels on top of the Middle Triassic dolostones and mudstones (Geyer et al. 1995; Heidgen et al. 2020; Martin et al. 2020). In addition, the Ammer River Valley is partly covered by nutrient-rich loess deposits. Agriculture dominates today 71% of the land cover and oak, beech, and pine trees are covering hillslopes by ~12% (Schwientek et al. 2013). Nearby, several archaeological sites have been investigated, such as Neolithic settlements of the Lineare Bandkeramik period (6.3–6.0 cal ka BP), excavated by Krauß et al. (2020), and the Mesolithic archaeological site 'Rottenburg-Siebenlinden' (*c.* 6 km away), which revealed human occupation from 10.1–7.8 cal ka BP (Kind 2010).

Sediment description and dating

Two sediment cores, X039A and X039B, (48° 31′ 44.11″ N, 08° 57′ 47.73″ E) were taken in continuous 2 m intervals with no overlap, with core recovery of about 82% (Heidgen et al. 2020). The palynological studies concentrated on the upper 8 m from core X039B (Table I), from which 46 samples, with pollen sums between 150 and 500 arboreal pollen grains, were analysed. Pollen taxonomy follows Beug (2004). In addition to dispersed spores and pollen grains, microcharcoals > 10 µm and non-pollen palynomorphs (NPPs) were registered as well. The software TILIA (incl. CONISS) was used for constructing the pollen diagram and to determine the local pollen assemblage zones (LPAZs) (Grimm 1992a, 1992b). The chronology of core X039B is based on 14 accelerator mass spectrometry (AMS) carbon-14 (^{14}C) dates (Table II).

Interpretation

The pollen record covers the Early Holocene (11.5–7.8 ka) and consists of three LPAZs (LPAZ-AM1, LPAZ-AM2, LPAZ-AM3) and subzone divisions for LPAZ-AM2 (AM2-1, AM2-2) and for LPAZ-AM3 (AM3-1, AM3-2, AM3-3) (Figure 1).

LPAZ-AM1 (*Pinus*), 11.6–10.6 ka (760–675 cm) is dominated by *Pinus* (~90%), followed by *Betula* (> 10%) and *Corylus avellana* (~8%). The non-arboreal-pollen (NAP) fraction is dominated by Poaceae, *Artemisia* and Asteroideae. Wetland taxa

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Table I. Lithology of core X039B.

Depth (cm)	Description
0–285	Brown clay
285–297	Peat layer
297–600	Calcareous Tufa
600–650	Peat layer
650–700	Calcareous Tufa
700–774	Grey clay
774–800	Gravel

are dominated by Cyperaceae and *Polypodium vulgare*, suggesting local lowering of the water level.

LPAZ-AM2 (*Pinus-Corylus-Quercus*), 10.6–9.5 ka (675–490 cm), is divided into two subzones: LPAZ-AM2-1 (*Pinus-Corylus-Quercus*), 10.6–10.1 ka (675–610 cm) is dominated by *Pinus* (~80%), but at the same time, pollen representing deciduous vegetation becomes more frequent including *Corylus avellana* (30%), *Quercus* (up to 20%), *Ulmus* (~10%), *Tilia* (~8%) and some *Betula* (~5%). NAP includes *Artemisia*, Chenopodioideae (Amaranthaceae), Asteroideae, and *Galium*-type. Abundant *Urtica* suggests the presence of nutrient-rich open wetlands. Further wetland taxa involve Cyperaceae, *Cladium mariscus*, *Sparganium*-type, and *P. vulgare*. LPAZ-AM2-2 (*Pinus-Corylus*) 10.1–9.5 ka (610–495 cm) is still dominated by *Pinus* (~70%), but *C. avellana* (60%) increases pronouncedly. A decrease in *Quercus* (10%), *Tilia* (~5%), and *Ulmus* (~10%) is recorded, with *Betula* (~5%) continuing with similar abundances as seen in the previous subzone. NAP vegetation includes *Artemisia*, *Crepis*-type and Asteroideae. Local wetland taxa that are abundant include again *Urtica and Filipendula*, while open water is indicated by Cyperaceae, *C. mariscus*, *Typha latifolia*-type, *Sparganium*-type, *Potamogeton* and at 9.6 ka the appearance of *Nuphar lutea* and *Nymphaea alba* points toward lacustrine conditions during this period.

Table II. List of radiocarbon dates from the core X039B.

Lab code	Core depth (cm)	Date (year BP)	Calibrated ranges (95.4% probability)	Material
MAMS-44671	180–181	1012 ± 26	926–954	Charcoal
MAMS-42988	260–261	7032 ± 48	7820–7924	Charcoal
MAMS-46307	285–286	5973 ± 36	6693–6703	Charcoal
MAMS-46308	305–306	7296 ± 31	8027–8172	Seed
MAMS-44672	351–352	7882 ± 35	8629–8751	Charcoal
MAMS-42990	426–427	8879 ± 33	9940–10125	Charcoal
MAMS-46309	473–474	8368 ± 35	9301–9473	Charcoal
MAMS-46310	591–592	Dating failed		Charcoal
MAMS-42989	586–587	Dating failed		Charcoal
MAMS-46314	606–607	6186 ± 29	6993– 7168	Plant fragment
MAMS-46311	638–639	8943 ± 43	9917–10114	Seed
MAMS-46312	695–696	9613 ± 34	10780–11163	Charcoal
MAMS-46313	707–708	9575 ± 34	10749–11097	Fruit
MAMS-42991	756–757	10027 ± 35	11396–11687	Wood

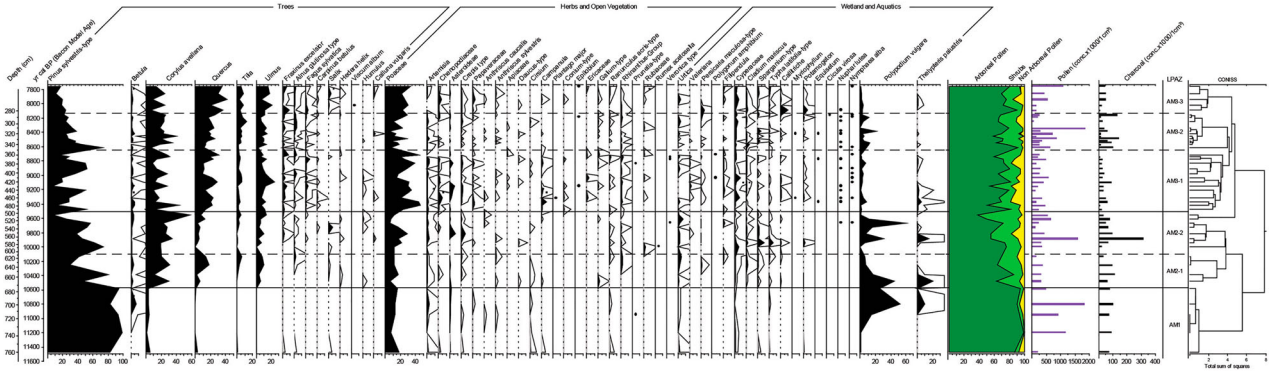

Figure 1. Percentage pollen diagram for selected pollen types and charcoal concentration observed in core X039B (dots indicate minor abundances, exaggeration curves are × 10).

LPAZ-AM3 (*Pinus-Corylus-Quercus-Tilia-Ulmus*), 9.5–7.8 ka (495–250 cm), was divided into three subzones. The lower subzone LPAZ AM3-1 (*Pinus-Corylus-Quercus-Ulmus*) 9.5–8.7 ka (495–350 cm) is dominated by *Pinus* (up to 60%), while *Corylus avellana* (up to 50%), *Quercus* (30%) and *Ulmus* (25%) increase gradually. NAP reach up to 20%, mostly consisting of *Artemisia* and Chenopodioideae. LPAZ-AM3-2 (*Pinus-Corylus-Quercus-Ulmus-Tilia*), 8.7–8.1 ka (340-295 cm) is characterised by a rapid decrease of *Pinus* and by a large proportion (40%) of the pioneer taxon *C. avellana* (45%). Mixed deciduous oak forests expand gradually to reach their maximal extension in the last subzone indicating increasing temperatures and humidity. LPAZ-AM3-3 (*Quercus-Corylus-Ulmus-Pinus*), 8.1–7.8 ka (340-290 cm), is dominated by *Quercus* (30%), *Corylus* (30%), *Ulmus* (20%) and *Tilia* (10%) reflecting the development of mixed oak forest and the increasingly closed character of the forests. Local vegetation is presented by *C. mariscus*, Cyperaceae and *Sparganium*, indicating wetlands with shallow water, but also by aquatic plants, such as *Potamogeton, Nuphar lutea* and *Nymphaea alba*, pointing to the presence of open water. In the uppermost part of this subzone (LPAZ AM3-3), the local vegetation is replaced by wet meadows and nutrient-rich habitats indicated by *Urtica*, *Filipendula*, Cyperaceae and *Callitriche*.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Arnold W. 1986. Der Wald im Naturpark Schönbuch. In: Einsele G, ed. Das landschaftsökologische Forschungsprojekt Naturpark Schönbuch, 67–74. Weinheim: VCH.

Beug H-J. 2004. Leitfaden der Pollenbestimmung für Mitteleuropa und angrenzende Gebiete, Mit 13 Tabellen. München: Pfeil.

Geyer OF, Gwinner MP. 1995. Geologie von Baden-Württemberg. Stuttgart: Schweizerbart.

Grimm E. 1992a. *TILIA 1.11 and TILIA GRAPH 1.17*. Springfield, IL: Research and Collection Center Illinois State Museum. https://www.tiliait.com.

Grimm E. 1992b. Tilia version 2. Springfield, IL: Research and Collection Center Illinois State Museum. https://www.tiliait.com.

Heidgen S, Marinova E, Krauß R, Nelle O, Ebner M, Märkle T, Miranda T, Bofinger J, Klingler S, Junginger A. 2020. Palaeoenvironment and potential resources for early Holocene subsistence in the Ammer River Valley (Germany) based on palaeoecological and bioarchaeological evidence. Quaternary International 560–561: 259–272. doi:10.1016/j.quaint.2020.05.038

Kind C-J. 2010. Jenseits des Flusses–mesolithische Lagerplätze in Siebenlinden 3, 4 und 5 (Rottenburg am Neckar, Lkr. Tübingen). Archäologisches Korrespondenzblatt 40: 467–486. doi:10.11588/ak.2010.4.28094

Krauß R, Bofinger J, Weninger B. 2020. Chronology of Early Neolithic sites in the Ammer Valley, West of Tübingen (SW-Germany). Quaternary International 560-561: 273–285. doi:10.1016/j.quaint.2020.04.004

Martin S, Klingler S, Dietrich P, Leven C, Cirpka O-A. 2020. Structural controls on the hydrogeological functioning of a floodplain. Hydrogeology Journal 28: 2675–2696. doi:10.1007/s10040-020-02225-8

Schwientek M, Osenbrück K, Fleischer M. 2013. Investigating hydrological drivers of nitrate export dynamics in two agricultural catchments in Germany using high-frequency data series. Environmental Earth Sciences 69: 381–393. doi:10.1007/s12665-013-2322-2