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Woodland vegetation history and human impacts in south-central Anatolia 16,000–6500 cal BP: Anthracological results from five prehistoric sites in the Konya plain

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ABSTRACT

This article addresses the development and palaeoecological history of woodland vegetation in the inland high-altitude plateaux of south-central Anatolia using wood charcoal remains from the sites of Pınarbaşı, Boncuklu, Can Hasan III, Çatalhöyük East, and Çatalhöyük West spanning the period ~16,000–6500 cal BP. The anthracological evidence highlights the role of *Juniperus*, *Amygdalus* and *Pistacia* as pioneer species during periods of woodland expansion in south-central Anatolia when temperatures started to increase following the Last Glacial Maximum (evidenced at Epipalaeolithic Pınarbaşı). During the early Holocene, three habitation sites (Boncuklu, Can Hasan III, Pınarbaşı A) provide evidence for the presence of diverse semi-arid and riparian woodland habitats in the Konya plain of south-central Anatolia. The anthracological data provide insights into the establishment and spread of regionally significant woodland vegetation types such as the oak and juniper-dominated semi-arid steppe woodlands. It is argued that within the context of early Holocene climatic amelioration, and the first sedentary communities practising agro-pastoral economies, anthropogenic woodland habitats were established.

1. Introduction

This paper investigates the vegetation history of south-central Anatolia through charcoal analysis (including new and previously published assemblages) originating from five prehistoric habitation sites in the Konya plain: Pınarbaşı, Boncuklu, Can Hasan III, Çatalhöyük East and Çatalhöyük West. Together, these sites cover the timespan between the late Pleistocene and the mid-Holocene (~16,000–6500 cal BP). In south-central Anatolia, this period witnessed a series of environmental, socio-cultural and economic transformations that framed the appearance of early settled life and the onset of plant cultivation and animal herding (Asouti, 2006; Baird et al., 2013). These transformations occurred against a background of abrupt climatic shifts that exerted significant impacts on water and vegetation resources (Roberts, 2016). Until recently, in Southwest Asia little emphasis has been placed on using the potential of archaeological charcoal data for reconstructing long-term diachronic vegetation change, which (with few exceptions, e.g., Asouti et al., 2015; Willcox, 1974, 2002) remains the preserve of pollen analyses. However, when considering the poor preservation, low spatio-temporal resolution and general rarity of uninterrupted pollen sequences available from the semi-arid regions of inland Southwest Asia, multi-period anthracological assemblages originating in radiometrically-dated and closely controlled archaeological contexts emerge as an invaluable source of palaeovegetation data (Asouti and Austin, 2005). These conditions are especially pertinent to researching the vegetation history of prehistoric central Anatolia. Apart from deciduous *Quercus*, central Anatolian woodlands are dominated by taxa that are either absent from, or under-represented in pollen sequences (i.e. Rosaceae, Salicaceae, *Fraxinus*, Ulmaceae, *Juniperus*, *Pistacia*). Furthermore, wood charcoal macrofossils representing the remains of prehistoric fuel wood use derived from well-dated archaeological contexts, can provide direct evidence on the manner and intensity of anthropogenic impacts on woodlands, and the environmental conditions affecting tree growth (Kabukcu, 2017).

The paper explores the evolution of the regional woodland vegetation starting from the earliest known periods of woodland vegetation expansion in south-central Anatolia during ~16,000–14,000 cal BP (evidenced in Epipalaeolithic Pınarbaşı) which provide important insights into the nature of early woodland

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formations on the south-central Anatolian plateau. Early to mid-Holocene anthracological assemblages from the Neolithic sites of Pınarbaşı A and B, Boncuklu, Can Hasan III and Çatalhöyük East, the Chalcolithic mound of Çatalhöyük West, and Chalcolithic to Early Bronze Age phases of Pınarbaşı B, cover the timespan between ~10,700 and 6500 cal BP. They provide evidence for the establishment of diverse semi-arid and wet/riparian woodland habitats in the Konya plain and its environs during this period, alongside the development of increasingly specialised fuel economies at each site. It is argued that against the background of early Holocene climatic amelioration anthropogenic woodland habitats became more prevalent through time. This pattern reached a peak during the Neolithic occupation of Çatalhöyük East with the intensive management of local and more distant woodlands for fuel, timber and fodder. Furthermore, post-Neolithic woodland composition on the Konya plain points to a remarkable degree of ecological resilience of the regional woodlands in the context of heightened mid-Holocene climatic fluctuations. In addition to diachronic taxon frequencies, dendroecological evidence of tree growth conditions, seasonality of rainfall, and vegetation successional dynamics are also considered. The paper concludes by placing the Konya plain anthracological record in the wider context of the late Pleistocene to mid-Holocene vegetation history of Southwest Asia through detailed comparisons to published anthracological archives from other regions of inland Southwest Asia.

2. The study area: climate, soils and vegetation

South-central Anatolia comprises the Konya basin, a high-altitude (~1000 m a.s.l.) inland plateau and the surrounding foothills of the north-facing slopes of the Taurus range (Fig. 1). The basin floor, formed by the drying-up of a large late Pleistocene palaeolake, contains sediments accumulated during the Tertiary and Quaternary sourced from the surrounding uplands, most of which consist of Palaeozoic and Upper Cretaceous limestone. At lower elevations, especially on the northern outskirts of the Karaman plain, the original lake bed marl is exposed. From the southern upland zone (the Taurus and anti-Taurus foothills) several streams and rivers enter the basin depositing alluvial sediments in the shape of wide fans such as the Çarşamba and May fans near Çumra, the Meram and Sille fans, on which the modern city of Konya is built, and the Selerecki fan near Karaman (De Ridder, 1965; De Meester, 1970; Bozyiğit and Güngör, 2011).

The region is characterised by a markedly continental climate, with cold winters and hot and dry summers giving rise to semi-arid steppe vegetation that has been continuously impacted by millennia of human activities, especially pastoral production (Fırıncıoğlu et al., 2007). Precipitation on the Konya plain ranges from ~270 to 350 mm/p.a. with the majority of it falling in winter and early spring (Fig. 2). The strong seasonal gradients of rainfall (especially summer aridity) and temperature limit the growth season of plants, thus dictating to a great extent the ecology and distribution of the main vegetation types that are found in the Konya Basin today. The predominance of treeless steppe on the plain itself largely reflects its very low annual rainfall, which has a severe effect on plant growth; ~150 mm of annual precipitation are received during the 220 days out of a year with temperatures >8 °C (i.e., the necessary requirements for successful plant growth). There is a strong orographic gradient in precipitation values, which increase gradually with elevation to reach levels between ~500 and 650 mm/p.a. near Hadim, Çat and Bozkır on the north-facing Taurus foothills. At Akşehir and Seydişehir near the Anatolian Lake District, on the southwestern outskirts of the Konya plain catchment area, mean rainfall values can be as high as ~700 mm/p.a. (Fig. 2, Çetik, 1985: 59, Devlet Meteoroloji İşleri, 2011).

South-central Anatolia is located in the biogeographic region referred to as Irano-Turanian by Davis (1965–1988) and Çetik (1985), coinciding to some extent with the Irano-Anatolian

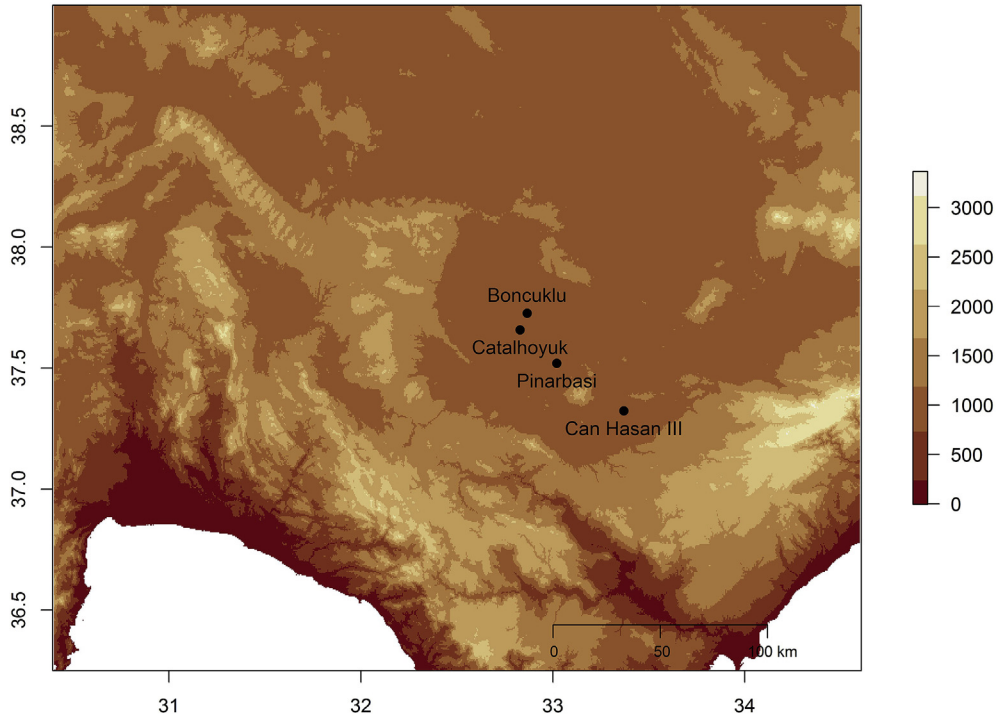

Fig. 1. Konya plain and surrounding region elevation map with locations of archaeological sites. Map generated by author using R (package *raster, rgeos*); data source Shuttle Radar Topography Mission.