Materiali e documenti

Abu Tbeirah Excavations I. Area 1

Last Phase and Building A – Phase 1

edited by

Licia Romano and Franco D'Agostino

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In copertina: Modified satellite imagery of Abu Tbeirah site (courtesy of © DigitalGlobe, distributed by e-GEOSx). Logo: Iraqi SBAH

This book is dedicated to Amir Doshi,
whose friendship is the pillar
of our work at Abu Tbeirah

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PALAEOENVIRONMENT, CLIMATE AND LAND USE IN SOUTHERN MESOPOTAMIA/NASIRIYAH AREA

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PALAEOENVIRONMENT, CLIMATE AND LAND USE IN SOUTHERN MESOPOTAMIA/NASIRIYAH AREA

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4.1 The Mesopotamian Palaeoenvironment

The past vegetation and climate changes in Mesopotamia have been the subject of several investigations through the analysis of pollen and Non-Pollen Palynomorphs (NPPs) (Fig. 4.1).[1] Although the available palaeoenvironmental reconstructions are supported by very few radiocarbon dates, they depict an interesting series of changes in the postglacial vegetational landscape, partly related to the geomorphological evolution of the floodplains and partly to changes in the precipitation regime and increased human activity.

Pollen records from caves and river valley sections in north-eastern Iraq show a quite different vegetation composition from the Mesopotamian Plain, with significant percentages of oak pollen, accompanied by *Pistacia*, *Olea*, and cereals, as documented by pollen analysis from several sites, often located near Palaeolithic caves, for example Zawi-Chemi Shanidar, Hawdian Cave, and Hazar Merd Cave.[2] This vegetation type is consistent with the orography of the region, which promotes rainfall (600-800 mm/year) and winter snow, thus allowing even at present the formation of oak and chestnut woodlands.

In addition to pollen records, plant macroremains were recovered in the early Neolithic village (ca. 9450-9300 cal BP) of Jarmo (Iraqi Kurdistan; Fig. 4.1), whose inhabitants cultivated and stored wheats (*Triticum*), two-rowed barley (*Hordeum*), peas (*Pisum*), lentils (*Lens*) and pistachio (*Pistacia*).[3] Remains of domesticated and wild animals were also found at Jarmo, including goat, gazelle, sheep, bovid, deer, dog, pig, bear, wolf, fox, leopard, cat, badger, beech marten, rodent, birds, tortoise, fishes, and rats.[4]

Several investigations on archaeobotanical remains from prehistorical archaeological sites in Iraq were published in the Sixties and Seventies, but they are not supported by radiometric datings. Zohary *et al.* report the results from the following sites:[5] Tell es-Sawwan, Samarra (7300-7000 cal BP),[6] Yarym Tepe (8^{th}-6^{th} mill. BP),[7] and Choga Mami (second half of the 8^{th} mill. BP)[8] (Fig. 4.1). Here, plant remains of cereals (*Triticum monococcum*, *T. dicoccum*, and *Hordeum* sp.), legumes (*Lens*, and *Pisum*), and *Linum*, accompanied by wild taxa (e.g. *Pistacia*, *Prosopis*, *Capparis*, *Lolium*, *Avena* and other grasses) document agricultural activity and land use.

In the western Iraqi desert along the Euphrates River, an area currently characterized by mean annual precipitation around 150 mm, pollen data were published from the section of Barwana, 6 km south of Haditha City. They indicate that an open forest with *Pinus* (13-46%) and *Quercus* (up to 8.5%) was present during a postglacial

[1] Al-Rawi *et al.* 2005; Al-Ameri - Jassim 2011; Al-Ameri *et al.* 2011; Awadh *et al.* 2011; Al-Ameri - Al-Dolaymi 2013; Kumar 2015.
[2] Al-Ameri *et al.* 2011.
[3] Helbaek 1960.
[4] Al-Ameri *et al.* 2011.
[5] Zohary *et al.* 2012.
[6] Helbaek 1960.
[7] Bakhyeyev - Yanushevich 1980.
[8] Helbaek 1972.

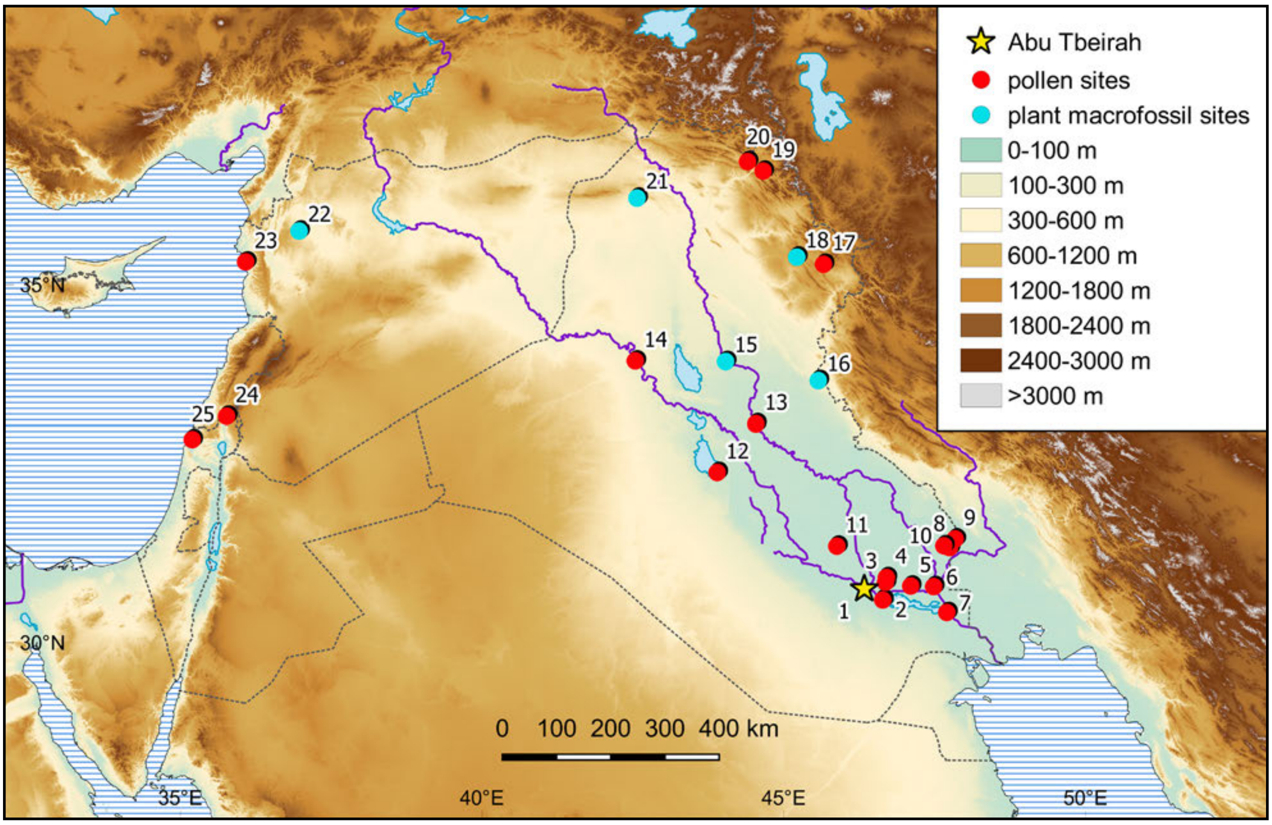

Fig. 4.1 Pollen and plant macrofossil sites mentioned in the text: 1. Abu Tbeirah; 2. Al-Kurmashiyah K6a; 3. Abu Zarak AZ6; 4. Abu Zarak AZ11; 5. Al-Baghdadiyah core 8C; 6. Borehole 18; 7. Al-Mashab core 11C; 8. Hwaiza-Ummulnaage core 1A; 9. Hwaiza-Udaem core 2; 10. Hwaiza-Ummulnaage core 11A; 11. Tell Umm al-Aqarib; 12. Razazza; 13. Al-Dora (South Baghdad); 14. Barwana; 15. Tell es-Sawwan; 16. Choga Mami; 17. Hazar Merd Cave; 18. Jarmo; 19. Hawdian Cave; 20. Zawi-Chemi Shanidar; 21. Yarim Tepe; 22. Tell Mardikh (Ebla); 23. Jableh; 24. Tel Dan; 25. Tel Akko.

phase when marine sediments were deposited.[9] This pollen assemblage suggests a climate much wetter than at present, with winter and summer precipitations supporting tree growth. Pine and oak pollen in significant percentages (>20% and >2%, respectively) are recorded for some time after the sediment deposition was not in marine environment any more. Then, an increase in Palmae is found (up to 19.4%), indicating warm climate, less humid than in the previous period, and presence of human activity. A subsequent increase in Poaceae (up to 45.3%) and Chenopodiaceae (up to 13.6%), indicating the emergence of steppe vegetation, together with Asteraceae (up to 15%) and Palmae (up to 15%), suggests a warmer climate. After a level characterized by sediments containing many archaeological pottery of different sizes, where pollen is absent, the pollen assemblage reflects widespread steppe-desert plants under semi-arid warm conditions, and the beginning of a desertification phase.[10] Towards the top of the record, an increase in Cyperaceae, probably deposited in swamps and wetlands, suggests a lowering of the river as a result of drought and possibly also of human intervention to cultivate the area surrounding the river. At the same time, a wide distribution of Palmae, reaching the highest values (>20%) of the studied section, is recorded. At the top of the sequence, increasing percentages of desert shrubs show semi-arid warm climatic conditions similar to the current climate of the region, and continuous human impact on the environment.[11]

In the western Iraqi desert near Lake Rezazza (Fig. 4.1), where the mean annual precipitation is less than 100 mm, the vegetation of the last glacial period, characterized by percentages of

[9] Al-Ameri - Al-Dolaymi 2013.

[10] Al-Ameri - Al-Dolaymi 2013.

[11] Al-Ameri - Al-Dolaymi 2013.

chenopods over 80%, was replaced during the Holocene by a grassland with significant values of oaks and palms.

In central Iraq, a pollen record from the eastern bank of the Tigris river at Al-Dora site (south of Baghdad) shows an anthropogenic vegetation dominated by Poaceae, including cereals, and palms. Similarly to western Iraq, there is also a significant amount of *Pinus*, whose pollen may also be of distant origin.[12] A progressive increase in chenopods recorded at the top of the sequence suggests dryness and soil salinity in recent times.

In the wetlands of southern Iraq, a 152 m deep sediment core (borehole 18; Fig. 4.1), spanning approx. 50.000 years, was drilled between the cities of Qurna and Amarah.[13] The early Holocene sediments are mainly composed of clay and characterized by occurrence of marine dinoflagellate cysts, foraminifera linings, gastropods, and pelecypods. The pollen record of this time interval shows high occurrences of Poaceae and low values of chenopods and *Artemisia*, indicating an overall wet climate. The presence of palms may indicate high temperatures. In the upper part of the record, the sediment is mainly composed of clay and sand, deposited during the progradation of the shoreline. The vegetation was dominated by Poaceae and palms, with increasing values of *Artemisia* and chenopods in the top layers, indicating a progressive increase in temperature and annual evaporation rates, leading to the formation of evaporite beds and the current semiarid climate.[14]

Pollen analyses of eight 1 m long sediment cores (Al-Mashab core 11C, Al-Kurmashiya K6a, Al-Baghdadiyah core 8C, Abu Zarak AZ6, Abu Zarak AZ11, Hwaiza-Ummulnaage core 1A, Hwaiza-Ummulnaage core 11A, Hwaiza-Udaem core 2) (Fig. 4.1) depict the late Holocene development of vegetation of the wetland of Ahwar of southern Iraq.[15] Although the regional vegetation was always characterized by Poaceae and Palma*e*, two main environments can be distinguished: a permanently flooded one, with abundant *Typha* and other marshy plants, associated with the deposition of peat and/or organic clay, and a partially dry marshland where *Typha* is missing, but abundant chenopods, indicating a salt-rich substratum, are found.

A pollen record was also obtained from the archaeological site of Tell Umm al-Aqarib, 25 km west of Al-Rifai city within Al-Nasiriyah region, approx. 90 km north of Abu Tbeirah.[16] Samples were collected from a 3 m deep section in an ancient river channel crossing the ancient city. The pollen record shows dominance of *Typha*, palms and Poaceae, including cereals, as well as rising percentages of chenopods, suggesting increasingly arid conditions, which may have been the cause for the demise of the ancient city of Tell Umm al-Aqarib around 2100 BC.[17]

4.2 The 4.2 ka BP Event

The new pollen data from Abu Tbeirah are expected to provide new insights into the climate event that affected the vegetational landscapes and human societies of the Near East between approx. 4200 and 3900 years BP.

The hypothesis that an abrupt and marked climate change caused the sudden collapse of Subir, a 3rd mill. BC rain-fed agriculture civilization of northern Mesopotamia on the Khabur Plains of Syria, and of the Akkadian empire based in southern Mesopotamia was first advanced by Weiss *et al.*[18]

A marked increase in aridity, dust, and wind circulation, inducing a considerable degradation of land-use conditions, were considered the main factors causing the abandonment of a large region across the Khabur and Assyrian Plains starting around 4200 cal BP. This megadrought event may have eliminated dry farming cereal cultivation across the north Mesopotamian and Syrian plains, following a 30-50 percent reduction in Tigris-Euphrates flow.[19] At the end of the "4.2 ka event", around 3900 cal BP, entire regions of northern Mesopotamia, Syria and Palestine were resettled

[12] Awadh *et al.* 2011.
[13] Al-Ameri - Jassim 2011.
[14] Al-Ameri - Jassim 2011.
[15] Al-Ameri - Jassim 2011.
[16] Al-Ameri - Jassim 2011.
[17] Al-Ameri - Jassim 2011.
[18] Weiss *et al.* 1993.
[19] Weiss 2017.

Fig. 4.2 Reed-mat from the floor of Room 1, Building A - phase 2.

Fig. 4.3 Fragment of a charred date palm (*Phoenix dactylifera* L.) stem from Room 3, Building A - phase 2.

intensively and reorganized fundamentally,[20] probably in response to a recovered precipitation regime.

In southern Mesopotamia, the social effects of the 4.2 ka BP event are perceptible unevenly as there is no high-resolution archaeological survey data for this period.[21] However, the megadrought effects are documented further south, in the Gulf of Oman, where Cullen *et al.*,[22] using mineralogic and geochemical analyses of a marine sediment core, in a location directly downwind of Mesopotamian dust source areas and archaeological sites, found a very abrupt increase in eolian dust and Mesopotamian aridity dated 4025 cal BP, which persisted for approx. 300 years.

A clear climatic instability is recorded also in northern Syria.[23] At Tell Tweini (Jableh; Fig. 4.1), a pollen-based environmental reconstruction shows that drier conditions prevailed during the 4.2 ka BP event, with ecological shifts induced by lower winter precipitation. The drier conditions ended at about 3950 cal. BP.[24] In continental Syria at the Ebla archaeological site, modeled precipitation estimates suggest a regional crisis in the rainfall regime beginning at around 4200 cal. BP that may be related to the 3rd mill. BC political and structural collapse occurred at Ebla (Early Bronze Age IV B).[25]

Along the Levantine coast, at Tel Akko, a pollen-based climate reconstruction shows an approximate 12% decrease in annual precipitation between 4200-4000 cal. BP, followed by an urbanization phase at the termination of the drought event.[26] At the foothills of mount Hermon in Galilee, the site of Tel Dan shows clear signatures of an arid event characterized by a sharp drop in surface water between ca. 4100 and 3900 cal. BP.[27] During this phase of enduring drought in the area of Tel Dan the societal structure appears to have become extremely fragile. The migration toward river banks and karst-fed spring zones, such as the fertile area of Tel Dan, may have created rivalry for resources, tensions between groups, and finally the semi-abandonment of the city.[28]

In this perspective, the recognition of environmental changes at Abu Tbeirah related with the 4.2 ka BP event appears especially relevant and deserves attention. The pollen and plant macrofossil analyses from the archaeological excavation, interpreted in the light of the environmental changes recognized in the Near East, may offer novel insights into cultural development, societal changes and climate dynamics of the region.

[20] Staubwasser - Weiss 2006.
[21] Staubwasser - Weiss 2006.
[22] Cullen *et al.* 2000.
[23] Kaniewski *et al.* 2018.
[24] Kaniewski *et al.* 2008.
[25] Fiorentino *et al.* 2008.
[26] Kaniewski *et al.* 2013; 2018.
[27] Kaniewski *et al.* 2017.
[28] Kaniewski *et al.* 2017.

4.3 The Abu Tbeirah Plant Remains: Preliminary Insights

The study of plant macroremains retrieved from archaeological layers connected to human activity at Abu Tbeirah makes a valuable contribution to the palaeoenvironmental reconstruction of southern Mesopotamia. Several limitations are to be considered when interpreting the plant macrofossil record, especially concerning the preservation of plant remains, which by their nature are the most fragile among bioarchaeological ones, being very sensitive to environmental modification processes over time (*e.g.*, strong temperature variations, salt deposition, taphonomical processes, waterlogging, and desiccation of clayey sediments containing the plant remains). On the other hand, plant macrofossils, complemented by pollen analysis, provide different kinds of information useful to archaeologists, to reconstruct palaeoenvironment, land use, as well as economic, nutritional, ritual, and technological aspects connected with the human presence in the territory. Thus, the multifaceted purposes of archaeobotanical research largely depend on the archaeological contexts and structures present on the site.[29]

A total of five plant macroremains, consisting of fragments of unburnt vegetable fibers, were identified as reeds and selected for AMS radiocarbon dating from the Abu Tbeirah excavation. They were collected from various layers not contaminated by circulating Carbon and were sent to the Dating and Diagnostic Center (CEDAD) of the University of Salento and to the Institute of Nuclear Fisics in Florence. The obtained reliable datings are unfortunately limited in number due to a diffused bitumen contamination (see § 6.1.1.2).

A preliminary list of plant remains from Abu Tbeirah abitative contexts includes interwoven fibers and mats, a palm stem and some charred cereal grains (Figs 4.2-4). Fragments of reed-mats were retrieved on the floor of Building A Room 1 (phase 2) in connection with a hearth and some post holes (Fig. 4.2).[30] Besides, intertwined reeds were found in domestic contexts and burials as baskets (*e.g.*, the small basket in Grave 12, Room 4 Building A - phase 1 - see § 8.4).[31] Through anatomical and morphobiometrical analyses it was possible to attribute them to *Arundo donax* L., common reed, still used at present in the marshland territory of southern Iraq as building and roofing material, as well as in the internal floor surfaces. An unburned fragment of palm stem, about 15 cm long, retrieved from Building A Room 3 - phase 2, was identified as *Phoenix dactylifera* L., date palm (Fig. 4.3). It was tentatively interpreted as the handle of a copper-alloy chisel found nearby. In the northern sector of the excavation, evidence of agricultural activity of the Abu Tbeirah community is documented. A number of charred cereal grains, probably escaped from roasting processes, were found in a tannur located in a corner of Room 1 Building C (Area 2).[32] Other charred caryopses were found on the floor of Building A Room 5 phase 2, in proximity of a millstone.[33] These caryopses, not well preserved, belong to two different taxa: barley

Fig. 4.4 Caryopses of cereals from the pavement of Room 5, Building A - phase 2. Top: einkorn wheat (*Triticum* cf. *monococcum* L.); bottom: barley (*Hordeum vulgare* L.). Scale bar is 1 mm.

[29] Celant *et al.* 2015.

[30] D'Agostino *et al.* 2013.

[31] See Montorfani 2019; Romano *et al. forth*.

[32] D'Agostino *et al.* 2015.

[33] Cereda - Romano 2018.

(*Hordeum vulgare*) and einkorn wheat (*Triticum* cf. *monococcum*) (Fig. 4.4).

Pollen analyses from the sediment cores collected from the Area 5 and from the borehole realized north of Abu Tbeirah settlement are currently being carried on (see § 3). They will be directly compared with the available pollen records from the southern Mesopotamian Marshland to depict a detailed picture of the landscape changes during the 4th-3rd mill. BC. Anyway, the results so far obtained from plant macroremains largely confirm the palaeoenvironmental reconstructions provided by the published pollen data, as they indicate that cereals, reeds, sedges, rushes and palms were the dominant elements of the large wetland surrounding Abu Tbeirah.

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