Urbanism, Archaeology and Trade

Further Observations on the Gao Region (Mali). The 1996 Fieldseason Results

Timothy Insoll

(With contributions by Dorian Q. Fuller, Nicky Milner, Helen Cook, Sarah Barrett-Jolley, Carol Stangroome, Rachel MacLean, Ben Roy, Maria Filomena Guerra and Paulo de Moraes Farias)

BAR International Series 829

2000

Chapter 1. Introduction.

Timothy Insoll, Department of Art History and Archaeology, University of Manchester.

The results of the 1996 field season in the city of Gao (Mali) and its immediate vicinity are described in this volume (Figure 1). Both excavations and surveys were completed in October and November 1996, with excavations undertaken in Gadei and Gao Ancien which lie within the limits of modern Gao, and Koima which is situated on the opposite bank of the River Niger. Survey was also completed within these three areas as well as north of Gao Ancien, and within the vicinity of the cemetery of Gorongobo.

This research was undertaken to build upon the results obtained from the first full seasons work completed in Gao in Autumn 1993. The results of this first season formed the basis of the author's doctoral thesis which has subsequently been published (Insoll 1996). This volume, in essence, could be considered as an appendix, albeit a substantial one, to the first volume. It is being loosely classified as such as the bulk of the relevant background description has already been provided in the former volume; the Arabic and local historical sources, the environmental background to Gao, detail on its current inhabitants, existing research, all were considered in some detail (see Insoll 1996). It would be a futile exercise to repeat all this here and the reader is thus encouraged to consider the two volumes together. Obviously, the results of the 1996 season have contributed something further to our understanding of the origins and development of Gao, therefore this volume is in reality more than an appendix, it is a site report in a traditional vein and with no pretensions as to its contribution to archaeological theory, for example.

In brief, the 1996 results have provided further insight into a variety of different questions which were left unanswered or subjects which were only vaguely understood following the 1993 season. Not least were the inter-relations between the different component parts which constituted Iron Age Gao, and these are considered in Chapter 2, where the results of the excavations and surveys are presented, the architectural and epigraphic data is evaluated, and an interpretative summary of settlement at Gao, based upon this new evidence, proposed.

The 1996 excavations also uncovered substantial assemblages of a variety of types of artifact which have similarly contributed significantly to our understanding of technology, diet, and trade. Faunal and botanical remains were exceptionally well represented and these have been analysed by a variety of specialists allowing a detailed picture of diet and subsistence patterns to be reconstructed, an area of study which was previously largely neglected. Thus, Chapters 3 and 4 present the results of the analysis of, firstly, the botanical remains, and secondly, the shell, fish, and other bones. Locally produced pottery was also found in substantial quantities. The 1993 results continue to provide the basis of the typology for this material, but it has proved possible to refine this based upon the new assemblages from both Gadei and Gao Ancien. The analysis of the locally produced pottery has also contributed to the reconstruction of dietary patterns and even of the "cuisine" which was in existence in the city. The results of this analysis are considered in Chapter 5 where an interpretation is proposed which draws together these varied strands of evidence with dietary associations, and which convincingly accounts for their presence as the residue of a specialised cuisine which has parallels in contemporary Songhai (the dominant ethnic group in the region to this day) ethnography.

Trade related items were also recovered, though in lesser quantities than in 1993. Amongst this category of artifacts was a large assemblage of beads. This was in fact the only type of material largely sourced via trans-Saharan trade which was found in large numbers. The bead assemblage is described in Chapter 6. Glazed pottery, contrary to the 1993 excavations, was wholly absent, whilst only a few fragments of glass were recovered. This latter material is outlined in Chapter 7, along with the other miscellaneous finds which were uncovered including lithics, spindle whorls, and pigments. Finally, the metals which were recovered are considered in Chapter 8, and an appendix provided describing the metal objects recovered in 1993, which because they were undergoing conservation, remained previously undescribed. By way of conclusion, the whole is drawn together in Chapter 9.

In summary, the results of the 1996 season in Gao have further indicated the importance of Gao as one of the leading, if not the paramount trade centres in West Africa at the beginning of the second millennium (all dates are AD unless otherwise specified). The Songhai associations of the city are further reinforced by these results. Furthermore, the foundations which were being laid for the emergence of the Songhai empire and the subsequent role of Gao as its capital are also readily apparent in the archaeological data. Future research in Gao can only serve to refine and enhance our understanding of this tenacious urban centre astride the Niger.

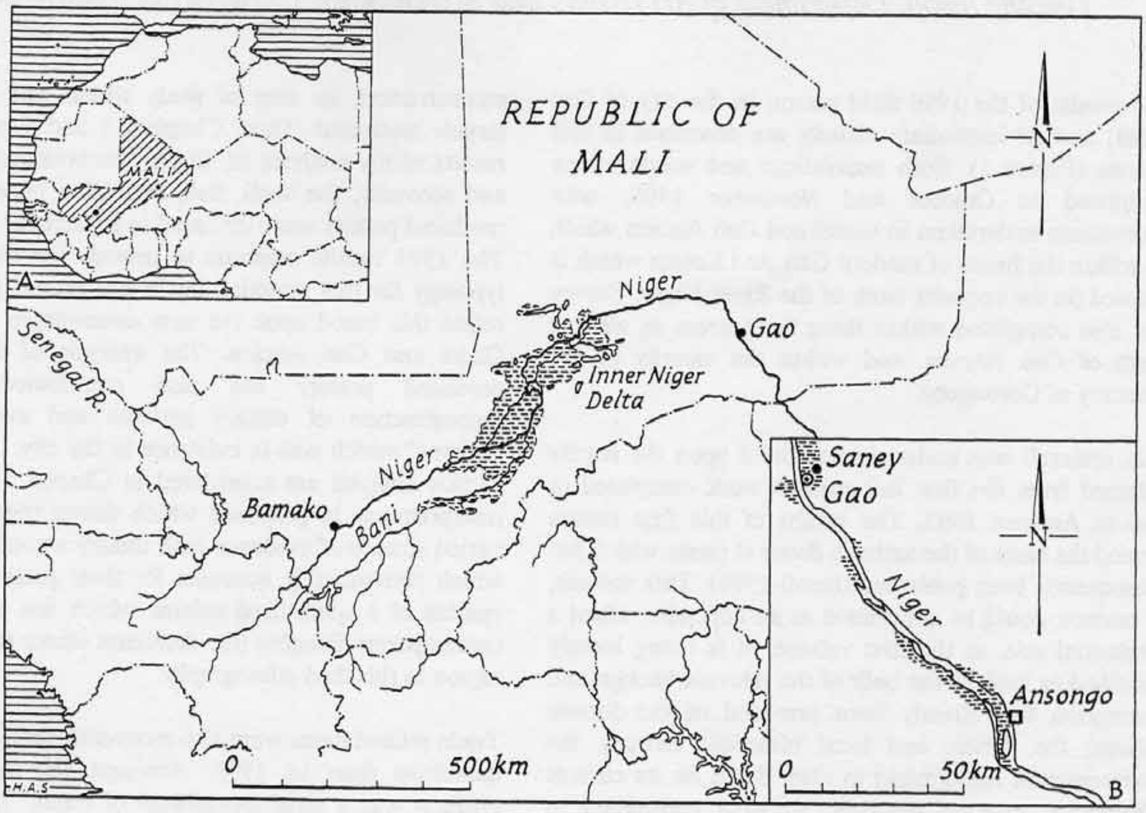

Figure 1. The location of Gao in Mali, and Mali in West Africa.

Chapter 2. Stratigraphy, Survey, and Architecture.

Timothy Insoll.

Introduction.

This chapter considers a variety of material which might at first glance appear somewhat disparate. This, however, is not the case as a link between all the categories of evidence exists, namely, the evolution of settlement within Gao over time. The evidence from the excavations supplements the data collected during survey, and a consideration of the architectural data further illuminates the development of Gao.

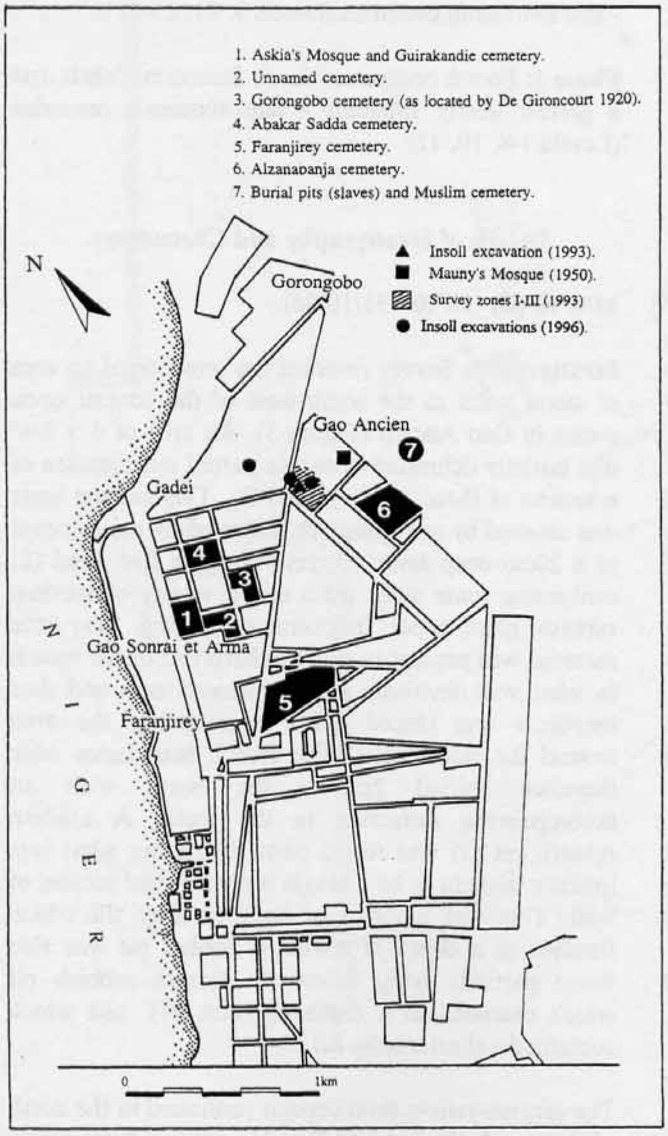

Figure 2. The position of the excavation trenches in Gao.

The Excavations. Methodology, and Research Questions.

Four archaeological excavations of various sizes were completed in different areas of the city and its surrounding area, in Gao Ancien, Gadei, and Koima (Figure 2). These excavations were undertaken to answer a variety of questions which are outlined below. The same methodology as that successfully utilised in the 1993 season was employed. Namely, the use of arbitrary levels where actual levels were difficult to recognise owing to colour changes in deposits as they dried out. The numbers assigned to the levels are bracketed in the text and all deposits were sieved using a 1.5mm sieve, thus providing a finer level of resolution than the 5mm sieve used in 1993. Datum points were set up adjacent to each excavation unit (excluding Koima), consisting of a 10cm masonry nail set in cement. All heights given refer to these datum points which are representative of surface level, as all readings were taken from the same station beside each unit. Finally, it should be noted that the same system as that employed in 1993 was utilised, whereby the most recent period or phase was numbered beginning at one, the reverse of normal procedure, but allowing for the addition of further periods or phases of occupation, if necessary, following future excavation seasons.

Gao Ancien: Two excavations were undertaken in the area of Gao first investigated in September and October 1993 (Insoll 1993, 1996, 1997). The excavations in Gao Ancien were given two reference codes, MM 96 (B) and MM 96 (C), thus following on from the 1993 series, MM 93 (A). A number of questions requiring investigation had arisen from the previous season which needed to be answered. These included:

i) Further assessing the origins of settlement within Gao Ancien to test the hypothesis that it post-dated the adjacent Gadei quarter and to see to what extent it differed in character from the latter; architecturally, a possible absence of trade goods, differences in other small finds present etc. (see Insoll 1996:30).

ii) Placing the buildings investigated in 1993 within their context in Gao Ancien, delimiting the settlement area, and further understanding the function of a fired-brick structure, part of a palace or rich merchant's house, uncovered in 1993.

iii) Placing the Gao Ancien chronology upon a more secure footing both through C14 and artifactural evidence.

Gadei: The excavation in Gadei was given the reference code GAD 96 (A) and was undertaken to answer in reverse, question (i), above. Thus the primary aim was the elucidation of settlement history in Gadei quarter with a view to substantiating or refuting the hypotheses advanced previously. Was this the area of first occupation in "left-bank" Gao?, was it a continuation of Gao Ancien?, or as was more probable, an entity displaying a completely different character?

Koima: The test pit excavated at Koima was assigned the code KO 96 (A). It was dug to obtain both a ceramic sequence and dating material to attempt to ascertain whether this was one of the primary settlements of the proto-Songhai following their supposed migration up the River Niger from Kukiya/Bentiya in the late seventh century.

Summary of Site Phasing.

MM 96 (B).

Periods 4-2: A dry-stone outer wall and "gatehouse" containing a well were built and were in use. Late tenth - twelfth centuries. Thus concurs with the end of Gao Ancien Period 4, and Periods 2 and 3 as defined below (Levels 4, 5, 14-17).

Period 1: Second phase of "squatter" occupation and partial re-use of the well. Conceivably from late thirteenth century - more probably from the last 100 years (Levels 1, 2, 3, 6-13).

MM 96 (C).

Period 5: First occupation level. Primary phase (A) of banco brick building. Sixth - early ninth centuries (Levels 19-23).

Period 4: Second occupation level. Two phases of banco brick building re-use (B and C). Mid ninth - late tenth centuries (Levels 13-18).

Period 3: Third occupation level. A lot of structural debris. Eleventh - early twelfth centuries (Levels 9-12).

Period 2: Fourth occupation level. Building utilising fired-brick floor and banco brick walls constructed. Early/mid twelfth - late thirteenth centuries (Levels 7-8).

Period 1: Fifth occupation level. "Squatter" occupation. Early fourteenth - late sixteenth centuries, with some modern disturbance (Levels 1-6).

GAD 96 (A).

Please Note: The term "phase" is being used here to refer to occupation episodes, to avoid confusion with Gao Ancien, where "period" was used. Furthermore, it is not possible, or indeed, desirable, to attempt to shoehorn the Gadei stratigraphy into the Gao Ancien periodisation.

Phase 4: First occupation level. Early seventh century or before (Level 25). An absence of structural debris, but some pottery and small finds in a deposit of apparently natural origin below (Levels 26-28).

Phase 3: Second occupation level. Structural debris. Mid seventh - early eleventh centuries (Levels 23-24).

Phase 2: Third occupation level. Numerous banco structures including a roundhouse. Early/mid eleventh - late fourteenth centuries (Levels 9, 11, 13-22).

Phase 1: Fourth occupation level. Structural debris and a cesspit. Early fifteenth - late sixteenth centuries (Levels 1-8, 10, 12).

Details of Stratigraphy and Chronology.

MM 96 (B) (18/10 - 31/10/96).

Stratigraphy: Survey revealed the presence of an area of stone walls to the south-west of the central open sector in Gao Ancien (Figure 3). An area of 6 x 6m² was initially delimited to enable partial examination of a section of these walls (A and B). This surface layer was cleaned by sweeping (1), followed by the removal of a 20cm deep layer of greyish-yellow fine sand (2) containing some stone infill and a variety of modern rubbish; glass, paper, fragments of matting. Very little material was present in this southern end of the trench in what was obviously a contaminated area and thus emphasis was placed upon investigating the area around the stone walls. The trench boundaries were therefore shifted 2m to the north with an accompanying retraction in the south. A modern rubbish pit (3) was found partially cutting what was initially thought to be a single uninterrupted section of wall. This was emptied of its grey ashy fill which finished at a depth of 20cm. A further pit was also found partially lying below the former rubbish pit which extended to a depth of 32cm (4), and which contained a similar ashy fill.

The greyish-yellow sand deposit continued in the north of the trench (2), but was found to contain some banco rubble probably indicating the one-time presence of more recent squatter structures as was apparent in MM 93 (A). Its removal revealed two further sections of stone wall (C and D), the northernmost under a banco brick wall (D), abutting the western stretch of wall

Chapter 3. The Botanical Remains.

Dorian Q. Fuller, Institute of Archaeology, University College London.

Introduction.

This chapter describes the botanical remains from the excavations in Gao. Flotation was not carried out on site, so the remains reported represent those which were noted visually during the course of excavations and collected by hand. While some were preserved by charring, many uncharred specimens were preserved by the desiccating conditions. In addition, a sample of ashy sediment contained in a ceramic vessel (GAD 96 [A] 7) was bagged in bulk and returned to the laboratory. A small sub-sample of this sediment has been saved for phytolith extraction at a later date, while a small number of charred seed remains were recovered from the remainder of this sediment.

The Material Recovered.

In the following list, the taxa recovered are listed under each context number. After the Latin name additional information is given: number of pieces, plant part, and additional descriptive notes about preservation.

GAD 96(A) 2

- *Phoenix dactylifera* (date), 1 stone (Figure 25) (No. 1, below).
- *Ziziphus* sp. (jujube/Christ's thorn), 3 stones, one gnawed by rodents, one fragment charred, diameters: 5.5, 7, 8.5 mm (Figure 26) (No. 2, below).

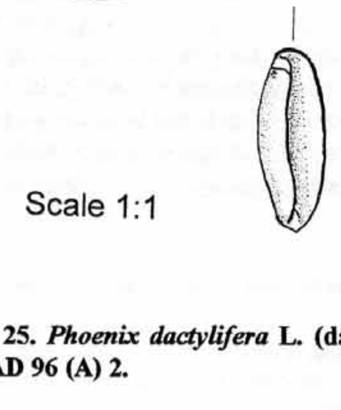

Figure 25. ***Phoenix dactylifera*** **L. (date) stone from GAD 96 (A) 2.**

GAD 96(A) 3

- *Ziziphus* sp. (jujube/Christ's thorn), 1 stone charred, rodent gnawed, 6mm diameter (No. 2, below).

GAD 96(A) 7

These remains come from the ashy contents of a ceramic vessel found at the base of the pit (total sample volume approximately 70 ml). As already noted, a sub-sample of the sediment has been saved for phytolith analysis at a later date. The remainder of the material was sieved, and fractions greater than 1mm and 0.5mm were sorted. It contained wood charcoal, charred grass nodes, silica rich grass glume fragments (probably entirely from rice), charred fragments of seeds, and one fragment of woven textile material.

- *Oryza* cf. *glaberrima* (rice), 3 caryopsis fragments, charred (Figure 27) (grasses/cereals, No. 3, below).
- *Oryza* cf. *glaberrima* (rice), spikelet base/ rachilla apex, charred (Figures 28-9).
- *Oryza* cf. *glaberrima* (rice), lemma/palea

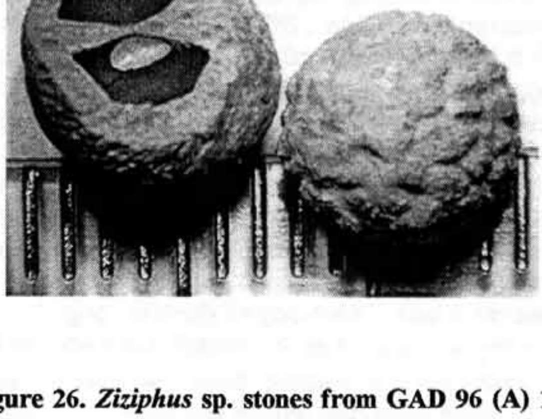

Figure 26. ***Ziziphus*** **sp. stones from GAD 96 (A) 13. Specimen on left is broken to reveal internal cavities. The edges of the break show rodent teeth marks. Scale in mm.**

fragments, numerous in the 0.5-1.0mm fraction, many charred (visible in Figure 28), some preserved due to high silicification (Figure 30).

- *Gossypium* sp. (cotton), 1 whole seed, 22 fragments, charred (Figures 31-3).
- cf. *Citrullus lanatus* (watermelon) charred seed coat fragments, the most numerous non-wood component in the >1mm size range. (No. 5, below).
- *Pennisetum* cf. *glaucum* (Pearl millet), (Figure 34) (grasses/cereals, No. 3, below).
- Graminae indet., 2 species, of indeterminate grasses, 1 specimen each, charred. (Figure 35) (grasses/cereals, No. 3, below).
- Grass nodes and culm fragments, various sizes, 10, charred.
- Textile fragment, approximately 2 x 5mm, animal hair fibre (wool?), Z-spun threads, apparently charred (Figures 36-7) (No. 7, below).

GAD 96(A) 9

- *Ziziphus* sp. (jujube/Christ's thorn), 1 stone, gnawed by rodents, 8mm diameter (No. 2, below).

GAD 96(A)13

- *Balanites aegyptiaca* (Egyptian myrobalon), 4 woody endocarp (stones), broken/cut open and rodent gnawed. (Figure 36) (No. 6, below).
- *Citrullus lanatus* (watermelon), 1 seed, charred (Figure 38).
- *Ziziphus* sp. (jujube/Christ's thorn), 5 stones, gnawed by rodents, diameters, 6.4mm, 7mm (3 specimens.), 7.3mm. (No. 2, below).

MM 96(B) 2

- cf. *Hyphaene thebaica* (Doum palm), fragments of fruit exocarp, charred (No. 1, below).

Criteria for Identification and Comments on Probable Utility.

In this section the taxa above are grouped by taxonomic family and listed in arbitrary numerical order corresponding to the numbers given in parentheses above. The taxa are described in terms of morphological characters used for the archaeological identification. This is followed by a brief discussion of the geography, ecology and history of each species and comments on its ethnographically documented uses. Uses are largely those reported by Dalziel (1937). It is notable that all the wild tree species are components of the Sudan savannah open woodland vegetation grouping (see also Steentoft 1988), where rainfall is 500-1000 mm, although these species also extend to a lesser degree northwards into the Sahel zone in which Gao is located.

1) Palmae (Palms): *Hyphaene thebaica* (L.) Mart., the Dom, Doum, or "Gingerbread" palm, is identified on the basis of fragments of its thin, brown rind. The fruit has a characteristic ovate to pear-like shape, often with a flat base. One of the fragments preserves part of this base.

The various parts of this tree have numerous uses, both as food and for construction (Bernus 1998; Dalziel

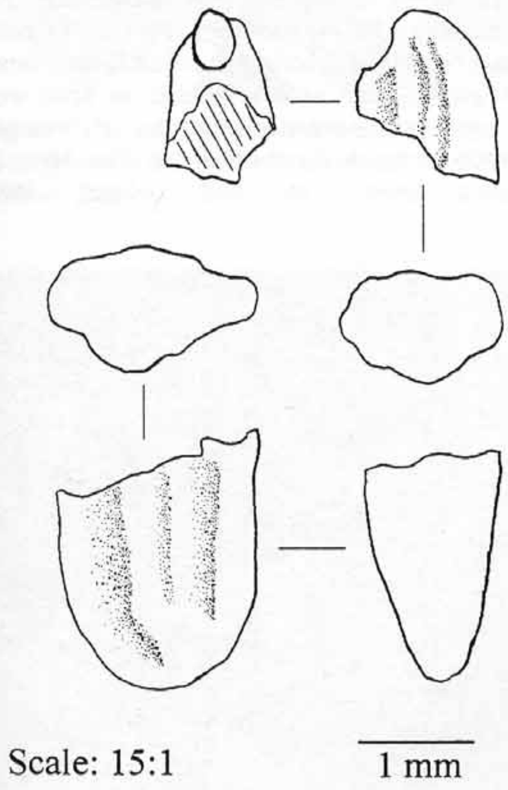

Figure 27. Two rice (*Oryza* cf. *glaberrima*) caryopsis fragments from GAD 96 (A) 7.

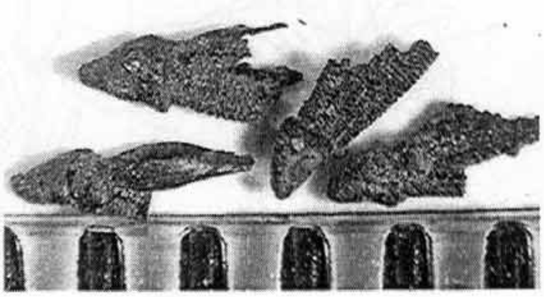

Figure 28. Rice spikelet bases from GAD 96 (A) 7. Scale in mm.

1937). The brown rind is edible on many species, and reportedly sweet. It is ground into a meal (called *garin goriba* in Hausa) and can be baked into cakes. Within this rind is a kernal which is edible when unripe which is also ground into flour. Once ripe and hard, this inner "nut" is used ornamentally, for bead-making or as "vegetable ivory". Since the rind specimens are charred, the inner "nut" may have been the focus of utilisation. Other parts of this tree are widely used: the fronds for weaving baskets and bags, the trunk for house-posts and sometimes canoe construction. *H. thebaica* is a component of the open woodlands of the Sudan savannah vegetation zone (Steentoft 1988).

Phoenix dactylifera L., the date palm (Figure 25). The stone in this archaeological specimen is 2.3cm and therefore exceeds the overall fruit length reported for the native, wild *Phoenix reclinata* Jacq. which ranges across sub-Saharan Africa (Hutchinson, Dalziel and Hepper 1968: 169; Barrow 1998). The domesticated date originated somewhere in south-west Asia between Turkey and Pakistan (Barrow 1998). The earliest archaeological finds come from Ubaid period Mesopotamia, fifth millennium BC (Zohary and Hopf 1993), and contemporary or earlier at Mehrgarh in Pakistan (Constantini 1983). It was cultivated around the Mediterranean by the first millennium BC. Today it is cultivated widely in desert and semi-desert regions south and east of the Mediterranean as well as areas south of the Sahara. Although the date requires a consistent water supply it tolerates high salinity. The date palm may have spread south of the Sahara with trade caravans. It is known as a trade good from Arabic sources (Lewicki 1971: 73-75), such as al-Idrisi (*c.*1150), who reported the importation of dates into what is now Senegal from Algeria. Ibn Said (thirteenth century), however, reported that dates were being grown in what is now eastern Chad.

2) *Ziziphus* sp. (family Rhamnaceae): *Ziziphus* sp., has woody, globose stones, with a rugose surface, with diameters ranging from 5.5 to 8.5 mm These stones have two, semi-circular to triangular hollows within them (Figure 26). These stones are likely to represent either of two species with edible fruits, *Z. mauritania* Lam. (= *Z. jujuba* (L.) Gaertn., nom. illeg.), the jujube, or *Z. spinachristi* (L.) Willd., Christ's thorn. Both of these edible species are subsumed under the Arab name *nabag*. The pulp is sometimes macerated in water to produce a refreshing drink (*k'walk'wando* in Hausa). Dried and fermented pulp are made into a sort of cake (*tuwon magarya* in Hausa). In addition, *Z. mucronata* Willd., Buffalo thorn, fruits are also sometimes used as flavouring or medicinally, although they are bitter. The hard stones of these species are sometimes used in Muslim rosaries. *Ziziphus* spp. are a normal shrub/tree component of Sudan savannah vegetation (Steentoft 1988). Ibn Battuta (mid-fourteenth century), reported that *nabag* flour was sold in village markets (Lewicki 1971: 69).

Z. mauritania is probably native to South Asia, but is widely cultivated and naturalised in the semi-arid tropics. The earliest finds come from Mehrgarh, Pakistan, dating from the fifth millennium BC (Costantini 1983; Zohary and Hopf 1993). This species is sometimes planted as hedges or for cattle enclosures. *Z. spina-christi* may have originated in south-west Asia. *Ziziphus* sp. is reported from sites in Cameroon *ca.* AD 500, so it must have diffused to West Africa in pre-Islamic times (Otto and Delneuf 1998).

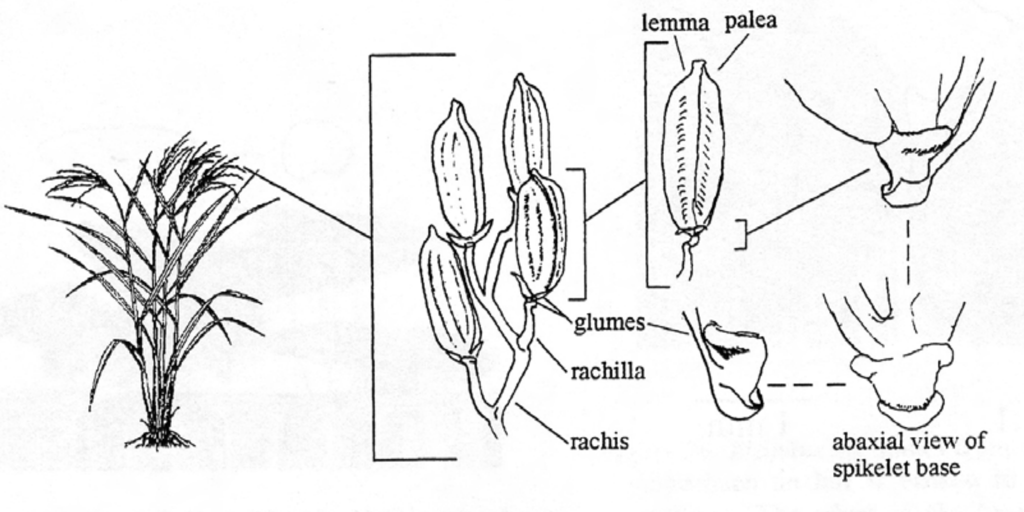

Figure 29. Rice plant showing enlargement of section of panicle and enlargements of spikelet base, the characteristic charred chaff of rice preserved in GAD 96 (A) 7.

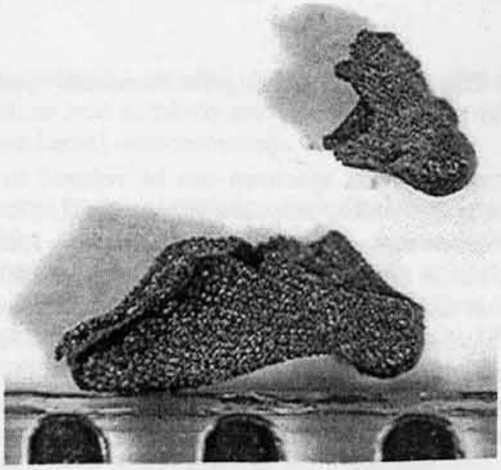

Figure 30. Rice chaff fragments, two lemma apices, from GAD 96 (A) 7. Scale in mm.

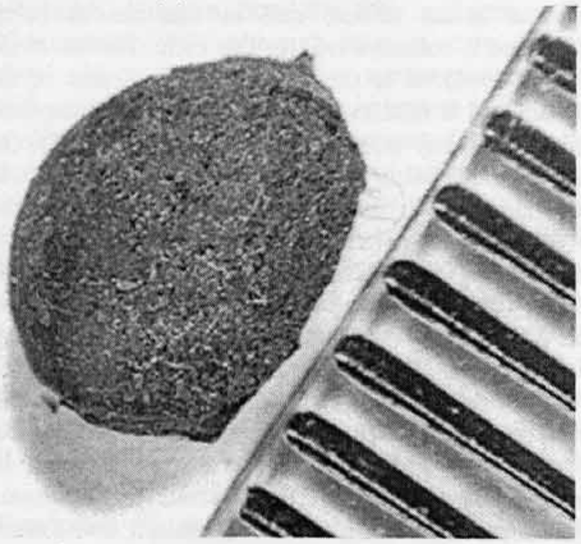

Figure 31. Charred complete cotton seed (*Gossypium* sp.), in lateral view, from GAD 96 (A) 7. Scale in mm.

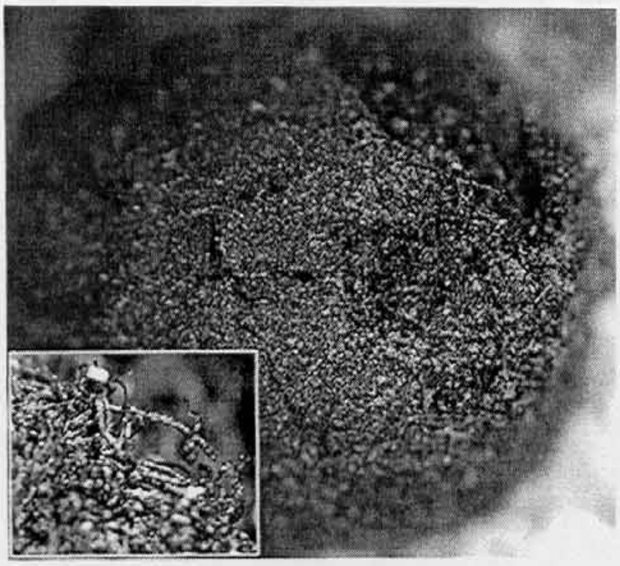

Figure 32. Close-up of fragmentary, charred cotton seed testa, showing preserved lint adhering to seed apex. Shown at approximately 40x. Inset shows fibres at additional enlargement (approximately 100x).

Figure 33. Scanning electron micrograph of lint adhering to cotton seed shown in previous figure.

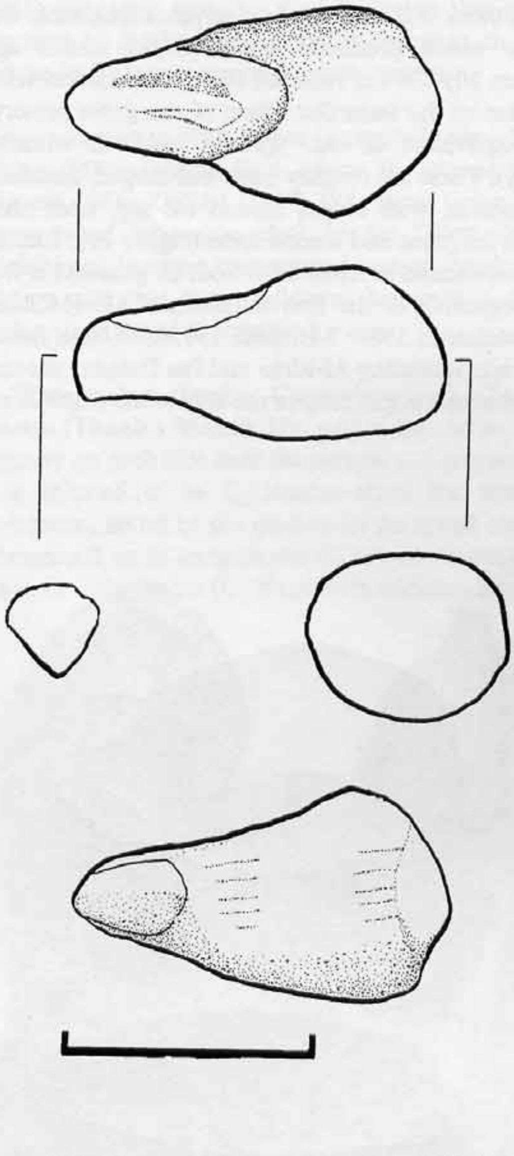

Figure 34. Charred caryopsis comparable tp pearl millet (*Pennisetum glaucum* (L.) R. Br.) from GAD 96 (A) 7. Dorsal view at top, showing scutellum/embryo. Ventral view with hilum at bottom. Scale bar = 1mm.

3) Cereals and grasses (family Graminae): *Oryza* sp., rice, cannot reliably be distinguished to species level on the basis of charred caryopses, and certainly not on the basis of fragments like those in the samples examined from Gao. Nevertheless, the rice genus itself is unmistakable, with its grooved caryopses and indented embryo (Figure 27). The specimens seem most likely to derive from the African cultivated rice (*Oryza glaberimma* Steud.) purely on geographical grounds, as Gao falls within the core region for cultivation of this species and near its probable region of domestication, the Inland Niger Delta (Portères 1976; Vaughn 1989; Harlan 1995; Borlaug et al. 1996). Numerous charred pieces of rice "chaff" were also recovered (Figure 28), including spikelet bases and fragments of the lemma and palea which show a distinctively tessellated ("chequer-board") surface. These fragments are so numerous in the <1mm fractions, and so fragile, that no attempt was made to count them. Amongst the lemma/palea fragments were a few which preserved the knob-like lemma apex (Figure 30). Of the rachilla, the apical portion which attaches at the immediate base of the grain preserves (the equivalent of the "spikelet fork" in wheat or barley). These are roughly trapezoid-shaped, narrowing downwards, with bulges around the top, from above which the palea and lemma arise (Figure 29). Rice has also been found at Jenne-Jeno from all phases, i.e. from the beginning of the first millennium AD (McIntosh and McIntosh 1980; McIntosh 1995c). Arabic literary evidence, including Al-Idrisi and Ibn Battuta, attests to its status as a staple crop in the area of the Niger Bend and at Gao specifically during the "medieval" period (Lewicki 1971: 36).

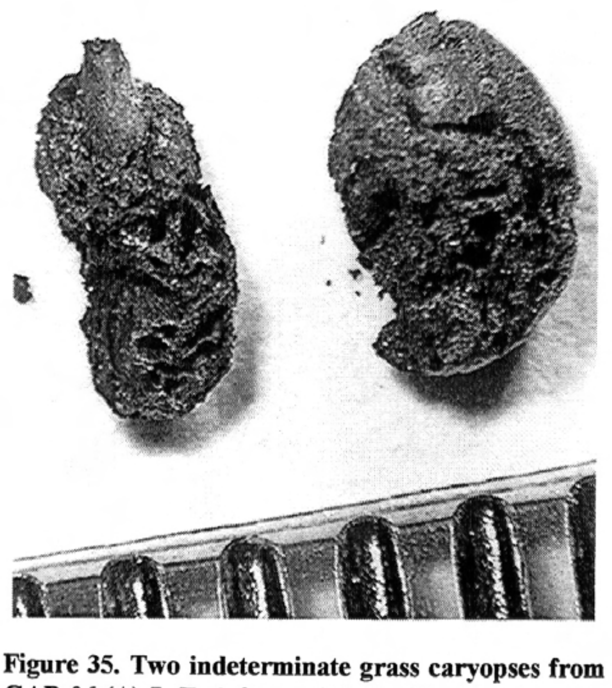

Figure 35. Two indeterminate grass caryopses from GAD 96 (A) 7. To left, possible Pooidae (subfamily), to right, possible Andropogonae. Scale in mm.

One grass caryopsis specimen can be referred to as cultivated pearl millet, *Pennisetum glaucum* (L.) R. Br (syn. *P. americanum* (L.) Leeke, *P. typhoideum* Rich.). This grain is roughly obovate in outline, but with a somewhat angular apex and an acute and narrowing base (Figure 34). From the basal end the elliptic embryo/scutellum extends about one half the length of the grain. The preserved testa shows faint longitudinal striations which have also been noted on modern comparative material.

Pearl millet is an important cereal in the dry northern savanna across Africa, and in addition to being cultivated is collected wild in this zone (Harlan 1995; Bernus 1998). It is the most drought-tolerant of all cereals and is able to grow further north in the sub-Sahara than any other grain (Bourlag et al 1996). On the basis of recent enzymatic studies pearl millet is now thought to have been domesticated in the westernmost savanna/sahel zone of Africa, in modern Mauritania (Tostain and Marchais 1993; Tostain 1994; 1998), contrary to the traditional view which derived the domesticate from eastern African savannahs (e.g. Harlan 1995). It had diffused eastwards across Africa and across the Indian Ocean reaching Indian archaeological sites in the early second millennium BC (Weber 1990; Fuller 1999). The earliest evidence in West Africa comes from Dhar Oualata in Mauritania and dates from *ca.* 1500 BC (Amblard and Pernes 1989). Pearl Millet has been reported from Jenne-Jeno, Phases I/II, III, and IV, i.e. from the beginning of the first millennium AD (McIntosh 1995c). The cultivation of *Pennisetum* in this northern savanna belt contrasts with contemporaneous evidence from the more southerly Sudan and Guinea savanna zones represented by archaeobotanical evidence from Cameroon dated to *ca.* AD 500, within which Sorghum appears to have been the dominant cereal, to the exclusion of *Pennisetum* (Otto and Delneuf 1998).

Two other grass seeds were recovered from the sample (Figure 35). Adequate comparative material was not available to identify them. One is badly damaged, and generally quite round and could be somewhere in the Andropogonae. The other is rectangular-ovate with a ventral furrow, and might fall somewhere in the large Pooidae subfamily.

4) Cotton (family Malvaceae): *Gossypium* sp., cotton, is represented in the material by one complete and several partial seeds. These are asymmetrical, transversely-depressed ovate in shape and have a small, squarish woody protuberance at the narrow end (Figure 31). At this end of one partial specimen a cluster of carbonized cotton lint is preserved (Figure 32). Cotton seeds have a hard seed coat approximately 0.2mm thick within which is a softer seed core. Amongst the archaeological material several fragments of this outer coat, as well as poorly preserved fragments of the soft inner kernal were recovered.

Current botanical evidence, including recent molecular work, favours two independent domestications of cotton in the Old World (in addition to at least two in the New World) of the species *G. arboreum* and *G. herbaceum* (Zohary and Hopf 1993; Wendel 1995). G. arboreum co-occurs with wild populations in part of South Asia, and although this wild cotton is considered to represent either feral populations or populations which have spread together with the cultivated variety, they support a domestication within this general region. Cotton seeds have been reported from Mehrgarh, Pakistan from the fifth millennium BC (Constantini 1983), although there is some concern about the antiquity of these specimens. In later millennia cotton cultivation was important in the Indus civilisation (Fuller 1999). This antiquity for cotton use is, however, attested by cotton fibres radiocarbon dated to *ca.* 4400 cal. BC, recovered from plaster fragments from a site on the Arabian peninsula (Betts et al 1994). These cotton finds could represent *G. arboreum*, although the other Old World cotton domesticate *G. herbaceum* might have been native to Arabia or Africa. In any case, there is no evidence for cotton in Mesopotamia or the Levant before the first millennium BC where it is recorded in Assyrian texts (Zohary and Hopf 1993).

Summaries of textual and art historical evidence generally attribute the wide dissemination of Old World cotton to the Islamic period, becoming widespread in perhaps the tenth century (Watson 1983:). Gervers (1990) argued that cotton cultivation that provided for local spinning was not taken up in Ethiopia until the medieval Islamic period (twelfth century?) when it was introduced by Arabs; he put forward similar arguments for Egypt and Nubia, although these latter arguments at least are controverted by the archaeobotanical evidence from the Late and post-Meroitic period (second to sixth centuries AD) at Qasr Ibrim in Egyptian Nubia (Rowley-Conwy 1989), which along with quantities of cotton textiles from the region (Bergman 1975; Mayer Thurman and Williams 1981) suggests cultivation and production within this region. There is also some evidence to suggest that cotton was grown and processed in Ethiopia in the later first millennium BC (Phillipson 1993: 356). The earliest find of cotton in Africa comes from Lower Nubia, from outside a building excavated at the A-Group site of Afyeh, 3200-2800 cal. BC (Chowdhury and Buth 1971). This find included seeds preserved in a charred(?) assemblage of cereals, pulses and sheep/goat dung fragments, which included further cotton fibres. Chowdhury and Buth (1971) suggested that this find indicated that cotton was used as fodder, because of its inclusion in dung and the lack of contemporary cotton textiles.

Cotton weaving in West Africa is generally regarded as having diffused from East Africa in Islamic times (Watson 1983). Dalziel (1937: 124) states that a term, *shigge*, used for cotton cloth in the "West Sudan" (Mali/Niger) has been documented back to the eleventh century, and that Kano (Nigeria) has been a cotton market since the ninth century.

5) Watermelon (family Curcurbitaceae) *Citrullus lanatus* (Thunb.) Mansf: The seed is flat, ovate, with a groove on each side near the narrow end (Figure 38). It is referred to as C. lanatus since the squarish projections, set off by the grooves on the apical end, are pronounced, as in comparative *C. lanatus* material but not in *C. colocynthus* (L.) Kuntze. In addition the flat

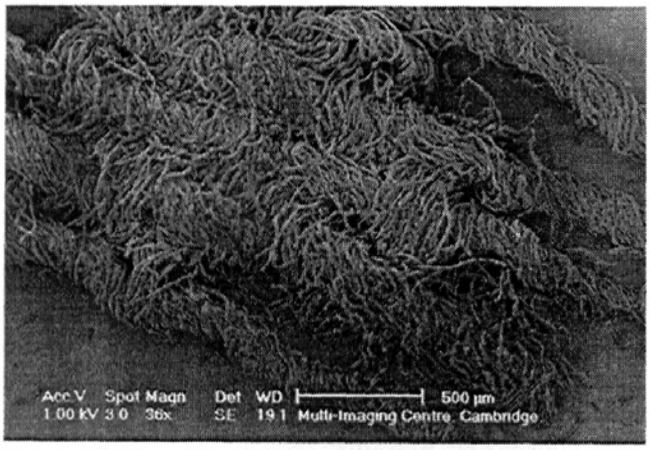

Figure 36. Wool (or hair) cloth fragment, charred, from GAD 96 (A) 7. Scanning Electron Micrograph.

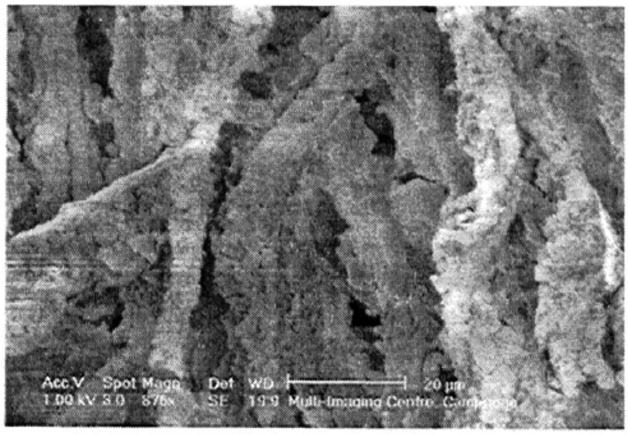

Figure 37. Scanning Electron Micrograph of wool fibres in cloth fragment from GAD 96 (A) 7.

surface is somewhat rugose, whereas *C. colocynthus* is smooth. However, the archaeological specimen, which measures 6.4 x 3.5mm and 1.6mm thick. is generally closer in size to modern fresh *C. colocynthus*. This is no doubt partly due to shrinkage during charring but could also indicate somewhat smaller-seeded (and presumably generally smaller-fruited) cultivars than modern, large watermelons. (Note: modern comparative material examined came from Republic of Sudan, including wild *C. colocynthus* collected by the author and *C. lanatus* seeds purchased in Khartoum).

There has been some controversy over the origins and early distribution of watermelons. Although watermelons were long reported in Pharaonic Egypt, many of the early reports have been questioned and re-examination of some of them revealed mis-identifications (Watson 1983: 58, 175, n. 4). One hypothesis derives watermelons from apparently wild *C. lanatus* in southern Africa (Watson 1983; Bates and Robinson 1995). Zohary and Hopf (1993) suggest derivation in Southwest Asia from *C. colocynthus*, and more recent and reliable finds of watermelon seeds from Pharaonic Egypt support this, notably their presence in foundation deposits of New Kingdom temples built in Nubia (Van Zeist 1983). "Wild" types of watermelon are still known to be gathered in West Africa (Lewicki 1971: 65), although it is conceivable that these are really feral forms if one accepts a single domestication in south-west Asia.

However, domestication in the Saharan region, perhaps in addition to further east, during the early or mid-Holocene wet phase (Muzzolini 1993) seems plausible. Seeds of both *Citrullus* species have been recovered from the Saharan Neolithic site of Uan Muhuggiag,

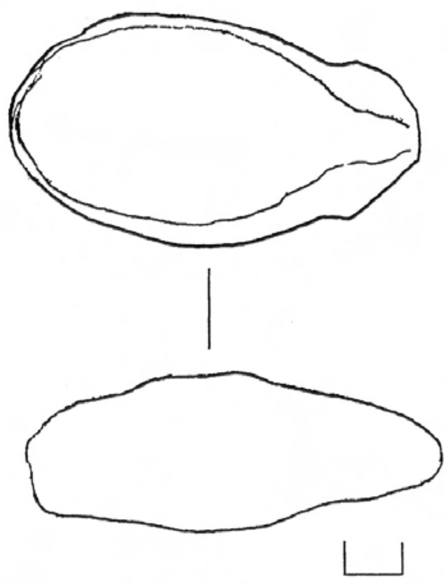

Figure 38. *Citrullus lanatus* (Thumb.) Mansf., watermelon seed, from GAD 96 (A) 13. Scale bar = 1mm.

and *C. lanatus* from Ti-n-Torha, both sites in south-western Libya dating back to ca. 4000 BC (Wasylikowa 1993). The "ennobled" form of this plant (particularly large and sweet) is thought to have been developed in India and may have secondarily diffused westwards during the Islamic period in the tenth to twelfth centuries, by which time it became common in north-eastern Africa (including the Nile valley) and was known on the Iberian peninsula (Watson 1983). The smallish seeds from Gao would seem to suggest a form which preceded the adoption of these "ennobled" varieties. Watermelon seeds have also been reported from Jenne-Jeno, late phase IV, probably thirteenth-fourteenth century (McIntosh 1995c). Ibn Battuta records that he ate watermelon while visiting a vice-regent in the Timbuktu-Gao region (Lewicki 1971: 65).

6) Balanites aegyptiaca (L.) Del. (family Zygophyllaceae): The Egyptian myrobalan, "desert date", or Arabic *hejlij*, produces drupaceous fruits. The fruit stone (endocarp) is fibrous and somewhat woody, ovate to tear-shaped lengthways, preserved lengths range from 14mm - 20mm, five-angled in cross-section such that specimens often split into five sections towards the ends, cross-section radius 8mm -15mm. All four specimens appear to have been broken (or cut?) open at one end and show rodent toothmarks. Archaeological specimens have a hollow centre, where fresh specimens contain oily, edible endosperm, sometimes called zachun oil (*kufi* in Hausa). The oil from the stone is used both as food and medicinally, for aches and feverish chills. It would appear, from the cut ends, that this oil was extracted from these archaeological specimens, which were subsequently utilized by rodents. The fruit itself, although fibrous, is edible, and is often used in the production of beverages, sometimes alcoholic. Numerous magical and medicinal uses have been recorded amongst the Hausa, for nearly all parts of the *Balanites* tree. For example, a confection made from the boiled and seasoned fruits and young leaves is eaten ceremonially amongst the Hausa and Fulani (*dabagira*, Hausa; *dubakara*, Fulani).

This species has a long archaeobotanical record in northern and western Africa. It was a commonly utilized species in the Saharan Neolithic sites in south-western Libya, i.e. since *ca.* 4000 BC (Wasylikowa 1993). It has been recovered from mid-first millennium AD sites in Cameroon (Otto and Delneuf 1998). This tree is a normal component of the open woodlands of Sudan savanna vegetation, as well as occurring further south in the savanna-forest mosaic and further north along wadis in the desert (Steentoft 1988; Wasylikowa 1993). It is found planted in villages even further south, beyond its natural range (Dalziel 1937). The spiny branches are sometimes used for fencing cattle.

7) Wool(?) Textile Fragment: A small, apparently charred, fragment of woven material was also recovered (Figure 36). It is made up of poorly preserved Z-spun threads. Although poorly preserved some of the individual fibres can be seen under high magnification (Figure 37) to show crimping characteristic of wool and the scaled surfaces characteristic of animal hairs (Cook 1984). The contrast with the cotton fibres shown in Figure 33 is striking.

Acknowledgements.

Many thanks to Alan Clapham for consulting on identifications, and to Leo-Aoi Hosoya for examining the rice chaff with me. I would also like to thank Professor Martin Jones for his encouragement and support of my archaeobotanical studies. The general funding for my doctoral research has been provided by St. John's College, Cambridge. Thanks are due to W.A. "Tinker" Green for his comments and copy editing.