The Late Stone Age Archaeology of the !Kangwa and /Xai /Xai Valleys, Ngamiland

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Introduction

The archaeological potential of the !Kangwa /Xai /Xai[1] region of northwestern Ngamiland was first recognised by Malan (1950) who reported the presence of Late Stone Age (LSA) lithics on a dune surface adjacent to the /Xai /Xai pan (Fig.l). Subsequent survey and excavation by Yellen from 1968-70 (Yellen, 1971) demonstrated the existence of subsurface materials at /Xai /Xai and the presence of similar LSA sites near the waterholes of =gi, Mahopa and !ubi.

Further (unpublished) surveys by Brooks from 1975 to 1982 and Wilmsen in 1987 have revealed additional sites again in association with present day sources of permanent or semi-permanent water and indicate congruence between the settlement and land use patterns of LSA peoples and contemporary Basarwa (!Kung or / Zutwasi) inhabitants. In this article we provide a detailed report on Yellen's 1970 excavations near the Mahopa and /Xai/Xai pans.

Because excavations at both sites have yielded archaeological sequences calibrated by multiple radiocarbon dates, their most immediate significance rests on the chronological information they provide. However these sites may also shed light on three issues of more general importance. Because charcoal from a clearly defined LSA hearth in good stratigraphic context at =gi has yielded a radiocarbon date of 110+-50 B.P. (Helgren and Brooks 1983), it appears highly probable that contemporary local Basarwa are directly descended from these LSA peoples.

Although neither a tradition nor recollection of LSA lithic technology has been preserved, interviews conducted in the 1960s identified Basarwa who were born in the region during the late 1800s and Wilmsen (1978:6) states his genealogical interviews confirm at least 150 years of continuity at /Xai /Xai.

The Basarwa in the /Xai /Xai and !Kangwa valleys, together with their kin in adjacent eastern Namibia, have been the focus of concentrated anthropological attention for over three decades and they constitute perhaps the most intensively studied traditional society in Africa. Although in outline their history during the twentieth century is known, only through archaeological investigation of the LSA can their roots be traced further back in time.

Questions, such as the extent to which "traditional" Basarwa lifestyle and population distribution were affected by the incursion of Iron Age peoples, can only be definitively answered with archaeological data. Parkington et. al., for example, have suggested a major population displacement of indigenous San groups with the arrival of pastoralists in the western Cape.

Secondly, study of the LSA from these two river valleys helps to resolve the more basic issue of how hunting and gathering societies can best be defined. Almost all ethnographers who have published monographs on the Kalahari Khoisan over the last two decades - Howell, Lee, Marshall, Silberbauer, Tanaka, Yellen - have recognised interaction between Khoisan "foragers" and non-Khoisan food producers. However, they and other researchers have argued that such contact, although it existed, was not substantial enough to change the people they studied from "hunters and gatherers" to something else; and therefore such Khoisan groups might provide insight into the universal human pre-Neolithic past.

In recent years this position has come under increasing attack from one direction by southern Africanist archaeologists such as Denbow and Wilmsen (Denbow 1984; Denbow and Wilmsen 1986) who have demonstrated the presence of Early Iron Age (EIA) peoples on the fringes of the adjacent Okavango Swamps by as early as 550 A.D. and from another direction by theorists such as Schrire (1984) and Wolfe (1982) who maintain that even the most "traditional" marginal groups can be understood only in the context of a world system which traces relationships between developed and emerging societies.

As Tables 1 and 2 indicate, the LSA culture in both the /Xai /Xai/and !Kwanga Valleys predates by over fifteen hundred years the appearance of non-hunter-gatherers in southern Africa; after this period of isolation, it co-exists with an Iron Age tradition, and clearly shows contact with it, for almost two thousand years.

Through comparison of pre and post contact phases it should be possible to determine whether this original hunting and gathering society is transformed into something else.

Finally, both the /Xai /Xai and Mahopa sites are important because in both cultural materials are contained within a matrix of course unconsolidated Kalahari sands and both are well dated by multiple radiocarbon determinations. At the site of /Xai /Xai 2, (/2) 25 dates on charcoal, bone collagen and bone extracted humic acids were obtained over a depth of 56" from a single 5"x 5" square. At Mahopa, site 1, (Ml). 8 charcoal samples were

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dated from the uppermost 22" of 5 contiguous 5' x 5' squares.

Because a veneer of reworked unconsolidated sand covers most of central and western Botswana and extends westward to the highlands of central Namibia and northwards into Zaire, and because rock shelters are rare throughout this region, /Xai /Xai and Mahopa may be considered as representative of the majority of archaeological sites across this broad region.

The potential of mixing poses a major problem in such sand sites because of unconsolidated sediments which are continually susceptible to reworking by insects, rodents and larger mammals. Given the lack of stratigraphic differentiation in such deposits, it becomes extremely difficult to determine the extent of mixing, and therefore interpretation of incorporated archaeological materials may become extremely complicated. Because of the excellent radiometric control at both /Xai /Xai and Mahopa one can document the extent of mixing and also attempt to devise independent means to measure it. The techniques thus developed are potentially applicable to other sites in a similar geological context.

Geological and Archaeological Context

With the exception of bedrock projections, such as the Tsodilo, Aha and Gcwihabe Hills, the northwestern Kalahari which lies between the relict and present marsh terrains of the Okavango Delta and the central Namibian highlands is covered with veneers of relict eolian sands, often in the form of longitudinal dunes oriented in a northwest - southeast direction. (Gove 1969; Helgren and Brooks 1983).

The latter authors argue that "these sands were deflated from an ancient Okavango basin, probably during a major episode of regional aridity in the Cenozoic." Thus they predate human occupation of the region.

In the Aha Hills region, because of a southerly wind direction at the time of deposition, sands are banked more heavily on the southern side of the Hills and more sparsely distributed in the northern lee. An unconformity in the Ahas between karstic limestones and underlying impermeable schists provides the source for springs which drain eastward towards the Okavango Swamps. This has resulted in four river valleys, the !Kangwa to the north of the Aha Hills, the /Xai /Xai to the south and two smaller unnamed counterparts directly to the east. All have their origin in the Hills.

Only in years of extremely heavy rainfall are these valleys marked by surface flow, but pans in both the !Kangwa and /Xai /Xai valleys intersect groundwater and provide year-round water points. Both extensive surface survey and more limited test excavation indicate that LSA sites are distributed only in areas within easy walking distance of these pans.

A sharp line of demarcation separates the ancient and modern marsh terrains of the Okavango Delta, from the more sparsely vegetated dune and valley systems to the west, and it basically serves as an ethnographic boundary which marks the western limits of riverine-adapted peoples, such as the Bayei and Mambukushu. As Ware and Yalala's (1971) vegetation map indicates, along the western edge of the Okavango this line corresponds to the extreme western limit of "Northern Kalahari Tree and Bush Savannah with Mophane." In the extreme northwest, this mophane savannah extends westward away from the Okavango to include the Tsodilo Hills (which are 34 km. SW of the Okavango river, not 71 km. distant as Wilmsen (1988a:ll) incorrectly states).

Because this division appears to have archaeological correlates as well, the sequences in each area are considered separately. Both the Mahopa and /Xai /Xai valleys lie in the sandvelt, with vegetation classed by Ware and Yalala as "NorthWest Tree Savannah." In this western region, excavations by Brooks (Helgren and Brooks 1983) at the well stratified site of =gi and by Yellen (in press) at Gcwihabe indicate a discontinuous sequence of 1: Middle Stone Age which predates 40,000 BP and probably exceeds 100,000 years in age; an early LSA which dates to greater than 20,000 BP and is poorly understood; an LSA industry which appears only at Gcwihabe at approximately 12,000 BP, and has uncertain affinities to both its earlier and later counterparts (paucity of lithics from Gcwihabe precludes a determination).

Finally a distinct LSA industry is present at =gi, /Xai /Xai, Mahopa, !ubi and other sites in the river valley systems. Malan (1950) termed this latter "Wilton" because of the numerous small crescents present at /Xai /Xai; and in the context of the traditional southern African classification system, this designation is correct. No sites which meet (the also traditional) criteria of "Iron Age" have been discovered in this western region. Given intensive survey by several archaeological groups, this absence is almost certainly real and not an artifact of investigation techniques.

The archaeological situation along the Okavango margin is distinct. As Wilmsen (1988) and Denbow and Wilmsen (1986) state, a LSA industry is present as early as 10,000 to 15,000 years ago, while younger LSA materials date to the second millennia B.P. Brooks and Yellen have briefly examined LSA lithics at two "margin" sites, near Matlapaneng and Tsodilo, and they concluded that these materials fall within the same tradition as the Western "Wilton." (We are uncertain, however, from which specific site levels the lithics derive.) A radiocarbon date from Divuyu (in the Tsodilo Hills) attests to a full fledged Early Iron Age (EIA) by 550 A.D. in this region. Together the sites of Divuyu and slightly younger Nqoma, also in the Tsodilo Hills, indicate an Iron Age tradition which includes domestic goat, sheep and cattle, sorghum and millet, metal smelting and relatively large numbers of ceramics.

Wilmsen (1988) states that the Divuyu assemblage includes 952 decorated sherds and a single stone tool. EIA sites along the base and eastern margins of the swamps and along the Botletle River together with the Tsodilo data suggest that this tradition is confined to river systems; ceramic comparison suggests ties with both Zambia and Angola.

Mahopa: Site 1 (MI)

The Mahopa pan rests in the base of the !Kangwa river valley 15 km. southwest of !Kangwa. In 1969 and 1970 Yellen excavated two sites in the pan vicinity. Mahopa 2 (M2), situated on the eastern edge of the pan, replicated the stratigraphic and cultural pattern described by Helgren and Brooks (1978) at =gi. Because of extremely low artifact density and the good data available from =gi, work terminated after a small scale test excavation. The other Mahopa site, (MI), located approximately one quarter mile northwest of the pan in a flat, essentially featureless area of heavy sand, is marked by a surface scatter of LSA material. Local Basarwa alerted Yellen to its presence and in early 1968 one area of the site was surface collected and a single shallow 5'x 5' test square dug. In June 1970, more extensive excavations were conducted.

Eight 5'x 5' squares (Fig. 2) which form three horizontally discrete entities - square 1; squares 2,3; squares 4-8 - were excavated in two inch units which terminated on the surface of a calcrete (hardpan) layer which proved impenetrable to repeated assault by sledgehammer and pick. A comparable calcrete layer at =gi is radiocarbon dated to greater than 40,000 years and separates LSA from underlying MSA industries. Because the matrix from the surface to the calcrete consisted of unconsolidated sand which was homogeneous to the eye, and no vertical concentrations of cultural material or *in situ* features which might denote discrete occupation levels were apparent, all squares were excavated in arbitrary 2" levels.

In the following analysis, material is grouped by levels, (which are numbered from the surface downward), within individual or contiguous sets of squares. All matrix was sieved through quarter inch mesh and lithic and other cultural material such as pottery and iron separated from charcoal and faunal remains. Lithics which were classified as waste flakes or "debitage" and showed no sign of reworking were (unfortunately) discarded while cores, retouched pieces and other materials were marked in indelible ink with the prefix "MI" followed by a consecutive number beginning with "1".

The few identifiable faunal remains were separated from the mass of small bone fragments and charcoal numbered and sent to Dr Richard Klein at the University of Chicago for analysis. The total number of bone fragments, (both identifiable and unidentifiable) was also recorded.

The unconsolidated and apparently homogeneous nature of the sand at Mahopa, and at many other sandveld sites, poses several analytic problems. Because such sands are biogenically active and subject to reworking by plants, insects and both small and large mammals, substantial or complete vertical mixing must be assumed, unless otherwise proven. The question of horizontal correlation is also difficult. For example, at MI the top of the hardpan varied from 28" below the surface in square 5 (sq. 5) to a comparable 48" in sq. 3. Given this, it is impossible to assume *a priori* that level 6 in sq. 3 is synchronous with the same numbered level in sq. 5.

Below we describe procedures to determine both the extent of vertical mixing and the strength of horizontal correlations and analyse cultural materials accordingly. However, we are acutely aware of the problems inherent in this approach and place greater reliance on conclusions drawn from some areas within the site than from others.

To address the vertical mixing problem, twelve samples from the contiguous sq. 4-8 block were submitted to Beta Analytic Laboratories for radiocarbon dating. Two samples consisted of pure charcoal and the rest were mixed charcoal and burned bone. From six of the mixed samples the laboratory was able to extract enough charcoal to yield a conventional determination and this provided a total of eight dates. A collagen-like material was extracted from the burned bone, but because of its dark colour the laboratory suspected contamination, and processing was terminated at this point.

As Table 1 demonstrates, vertical mixing appears to be minimal at MI and only two relatively minor inversions in date order occur. The dates indicate a sequence which extends essentially from the present back at least to 3270 BP. What the radiocarbon series also reveals is a tripartite division which consists of a first unit (I) which includes levels 1-8 and spans the interval 0 - 600 BP; a unit II, levels 9 and 10, which are slightly younger than 2,000 BP; and unit III which extends from level II downward and dates to greater than 3200 years.

To determine the validity of equating levels across squares, within each square, the total number of pieces and number of faunal remains were plotted separately to provide depth dependent curves. (Fig. 2). Distribution of material by depth is controlled by a number of factors: the relative position of calcrete bedrock, the rate of sand deposition, the rate at which cultural and faunal remains are discarded onto the landscape and the extent to which vertical mixing takes place.

Given this number of variables and the potentially complex interactions among them, it may prove difficult to predict or explain the conformation of a particular curve. If however two or more squares exhibit the same pattern it seems reasonable to assume that correlation among them is valid.

Figure 2 suggests they were subjected to the same combination of processes and therefore that sqs. 5-8 conform to a single pattern and (as seen most clearly in sqs. 7 and 8), the most distinct shifts in density occur at the unit boundaries previously determined by radiocarbon dates. The contiguous sq. 2,3 group differ both from each other and the sq. 4-8 pattern.

Finally, the sq. 1 pattern is unique. From this one may conclude that squares 4-8, because of the similar pattern they exhibit and their consistent set of radiocarbon dates, provide a valid context in which to examine the distribution and change in cultural material over time. It is probably unwise to assume that a vertical correspondence exists with sq. 1-3 and conclusions derived from their analysis are much more tentative.

Figures 3 and 4 illustrate the Yellen-Brooks typology for LSA Ngamiland lithics. The system, based on the standard French typological approach, distinguishes between "worked pieces" and "debitage" and focusses exclusively on the former. Types are based on both shape and technological characteristics. Although use/wear analysis is now underway, we make no assumptions about presumed tool function.

The typology is purposely designed to emphasise very minor shape and technological variations and we have defined more "types" than other analysts of southern African lithics.

The major classes include cores; pointed bladelets and perforators; scrapers, including both "duckbill scrapers" (termed "short end scrapers" in our typology) and thumbnail scrapers; small quadrilateral flakes and blades with carefully fashioned convex retouched sides; a wide range of crescent forms, some characterised by various forms of retouch on the unbacked side; retouched blades; pieces with notched and concave retouched edges; and several additional rare types.

Pieces with irregular areas of retouch are classed under the category "miscellaneous retouched pieces" while broken specimens which cannot be typed more precisely are counted as either "badly broken pieces" or "badly broken blades."

LSA sites also contain iron and pottery, small pieces of red and yellow ochre, quartz crystals, ostrich egg shell and stone beads and small pounding stones. These are tabulated in Tables 3-5 with the lithic specimens. Because the Mahopa lithics are best understood in comparison with the /Xai /Xai material, analysis is reserved for the concluding section.

Excavation yielded ten potsherds (all undecorated body sherds), which constitute 00.63% of numbered pieces. Denbow (1987) in his analysis of the material states:

> "Unfortunately, most of the sherds are so small that it is difficult to say anything because I could not get a fresh break to look at the interior tempering material. With those reservations, two sherds (MI 40 and MI 257) are definitely charcoal tempered and therefore in that respect like our 1st millennium A.D. ceramics. All the other sherds appear to be mainly sand or grit tempered though a few had inclusions of some sort of black rock. One also had a micaceous stone in it. These tempers are not really typical of your Early Iron Age material."

Because these ten sherds are spread over the three sets of squares, definitive conclusions are difficult, but some interpretation is possible. Sq. 4-8 contain 5 sherds, all sand/grit tempered and all within unit I. The remaining 3 sand/grit sherds occur in level 4, Sqs. 2-3 and taken together these data suggest that at Mahopa this ceramic type is limited to the last 600 years. The two EIA sherds were recovered from Sq. 1, level 9 and Sq. 3 level 8 and are thus not securely tied to the radiocarbon dated sequence. Because these levels bracket the Unit I-II boundary in the Sqs. 4-8 group, they may be as young as 600 or as old as 1990 years BP. The latter date, if correct, would make this the earliest Iron Age pottery from the Okavango-sandveld region, and within the broader context of southern African such an age is not unreasonable.

What also makes these sherds of interest is their small size. The materials themselves are not friable or crumbly and one may conclude that ceramics are well preserved in this sand matrix. While lithics may be reworked and consequently reduced in size through resharpening, such is not the case for ceramics. Given both their minimal numbers and small size (most smaller than a thumbnail) one may suggest they were introduced to the site as sherds rather than as whole vessels. Three small metal fragments were recovered from Units I and II in Sq. 4-8.

Thirteen identifiable faunal remains - all teeth - were recovered from approximately 25,400 discrete bits of bone and tooth. The identifiable pieces constitute 00.05% of the assemblage. As work on recent ethnographically controlled assemblages indicates, the half life of unburned bone in such sandy matrix is measured in decades rather than centuries and only burned bone is well preserved.

Not surprisingly, all faunal material from MI, as well as much of the lithics, show evidence of burning. This process, however, breaks bone into small, and therefore usually unidentifiable fragments; this fact accounts for the extremely low percentage of identifiable pieces. While this small sample size precludes reliable conclusions about subsistence strategy, Klein's identifications are presented in Table 2; it should be noted however that no domesticates are represented. All species, except bushbuck, occur in the region today.

/Xai /Xai 1 (/1) and /Xai /Xai 2 (/2)

Alerted by Malan's (1950) report of LSA artifacts at /Xai /Xai, Yellen excavated in 1970 in two areas around the pan. While the base of the pan itself consists of fine silty material, the surrounding area forms a rim of soft unconsolidated sand similar in texture to the veneers north of the Aha Hills. On a rise overlooking the pan and to the southeast in an area with abundant surface LSA material, three contiguous 5'x5' units were excavated in 2" units to depths of 66", 60" and 54". In each square, excavation continued until no further artifacts were recovered and all matrix was sieved through 1/4" mesh.

All material was labelled, sorted and analysed (with the exception of the ceramics) following the MI protocol.

This site, designated /Xai /Xai 1 (/1) to distinguish it from a second site /Xai /Xai 2 (/2) which is located on the western rim of the pan site /2, also situated in an area with dense LSA surface material, consists of a single 5'x 5' square excavated in sieved 2" levels. Unfortunately neither site was tied by survey to a fixed point and the location of each can be described in only general terms. At both /1 and /2 the soft sandy matrix was undifferentiated and no natural stratigraphic subdivisions were observed. Therefore, as at MI, in the first stage of examination, materials were grouped separately by site into 2" level units of analysis.

Fifteen samples from /2 consisting of mixed charcoal and burned bone were submitted to Dr Robert Stuckenrath, then Director of the Smithsonian Radiocarbon Laboratory; the results are presented in Table 2. Stuckenrath in an (obviously) personal and informal letter (1986) states:

> "There was so much bone material in each sample that we tried a collagen date on as many as seemed usable, with less than scintillating results. Methinks it only proved what we had expected before: the whoop-de-doo water tables in the area, especially at those temperatures, not only degrades the collagen, but moves it around stratigraphically as well. In several cases, there were sufficient humic acid residues (NaOH-soluble) that we could reprecipitate them and count them as well to see what the local groundwaters were doing. They, as you see, are alive and mobile.
> By and large the best bets are with the charcoal, despite a few stratigraphic reversals here and there."

The charcoal dates indicate the presence of three units. The uppermost two are internally mixed but each is distinct from its neighbours. Unit I, which includes levels 1-8, extends from the surface to 16" and dates from the present to 635 B.P. Unit II consists of levels 9-18 (17"-36") and covers the time span 1765-2260 B.P. Levels 19-28 (37"-56") form Unit III which appears unmixed and dates from 3205 to at least 3645 B.P. These three units therefore provide the framework for subsequent analysis.

Figure 5 presents the /2 distribution of cultural material and faunal remains by depth, with the solid vertical lines marking the separation between units as determined by radiocarbon dates. The resulting pattern permits two (speculative) conclusions. First, the breaks between units, based on cultural and faunal distributions are fairly clear-cut. As the bone clearly demonstrates and the cultural material suggests, the boundary between Units II and III is clearly defined. The break between Units I and II likewise is marked by a sharp increase in bone and a less pronounced rise in cultural material. Because of the larger sample sizes, the faunal patterns provide a more accurate indicator of overall pattern; and one might conclude from this alone that a three unit subdivision existed even where radiocarbon dates were lacking to guide the analysis.

Secondly, it is possible to suggest a cause for the pattern observed in Units I and II. Because, as the radiocarbon dates indicate, both are mixed, it seems probable that cultural and faunal materials, (both of which are heavier than individual sand grains), would sift downward as a result of the mixing process. Because Unit III is unmixed a similar pattern would not be expected.

These data are important because they provide the basis for interpretation of the /1 material. The distributions by depth of /1 cultural and faunal remains are presented in Fig. 6. Both materials indicate a clear break at approximately level 19 with a changeover from increasing numbers of pieces to a more abrupt decline. This mirrors the /2 pattern and suggests that level 19 marks the top of Unit III. Neither the /1 fauna nor cultural material show a break at any point which might suggest a Unit I-II boundary. Rather for both materials the number of pieces increase with depth and this is indicative of more extensive mixing. The pattern is particularly clear in the faunal remains.

Because the /1 and /2 lithics can best be interpreted within the context of a broader Mahopa - /Xai /Xai comparison, again analysis is deferred to the concluding section. As tables 7 and 8 indicate, 12 sherds were recovered at /1 and 4 at /2. These constitute 1.75% and 1.22% respectively of the cultural materials at each site. As at MI, all sherds are extremely small, ca. thumbnail size. They were analysed by Wilmsen and Denbow, the results reported in Wilmsen (1986).

Wilmsen states that the lowest three from /2 are, on the basis of their fabric, EIA while the overlying one is, "identical to that of Mbukushu and Herero ware (MHW) of the past few centuries." This places the EIA materials in Unit II and thus at least 1765 B.P. years in age and the MHW in Unit I and thus more recent than 635 B.P. In reference to /1, Wilmsen states that the lowest 4 sherds are attributable to the EIA. I assume this statement refers to the lowest 5, since, as table 7 indicates, there are no lowest 4 sherds which can be grouped to form a stratigraphically discrete unit. If so, this means either that at /1 Units 1 and II are mixed, (as the distribution data implies), or that site inhabitants saved old sherds, or that the EIA tradition continues into the last 635 years. At /1, a single metal bead was recovered in level 19 (the uppermost level in Unit III.) The most parsimonious interpretation for this extremely early appearance of metal is that the small object was displaced from Unit II, which lies immediately above.

Faunal remains from both /1 and /2 are burned and broken into small but well preserved fragments. /1 yielded no identifiable items out of 1342 remains; and at /2, 2 species determination could be made on 2 of a total of 11,173 pieces (Table 6). This means that 0% of the /1 remains and 00.02% from /2 sample could be identified, an elegant testimony to the physical state of these remains. Both springhare and porcupine identified at /2 are present in the /Xai /Xai region today.

In the mid 1970s, Wilmsen excavated near the /Xai /Xai pan and the results are reported in Wilmsen 1978, 1982, 1986 and 1988. In addition to a large number of 1 m. radius circles, excavated to a depth of 8 cm., Wilmsen dug at least 21 units in 10 cm. levels to a depth of 1 m. While in general the results appear similar to those obtained at /1 and /2, his excavations are of particular interest because of claimed presence of cow (*Bos taurus*) maxilla associated with a radiocarbon date of 1150 B.P. On this basis Wilmsen argues for the early presence of livestock at /Xai /Xai.

For several reasons, Wilmsen's excavation and assertion are open to serious question. Wilmsen (1988b) notes that while the maxilla and dated radiocarbon sample are both at roughly the same depth - in a level which extends from 58 to 68 cm. below the surface - they were recovered from different excavation circles located 8 m. apart.

Given the difference in pattern between adjacent squares 2 and 3 at MI, it is at best hazardous to assume chronological equivalence.

The problem of equivalence is an especially serious one, given evidence of Unit I -II mixing at /1. The two most distant units excavated by Wilmsen are separated by ca 280 m., yet for analytic purposes, levels from all circles are aggregated together by depth. *A priori* correlations of this nature are suspect and the strongly divergent patterns between circles in number of pieces vs. depth (Wilmsen 1978:13) make this an even more hazardous enterprise.

A second reason for caution involves the nature of bone preservation in sand matrix of this kind. At the Dobe waterhole, immediately north of the Aha Hills, Yellen (1986) recovered faunal samples from Basarwa sites of known age from a sand matrix essentially identical to /Xai /Xai. At Dobe, after ca. 25 years, the composition of unburned bone begins to change and degradation is obvious. Fragments, when pressed between the fingers, decompose into a paste and it is extremely unlikely that survival exceeds 50 years. However burned bone recovered from these ethnographically controlled sites had broken down into small fragments and was well preserved. No unburned bone was recovered at either MI, /1 or /2 and in this context the "/Xai /Xai cow" is clearly anomalous.

Wilmsen states (1988:16):

> "The CaeCae specimen is a complete maxillary dental arch of a juvenile (M3 erupting) cow (*Bos taurus*); the bone had been crushed and badly eroded but was stabilised during excavation with diluted white glue in order to preserve the relative position of the teeth."

The presence of such a large and thus apparently unburned bone is at best extremely unusual; given the burned and highly fragmentary state of other bones from the site and the nature of bone preservation in Kalahari sands, they are best interpreted as intrusive. The depth profile for /1 and the placement of these bones within the Unit I-II lends credence to this interpretation.

Unfortunately, detailed comparison of materials from the Wilmsen and Yellen excavations are not possible. Wilmsen does not divide lithics by types and his pottery descriptions are not consistent. Wilmsen (1986) describes Yellen's material as follows: the uppermost sherds "have a hard grey paste with calcretic temper...while the lower 7 have friable black paste with charcoal temper typical of the EIA." A handwritten note then states "this is also true of those I collected." (As Denbow, in his analysis of the M 1 material states, charcoal temper is a hallmark of Ngamiland EIA ceramics).

Wilmsen (1982:15) however describes his /Xai /Xai ceramics as follows:

> "Ceramics occur at many points at the surface and throughout the depth tested. There are 357 plain body sherds included in the assemblage, along with 16 incised and/or punctuated sherds; all of these are grey in colour, thick, course in texture, *and appear to contain limestone or bone temper which is white and chalky*. (emphasis added) In these characteristics, in design elements..., and in patterns of design ... the sherds are identical to modern Hambukushu pottery and also conform to descriptions of Late Iron Age/ Historic Lungwebongu ware which is said to have been widespread in western Zambia and westward".

Conclusions

Kalahari sands are known to undergo extensive vertical reworking (Cahen and Moeyersons 1977) and therefore have limited potential for time sensitive archaeological research. What the Mahopa - /Xai /Xai sites reveal, however, is that in some cases stratigraphic integrity, to a greater or lesser degree, may be retained.

At MI, mixing is minimal while at /2, three separate units, two of them internally mixed, were encountered. This suggests that although such deposits must be approached with extreme caution, if care is exercised and each situation approached on a case by case basis, chronological distinction may be possible. Large series of radiocarbon dates, preferably on charcoal, from limited areas within a site, are required. Given lack of stratigraphic subdivisions for within site correlation, a method which plots density of material with depth and uses such patterns for both correlation and explanation may prove effective.

Taken together, the sites in the !Kangwa and Mahopa valleys indicate a single LSA industry characterised by large numbers of crescent forms and relatively few short end scrapers (Duckbill scrapers) and thumbnail scrapers. What we term "steep biconvex crescents" (and are often incorrectly called "double crescents") are characteristic of these assemblages.

An additional hallmark are pieces with carefully formed symmetrical, convex retouched sides and this configuration is observed on both biconvex crescents and a variety of forms of blades or flakes with convex retouched edges. EIA pottery may appear in small amounts as early as 1990 B.P. while a second tradition characterised by sand, grit or calcrete temper seems to postdate Unit II and are thus younger than c. 1900 B.P. Metal, in small amounts, is present in Units I and II and a single specimen was recovered from the uppermost level of Unit III.

This Mahopa - /Xai /Xai LSA forms part of a broader tradition which extends westward into Namibia (Jacobsen, personal communication) and probably into the northwestern Cape region of South Africa where steep biconvex crescents occur. The Okavango appears to mark the eastern limit of this industry. LSA lithics from the Tsodilo Hills and Toteng exhibit the same range of lithic categories while LSA material of similar age from Toromoja in the Makgadikgadi Pans of central Botswana is distinct.

Radiocarbon dates indicate the presence of this LSA tradition in the western sandvelt by 3645 B.P. and it appears to continue into the last century. Fig. 7 which plots radiocarbon dates at both Mahopa and /Xai /Xai against depth reveals an interesting pattern. At both sites, while datable material is evenly distributed with depth, in both, the dates divide into three distinct clusters - the present to 635 B.P.; 1765-2260 B.P.; and 3205 - 3645 B.P. - and thus indicate discrete and discontinuous periods of occupation (at least in the immediate area sampled).

That both sites exhibit the same pattern suggests a cause other than chance and a climatic interpretation may be offered. Because it is located on the northern fringe of the Kalahari, this region undergoes wide year-by-year swings in rainfall. In years of low rainfall, some waterholes may go completely dry while in wet ones even seasonal pans may retain water year-round.

Data from =gi indicate that over the last 100,000 + years the region has been subjected to alternating intervals of increased wetness and dryness. One may suggest that the !Kangwa and /Xai /Xai valleys in the last 4 millennia have experienced three wetter and two intervening drier intervals and that the latter rendered habitation of the valleys difficult. Because sterile soil does not separate each of the chronologically distinct units, deposition of sand did not occur during the intervening periods. This may be explained by lack of plant cover - the result of drier conditions - which promotes the retention of sand and impedes wind-blown erosion.

Finally, these archaeological data speak to the issue of Iron Age hunter-gatherer interaction in the !Kangwa /Xai /Xai region. Viewed in a broader southern African context, it is clear that Khoisan hunters and gatherers interacted with Iron Age peoples in a variety of ways. In some areas, such as Zeekoe Valley in the Karoo and the Johannesburg region of the Transvaal, excellent archaeological evidence indicates extreme resistance to integration; despite long periods of contact, hunting and gathering traditions were maintained. In other areas, hunters and gatherers either disappeared through physical assimilation into Iron Age societies or were transformed into pastoralists while maintaining a distinct genetic and cultural identity.

Other outcomes from contact are possible and likely occurred. Therefore it is not possible, *a priori* to speculate about the !Kangwa /Xai /Xai situation. However the archaeological data provides excellent insight. If the generally accepted date for the first appearance of Iron Age traits in southern Africa at about 2,000 years ago is correct, Unit III at both /Xai /Xai and Mahopa clearly predate this introduction and the culturally derived materials they contain are the product of hunter and gatherers living in a forager's world. At both sites, Unit II marks a period of transition while Unit I clearly postdates Iron Age contact. At both sites presence of ceramics makes it clear, as logic would also suggest, that at least limited contact took place between local residents and Iron Age peoples to the east. Comparison between Units therefore should provide insight into the effects of this interaction.

Two facts are immediately apparent. First, settlement patterns are unchanged. Sites - presumably residence camps - remain situated slightly away from but within easy walking distance of "permanent" water points. Secondly, population replacement does not occur because typologically the industries represented in Units I, II and III are the same.

With the following qualification it may also be argued that lifestyle also remains unchanged. To do archaeology is to work constantly in the shadows, and for lithic analysts this is especially true. While classification systems of stone tools may be devised, the functions of individual tool types are rarely known and archaeologists can never be certain how closely the makers' emic typology would correspond to their own. However, one may assume that retouched lithics were in fact tools and served practical purposes. Also, although the exact relationships are and will likely always remain unknown, surely a correspondence exists between lithic assemblages and human activities and thus a change or lack of change in the former reflects the same in the latter.

In this context is it important to note that detailed typological analysis of the /Xai /Xai materials indicates not only continuity but also lack of change. If one focuses on the lithics and eliminates such catchall categories as badly broken and miscellaneous retouched pieces, the Yellen/Brooks toypology defines 46 tool classes or types. Comparison of types across Units from Mahopa and the /Xai /Xai sites indicates that no single type is distributed in such a way as to distinguish, with any reliability postcontact Units I and II from precontact Unit III.

With the exception of pottery, only two types, Blunt-ended crescents and Pointed blades with neither side backed, have likely stratigraphic significance and both types are limited to Units II and III. The ceramics and lithics both support the same conclusion that lifestyle remained basically unchanged. We have suggested that because they are so small and so rare, ceramics may have been introduced into the sites as sherds rather than whole vessels. While two lithic types may differentiate Unit I from Units II and III and thus may have chronological significance, neither correspond to the pre-contact, post-contact break.

Taken together, what the data suggest is the maintenance of a basic foraging existence at least into the nineteenth century A.D.

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FIGURE 1
LOCATION OF ARCHAEOLOGICAL SITES, WESTERN NGAMILAND, BOTSWANA

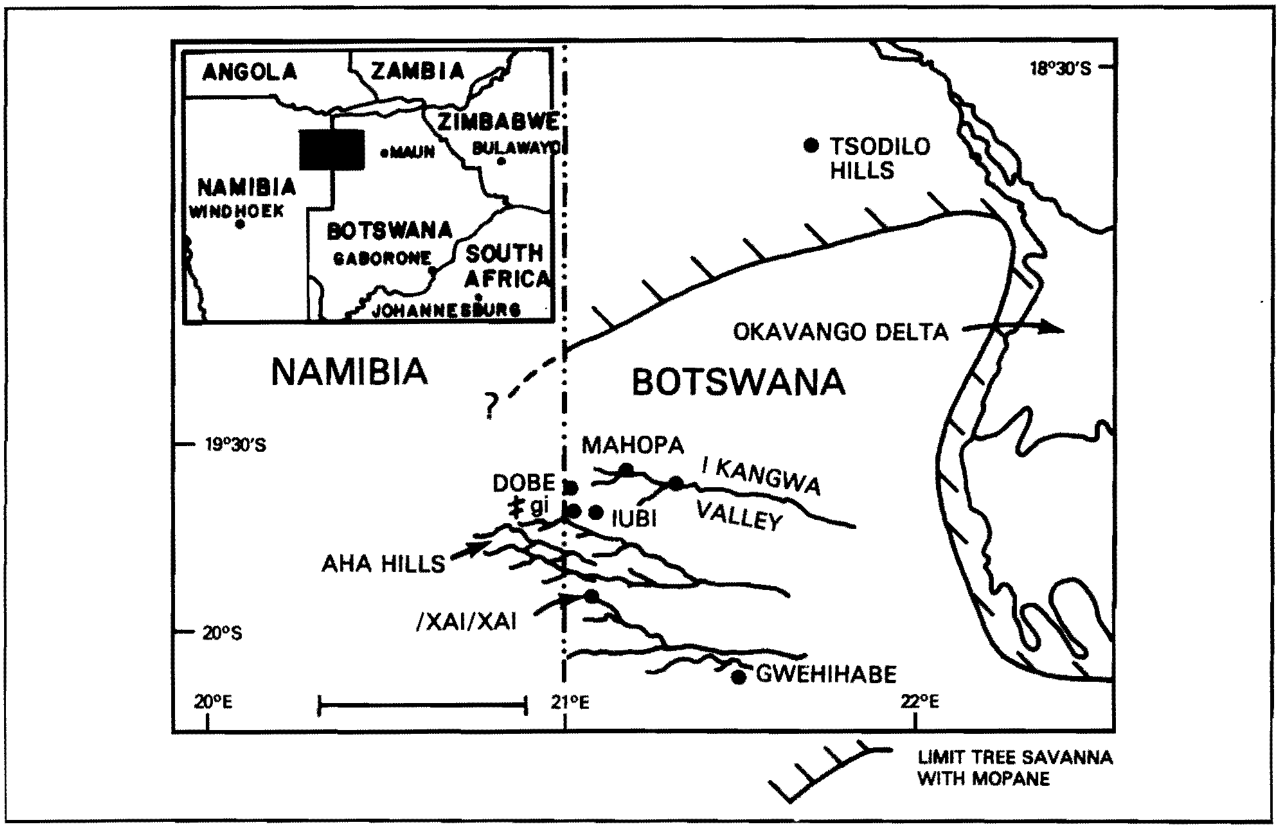


FIGURE 2
MAHOPA 1: DISTRIBUTION OF LITHICS AND BONE BY LEVEL

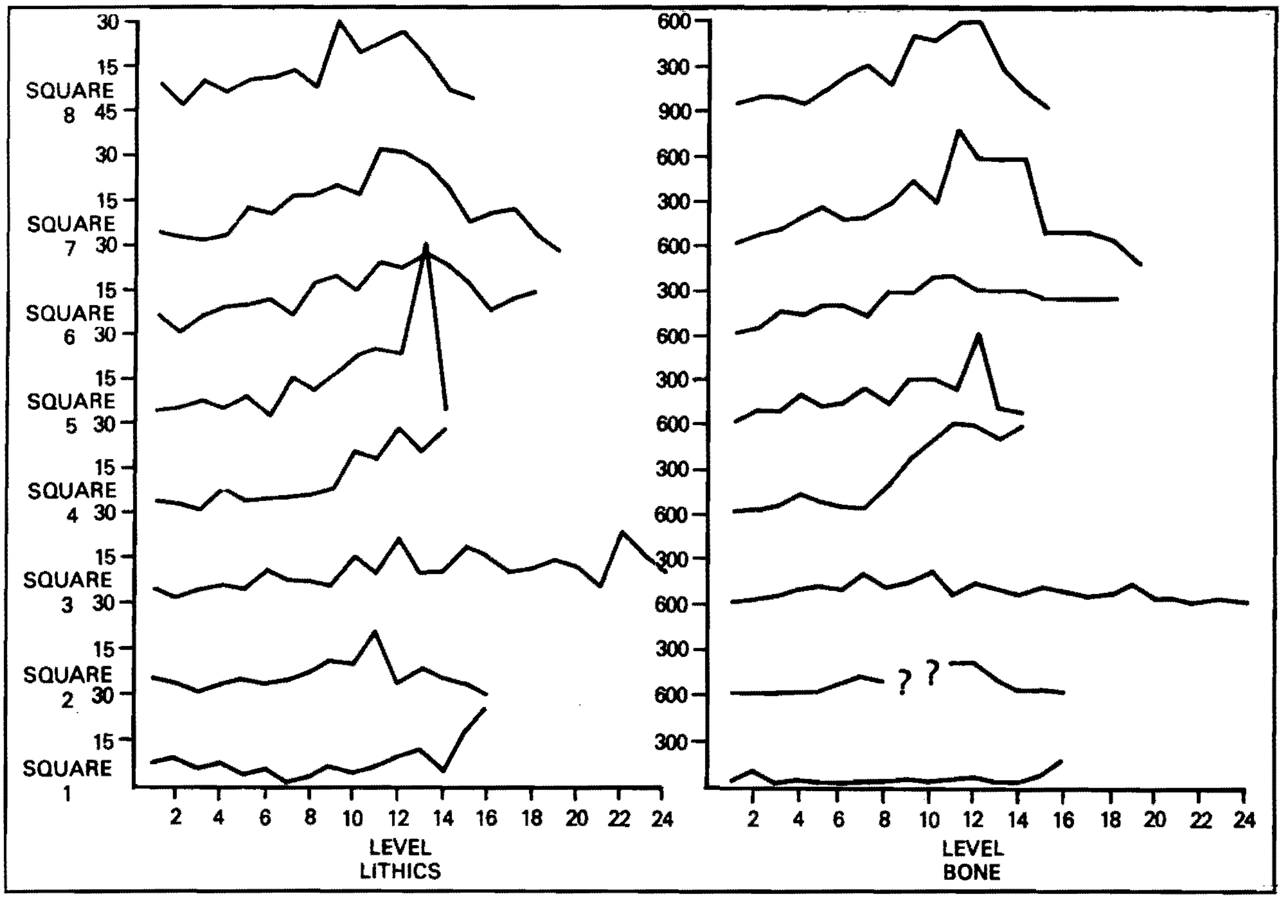
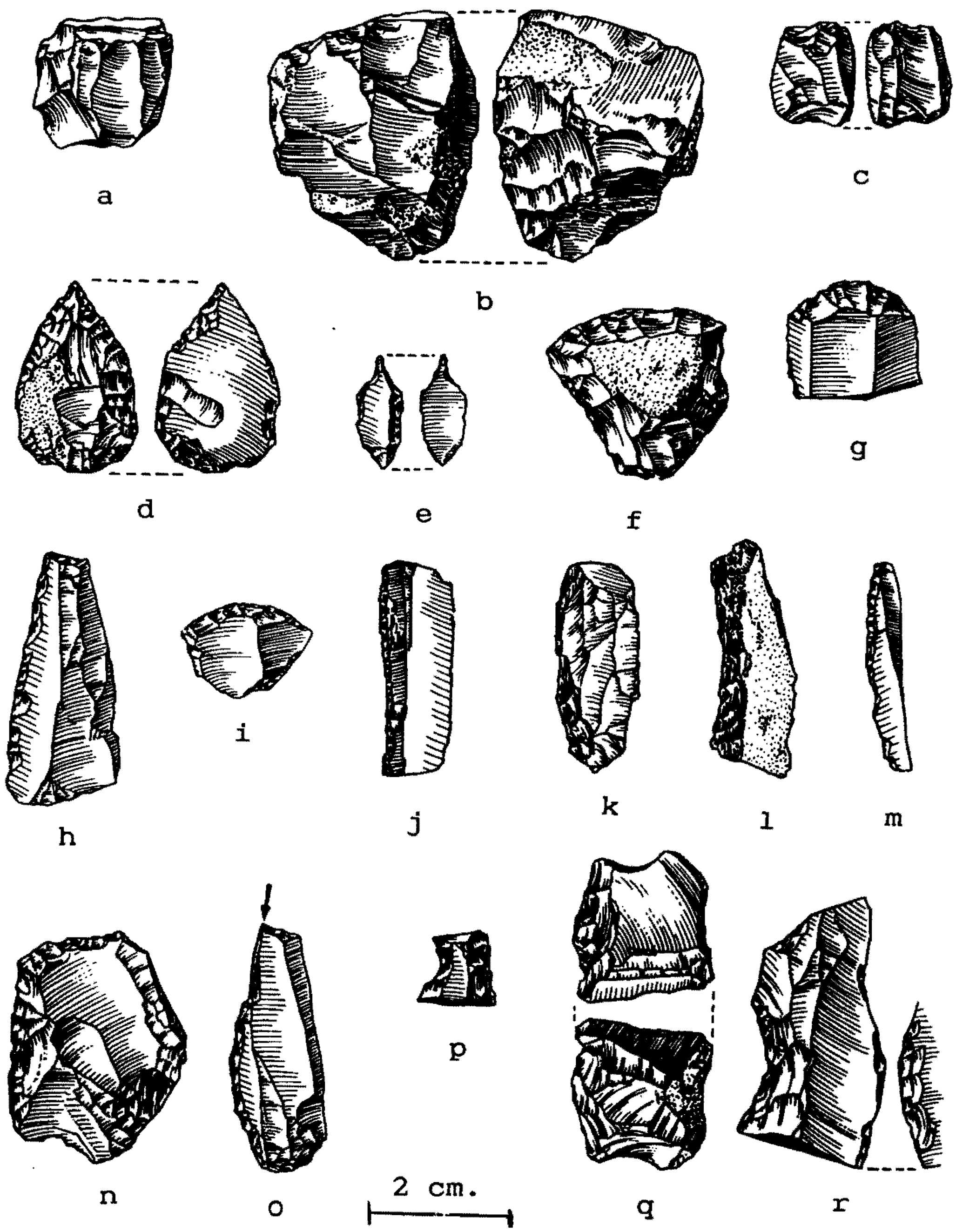
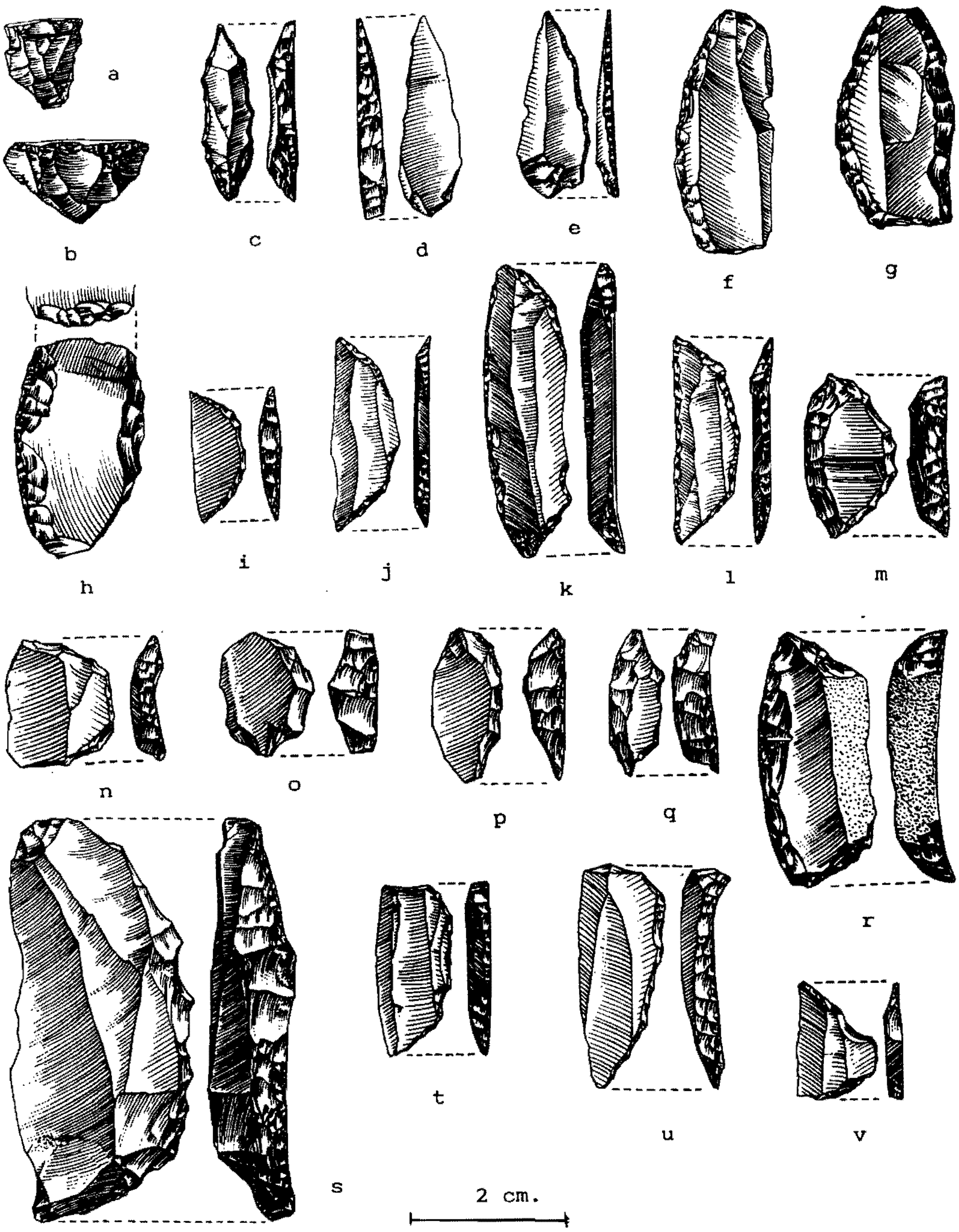


FIGURE 3
BROOKS-YELLEN NGAMILAND LATE STONE AGE TYPOLOGY



a:NAP; b:NMP; c:SC; d:PF; e:PR; f:SES; g:EBS; h:TB; i:TS; j:RB; k:SRB; l:CTB; m:STB; n:LF2R; o:B; p:NP; q:SP; r:PCS;
(See Table 3 for abbreviation key)

FIGURE 4
BROOKS-YELLEN NGAMILAND LATE STONE AGE TYPOLOGY



a:N1P; b:NSM; c:PB2B; d:PB1B; e:PB0B; f:BFC1R; g:BFC2R; h:BFCRT; i:S; j:SPB; k:SREPB; 1:SRE; m:BC; n:H; o:E; p:BCUR; q:SBC; r:BCPB; s:O; t:BE; u:RE; v:IC
(See Table 3 for abbreviation key)

FIGURE 5
/XAI /XAI 2: DISTRIBUTION OF LITHICS AND BONE BY LEVEL

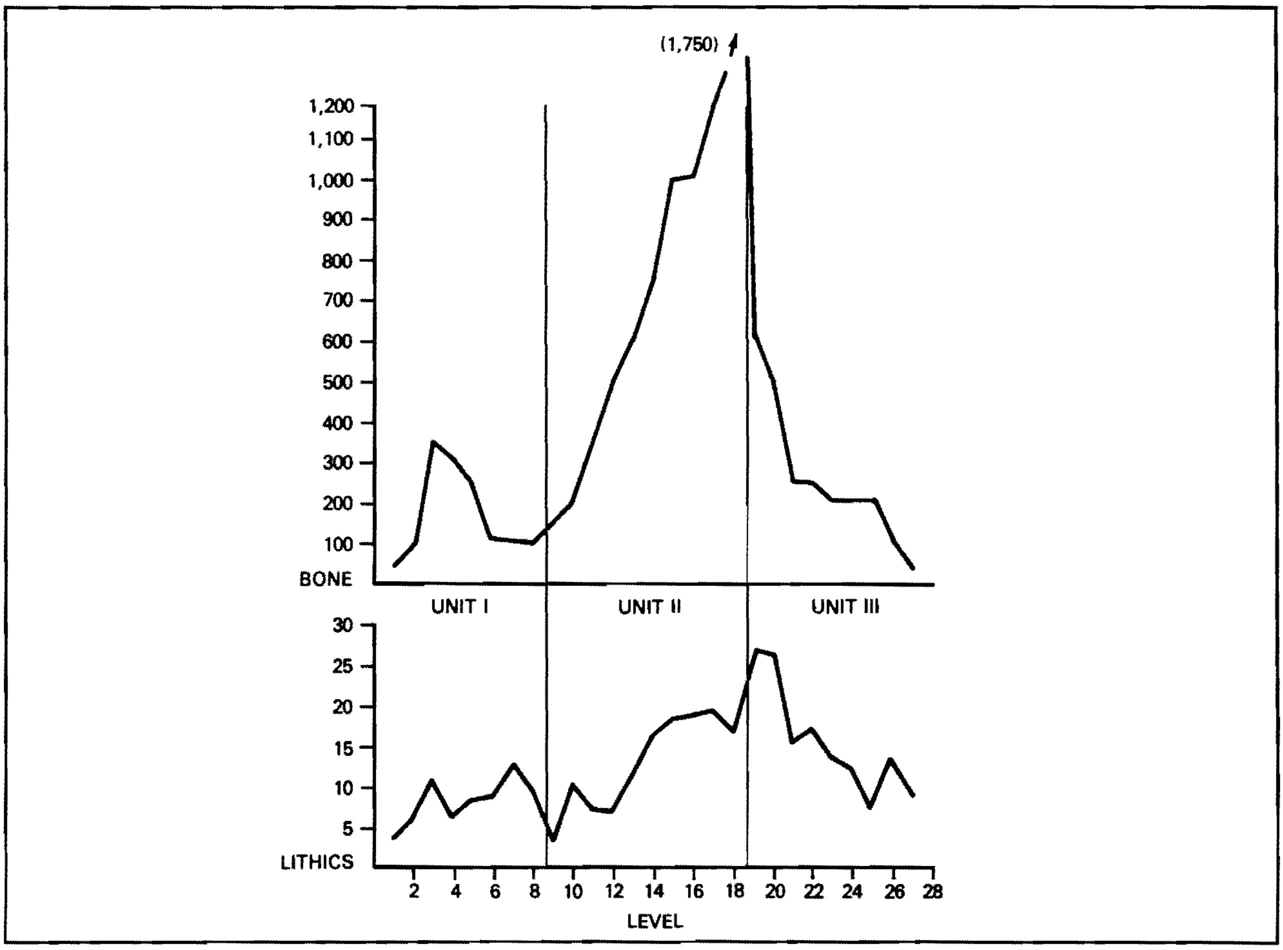


FIGURE 6
/XAI /XAI 1 (SQUARES 1-3): DISTRIBUTION OF LITHICS AND BONE BY LEVEL

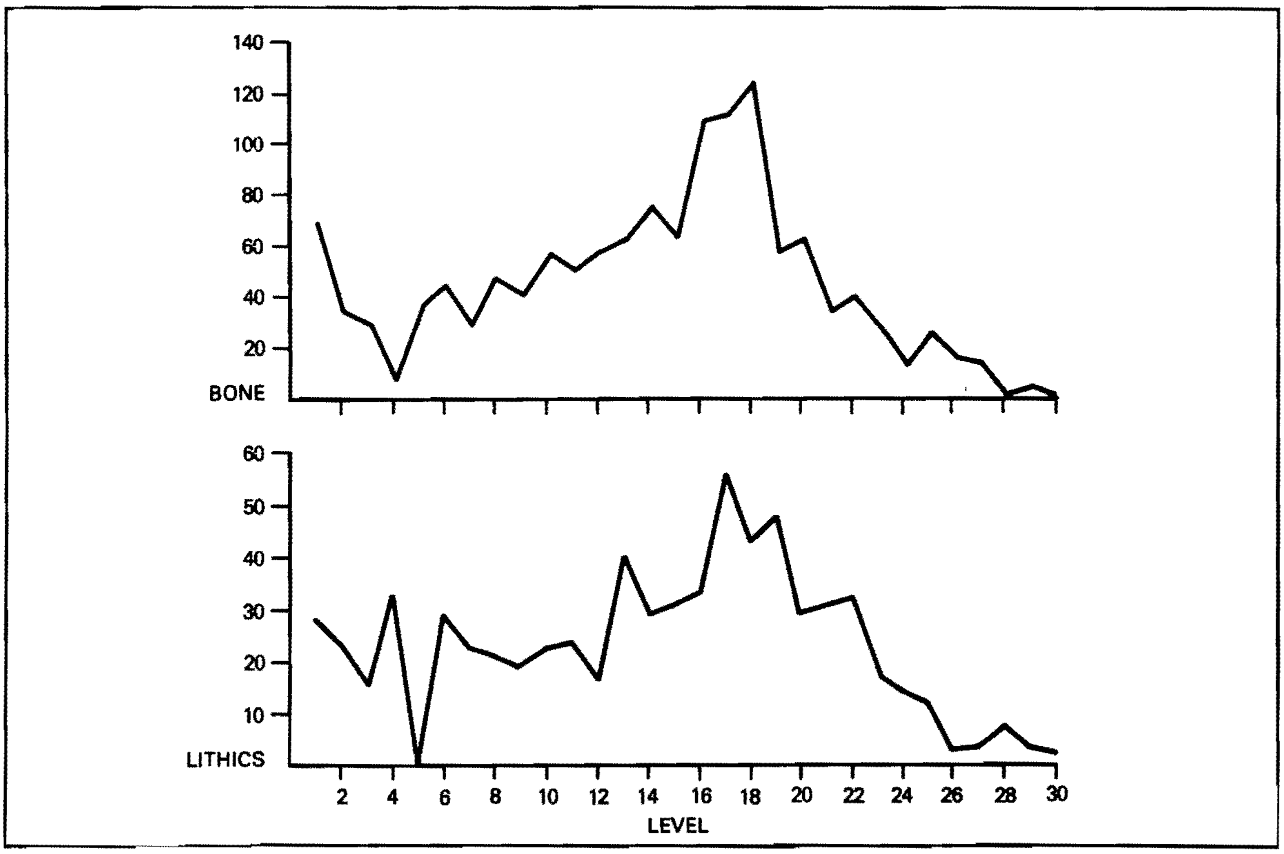


FIGURE 7
CORRELATION BETWEEN RADIOCARBON AGE AND DEPTH BELOW SURFACE AT MAHOPA 1 AND /XAI /XAI 2

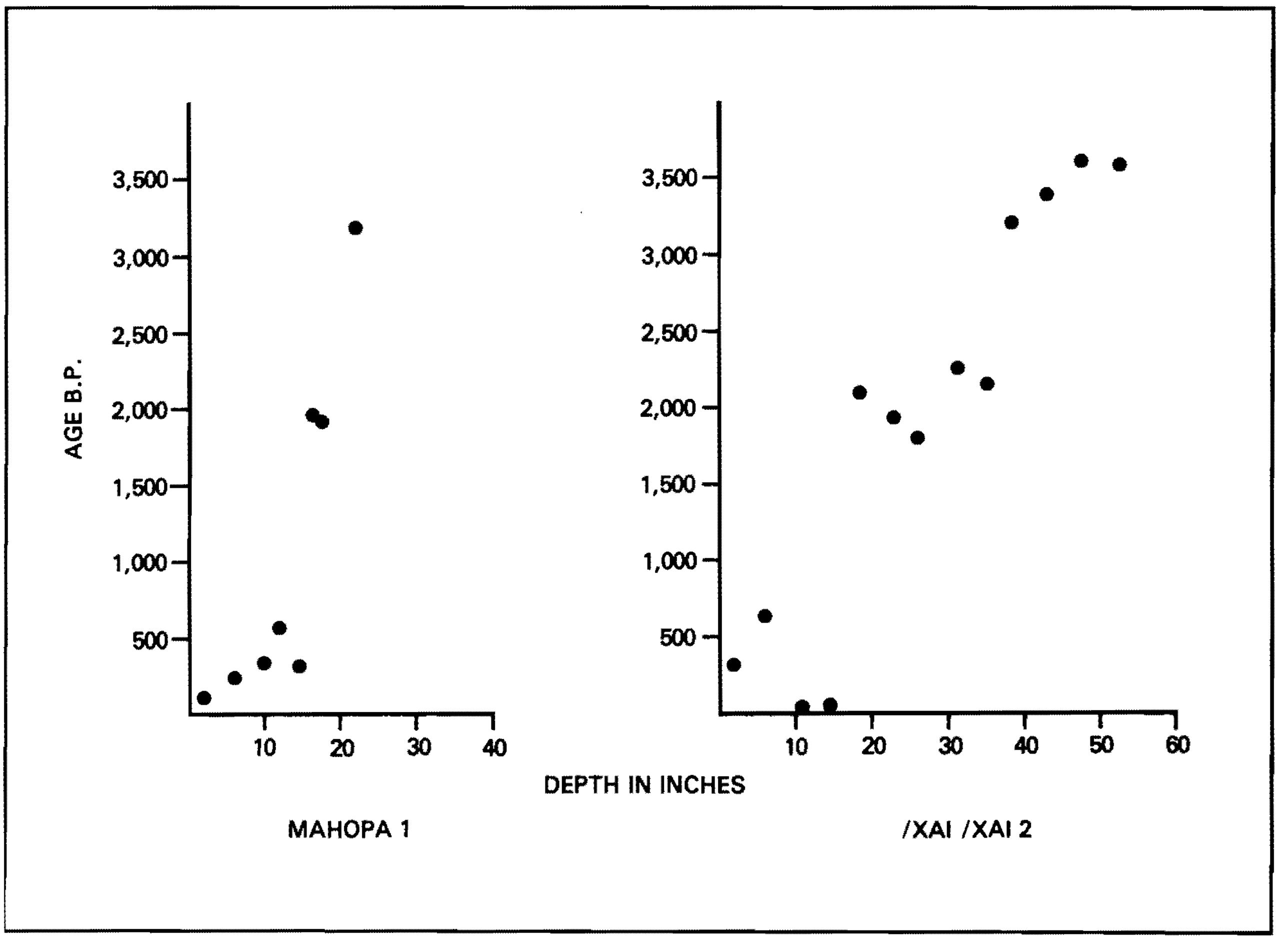


TABLE 1
MAHOPA 1 RADIOCARBON DATES

Squares. Levels*	Date
4-8.1,2	0 +70 B.P.
4-8.3,4	240 60 B.P.
4-8.5,6	360 50 B.P.
8.5,6,7	600 50 B.P.
4-8.7,8	300 60 B.P.
8.8,9,10	1,990 50 B.P.
4-8.9,10	1,960 50 B.P.
4-8.11,12	3,270 70 B.P.

Samples from levels 15-19 contained insufficient charcoal for conventional radiocarbon dating.

*To provide sufficient material for dating, materials from adjacent levels contained within the contiguous set of squares 4-8 were pooled.
"4-8.1,2" means that the dated sample contained charcoal from levels 1 and 2 in at least two squares in the sq. 4-8 series.

TABLE 2
/XAI /XAI 2 RADIOCARBON DATES

Level	Nature of Dated Material					
	Charcoal		Collagen		Humic Acid Residue	
1,2	280	70*				
3,4	635	50	1580	140		
5,6	147.6% modern					
7,8	122% modern					
9,10	2120	85				
11,12	1950	60				
13,14	1765	55			685	145
15,16	2260	65	1690	85		
17,18	2165	50	1485	??	1810	70
19,20	3205	85	2340	160	2000	75
21,22	3425	85	2405	110	2645	65
23,24	3645	100			2220	75
25,26	3600	125			2525	85
27,28					2880	95

* All dates in years B.P.

TABLE 3
PIECE COUNTS: MAHOPA 1, SQUARE 1

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16
RO						1						1				
YO													1			
QC																
I																
OB																
SB																
PS																
P									1							
NIP	1	1								1		1			1	1
NAP												2	2	1		
NMP									1	1		1	1	1	1	1
SC																
NSM																
PB2B								1							1	
PB1B																1
PB0B																
PF														1		
PR																
MSAP																
SES		1												1		
EBS																3
TB			1												1	
MRE	1									1						
TS										1					1	
BFC1R	1	1											1			2
BFC2R																
BFCRT																
BFCRB																
S	3	1	1	1		1		1			1					2
SPB				1		1							1		1	
SRE														1	1	
SPBRE																
BC	1	1		1									1	2	2	2
BCUR																
BCPB															1	1
SBC				1						1			1			
H																
E																
RE															1	
BE									1							
O																
MSC																
IC																
RB					1	2				1				1		
SRB		1						1		1			1			2
CTB																1
STB																
TRB																
LF1R																1
LF2R													1			1
B																
SP									1							
BBP	1	2	1								1		2		1	2
MRP				1			1				1	1	1		1	1
LMRP																
BBB				1												1
OTHER																
TOTAL	8	6	4	7	1	5	1	3	5	5	5	7	12	8	14	22

TABLE 3
LEGEND

RO	Red Ochre
YO	Yellow Ochre
QC	Quartz Crystal
I	Iron
OB	Ostrich Egg Shell Bead
SB	Stone Bead
PS	Pounding Stone
P	Pottery
N1P	Nucleus, 1 striking platform
NAP	Nucleus, 2 striking platforms
NMP	Nucleus, multiple striking platforms
SC	Spindle Core
NSM	Nucleus with scraper modification
PB2B	Pointed Bladelet, 2 sides backed
PB1B	Pointed Bladelet, 1 side backed
PB0B	Pointed Bladelet, neither side backed
PF	Pointed Flake
PR	Perforator
MSAP	Middle Stone Age Point
SES	Short End Scraper
EBS	End of Blade Scraper
TB	Truncated Blade
MRE	Miscellaneous Retouched End
TS	Thumbnail Scraper
BFC1R	Convex Blade or Flake, 1 side retouched
BFC2R	Convex Blade or Flake, 2 sides retouched
BFCRT	Convex Blade or Flake, 1 side retouched, 1 end truncated
BFCRB	Convex Blade or Flake, 1 side retouched, 1 side backed
S	Simple Crescent
SPB	Simple Crescent, partially backed
SRE	Simple Crescent, retouched edge
SREPB	Simple Crescent, retouched edge and partially backed
BC	Biconvex Crescent
BCUR	Biconvex Crescent, with unretouched edge
BCPB	Biconvex Crescent, partially backed
SBC	Steep Biconvex Crescent
H	Horseshoe Crescent
E	Elliptical Crescent
RE	Crescent with retouched end
BE	Blunt Ended Crescent
O	Oversize Crescent
MSC	Miscellaneous Crescent Forms
IC	Incomplete Crescent
RB	Retouched Blade
SRB	Slightly Retouched Blade
CTB	Chunky Triangular or Quadrilateral Blade with retouched edge
STB	Slender Triangular or Quadrilateral Blade with retouched edge
TRB	Thick Retouched Blade
LF1R	Large Flake, 1 side retouched
LF2R	Large Flake, 2 sides retouched
PCS	Piece with concave retouched side
B	Burin
SP	Splintered Piece
BBP	Badly Broken Piece
BBB	Badly Broken Blades
MRP	Miscellaneous Retouched Piece
LMRP	Large Miscellaneous Retouched Piece

TABLE 4
PIECE COUNTS: MAHOPA 1, SQUARES 2, 3

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24
RO									1							1								
YO																								
QC																								
I																								
OB																								
SB																								
PS																								
P				3				1																
NIP									1		1													
NAP							2				1		1		1					1				
NMP	1	1							1	1				2	2		1		3				1	1
SC																								

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	
NSM								1	1																
PB2B		1					1		1	1	2	1								1			1	1	
PB1B						1			1		1	2	1	1		1		1		1			1		
PB0B																									
PF					1													1						1	
PR																									
MSAP																									
SES					1	1		1		1	1	1	3		1		1								
EBS						1	1			2	1	1		1						1			1		
TB					1															1	2				
MRE											1						1	1							
TS	2										1	1				1									
BFC1R	1		1							2		1	1	1			1		1			3	3		
BFC2R											1														
BFCRT	1																								
BFCRB												1													
SE	S	2			2		2	1	1	2	4	3	1	2	4	2	4	2	2	4				4	2
SPB												1				1									
SRE													1												
SPBRE																									
BC		2		1	1	2	1		2		2		1	1	1	2		1	1	1	1			1	
BCUR																					1				
BCPB					1						1			1											
SBC					1				1						4	1		1					2		
H																									
E																									
RE												1			2								1		
BE											1														
O																									
MSC		1																							
IC														1								1			
RB				1	1						2	1		1		1	1			1	1	2	1	1	
SRB									1		2												1		
CTB					1				1	1	1														
STB								1				1							1			1	1		
TRB																									
LF1R									1	1		1	1	1								1			
LF2R																									
PCS	1																						1		
B																									
SP													1												
BBP	1		1		3	1	4	3	3	3	4	3		2	4	1	1	1	7		3		2	2	
MRP		1	1				3	1	1	2	4	1	1	1	1		1	2	1			3		3	
LMRP																									
BBB					1	1	1	1	2	1	1				1						1		2	1	
OTHER																									
TOTAL																									
	7	8	2	8	8	11	11	11	19	20	30	20	16	16	17	16	9	10	12	14	6	23	15	12	

TABLE 5
PIECE COUNTS: MAHOPA 1, SQUARES 4-8

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
RO			1		1			5	3		7	6	6	4	4	2	1		
YO				2			2		1	1	2	1	2	1	1			1	
QC																			
I								1		2									
OB																			
SB																			
PS																			
P	2	1		1	1	1		1											
NIP				3			1	1	3		2	3	2	2			1		1
NAP						1			2		1	2	4	1		1	1		
NMP	1		1			1	1	2	1	1	4	4	5	5		1	1	2	
SC																			1
NSM																			
PB2B	1		1	1	1		1		3	2	2	3	4	3	1	1		1	1
PB1B				1	1	1	1	2	1	6	3	5	4	2	1	1			
PBOB									2		1				1				
PF												1	1	1			1		
PR																			
MSAP																			
SES	1					2	1	2	3	3	4	3	1	4		1			1
EBS					2	2			1	2	5	2	5	2	3		1	2	1
TB									2				1						
MRE			1				1				1	1	2			1			
TS					1		1				1	4							
BFC1R	1		1			2	3	1	2	4	3	8	5	6	3	3	3		
BFC2R													1						
BFCRT						1		2			1			1					
BFCRB						1													
S	7		1	1	7	5	5	11	5	15	12	17	22	2	2	1	3	1	5
SPB			1	1	1			2	5	7	6	5	7	3		1	1		
SRE						1				1				2					
SPBRE																			
BC					2	4	1	1	1	2	4	6	1	2	1			1	
BCUR					1														
BCPB						1	1		1	1	1		4						
SBC	1	1			1	1	1		3	1	11	8	4	5	1				
H																			
E																			
RE																			
BE													1				1		
O																			
MSC							1	2		1		1							
IC											1	1	1						
RB	1				1		3	3	6	2	2	1	6	4	2			1	
SRB			2	2		2	3	1	2		6	4	4	3					1
CTB					1					1	2			2	1				
STB		1			1			1	2	1			1	1	1				2
TRB																			
LF1R												1	2				1		1
LF2R							1						1						
PCS			1						1		2	2	5	1		1			
NP										1	1								
B																			1
SP																			
BBP	4	2	4	3	7	7	9	9	13	17	27	17	25	15	10	4	6	3	3

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
MRP	6	1	1	6	3	5	11	9	18	15	5	17	12	5	3		3	1	3
LMRP																			
BBB	2	2	1	1	2	1		3	4	2	3	5	4	2					2
OTHER									1*										1*
TOTAL	27	8	16	22	36	37	50	57	86	89	119	129	143	78	35	18	24	13	24

(* rounded pebbles)

TABLE 6
FAUNAL REMAINS FROM MAHOPA 1 AND /XAI /XAI SITES.

Square. Level	Species		Tooth*
Mahopa 1			
1.16	*Equus burchelli*	(Zebra)	M (frag)
2.2	*Pedetes capensis*	(Springhare)	M
3.4	*Syncerus caffer*	(Cape Buffalo)	M1
3.4	*Syncerus caffer*		M1
3.4	*Syncerus caffer*		M3
3.6	*Tragelaphys scriptus*	(Bushbuck)	M3
4.12	*Equus burchelli*		P4
5.11	*Pedetes capensis*		M
5.12	*Equus burchelli*		P4
7.11	*Equus burchelli*		M1
7.18	*Pedetes capensis*		M
8.10	*Alcelaphus sp.*	(Hartebeest)	M (frag)
8.10	*Equus burchelli*		M1

/Xai /Xai 1

This site yielded no identifiable remains.

/Xai /Xai 2

1.6	*Hystrix africaeaustralis*	(Porcupine)	M
1.12	*Pedetes capensis*		M

* Teeth comprise 100% of identifiable remains.

TABLE 7
PIECE COUNTS: /XAI /XAI 1

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17
RO										1							
YO																	1
QC																	
I																	
OB																	
SB																	
PS																	
P	7			2		1					1	1					
NIP						1		1							1		2
NAP		1		1										1			
NMP				1	1								1	3		1	1
SC																	
NSM																	
PB2B	1		1			8		1		1	1	1	1		3	2	1
PB1B			1	1			1		1	2				3	1		1
PBOB							1										
PF																	
PR		1															
MSAP																	
SES									1	1			1	2			
EBS																	
TB															1	1	2
MRE																	
TS				1					1			1	1				
BFC1R		1	1	3				1	2		2	2			1		2
BFC2R						2				1							
BFCRT		1	1				1						2				
BFCRB																	
S	2	2	2			2	2		1	1	1	2	3	2	1	5	5
SPB	1			3									2	1	1	1	
SRE				3								1	1	1			2
SPBRE		1	1														
BC	3	2	1	3			3	2	1	4	3		3	2	2	2	5
BCUR						1								1			1
BCPB	1	1					1	2		1	1	1	1	1	3	2	3
SBC			1				1	1	1				4	1	1	2	4
H																	
E																	
RE	1	1	1				1				1		1	1			
BE													2				
O																	
MSC																	1
IC																	
RB			1				1	1		1	2	1	2	1		1	1
SRB	1		1	1					1			1				1	2
CTB				1													
STB													1			1	
TRB																	
LF1R						1											
LF2R																	
PCS	1					1										1	
NP												1	1		1		
B																	
SP																	
BBP	1	3	3	5		2	5	3	3	3	3	4	6	3	6	7	4
MRP	9	8	3	6		9	5	6	5	3	7	3	9	6	9	3	17
LMRP			1	1					1				1				
BBB																	
OTHER																	
TOTAL	28	23	18	32	0	29	22	21	19	21	23	18	40	29	31	33	56

(* metal bead)

TABLE 7

L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L29	L30
	1											
4		1	1		2							
	3				1			1	1	1		1
1	2	1										
						1						
2		1		1	1		1				1	
	1					2	1					
			1									1
												1
2	1	2		1			1					
			1									
										1		
4	4	1	4	3	2		1					
		2	1	2		1						
	2	4	3	2		1						
10	7	7	5	8	4	1		1			1	
				1						1		
1	2		1	1							1	
	4	3	1		2	1	1	1	1			
		1	1									
	1			2								
	1											
3	1	4		4	1	1	1	1			1	
1	2								1			
	1		1	1	1							
1	1									1		
				1								
9	3	4	4	2	1	2	4					
6	3	3	2	6	3	4	1			1	1	
1	2											
	1											
43	47	29	30	32	18	14	11	3	3	7	3	2

TABLE 8 - PIECE COUNTS, /XAI/XAI 2

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16
RO						1										
YO																
QC																
I																
OB																
SB																
PS																
P								1		1	2					
NIP	1											2		1	1	
NAP								1								
NMP							1									
SC																
NSM																
PB2B			3	1			1			1	1			1	3	1
PB1B	1												1		1	
PBOB																
PF																
PR																
MSAP																
SES						1	1			1		2			1	
EBS																1
TB																
MRE																
TS			1					1							1	
BFC1R					1			2								1
BFC2R																
BFCRT						1									1	
BFCRB																
S	1	2		2	1	2	4	2	2	1	1		1	4	2	
SPB					1											
SRE		1														
SPBRE																
BC			2	1	1	1	1	1		3			4		3	5
BCUR																
BCPB																
SBC								1			1			1		
H																
E																
RE																
BE													1		1	
O																
MSC																
IC															1	
RB						1								2		
SRB			1	1							1			1	1	1
CTB																
STB																
TRB																
LF1R																
LF2R																
PCS																
NP							1		1							
B																
SP																
BBP																
MRP	1	2	3		1	2	1	1		1	1	1	2	1	1	7
LMRP																
BBB			2	1	1	1	2	1		1	2	1	1	3	4	1
OTHER														1		
TOTAL	4	6	11	6	8	9	13	9	3	10	7	7	11	16	18	18

(* worked bone point)

L17	L18	L19	L20	L2 1	L22	L23	L24	L25	L26	L27
					1					
				1						
	1	2		1			1			
			3	1	1			1		
	3		1	1		2	3		1	1
2								1		
			1	1					1	
1		1								
		1								
		1	1	1		2				1
			1			1		1		
	1									
2	1	3	5	6	5	2		1		1
1	1	1						2	1	
	1		1							
3	3	6	2	1	2	2	1	2	5	2
		1								
1			1	1				1	1	
		1		1	1			1		
			1	1			2			
		1		1	1					
				1						
	1		1							
	1		1							
6	1	4	5	1	3	2	4	1		1
2		3	1	2	1	2	1	1		1
19	16	26	26	15	17	13	12	6	13	8