The African Archaeological Review, **4** (1986), pp. 41–82

The Upper Pleistocene and early Holocene prehistory of the Horn of Africa

STEVEN A. BRANDT

Abstract

The last major synthesis of the Upper Pleistocene and early Holocene prehistory of the Horn was published over thirty years ago. This paper therefore attempts critically to review the current state of knowledge and research pertaining to Middle Stone Age and Later Stone Age hunter/gatherer culture history and adaptation in the region that now encompasses Somalia, Ethiopia and Djibouti. Although the archaeological record still suffers from major gaps in information, chronometric analyses as well as subsistence, settlement and other behavioural data from stratified excavated sites have begun to reveal the Horn's potential for providing important contributions to understanding late Quaternary hunter/gatherer cultural development.

Résumé

Plus de trente ans se sont écoulés depuis la parution de la dernière grande synthèse sur la préhistoire de la Corne de l'Afrique au Pléistocène Supérieur et au début de l'Holocène. Cet article essaie donc de passer en revue de façon critique l'état actuel des connaissances et la recherche sur l'histoire culturelle et sur l'adaptation 'Middle Stone Age' et 'Later Stone Age' dans la région qui comprend la Somalie, l'Ethiopie et le Djibouti. Bien que les documents archéologiques souffrent encore de lacunes majeures en ce qui concerne les informations, les analyses chronométriques et les moyens de subsistance, des données sur les habitations et sur d'autres aspects du comportement obtenus de gisements stratifiés fouillés ont commencé à dévoiler que la Corne pourra éventuellement fournir des contributions importantes à notre compréhension du développement culturel des chasseurs-cueilleurs du Quaternaire final.

Introduction

Recent research has shown that during the Upper Pleistocene and early Holocene many parts of the globe experienced major climatic fluctuations, the palaeoenvironmental effects of which are relatively well documented and which form a backdrop for interpreting past animal/plant adaptations. It was during this comparatively brief time-span that archaic forms of *Homo sapiens* were replaced by anatomically modern humans with expanded intellectual and behavioural capabilities, and relatively rapid transformations in human social, technological, economic and geographic organization were witnessed (e.g. Trinkhaus 1983; Price and Brown 1985).

Although most of the major advances in our understanding of the African Upper Pleistocene and early Holocene have been the result of research conducted outside the Horn of Africa (e.g. Klein 1984; Williams and Faure 1980), recent investigations in this easternmost region of the continent have brought forth new data concerning this important period. Since the last major review of the Late Quaternary prehistory of the Horn was over three decades ago (Clark 1954), the purpose of this paper is to bring readers up to date on the current state of research on Middle Stone Age (MSA) and pre-food producing[1] Later Stone Age (LSA) hunter/gatherer culture history and adaptation in the Horn of Africa.[2]

A brief history of Middle and Later Stone Age research in the Horn

The Horn of Africa comprises the modern countries of Somalia, Djibouti and Ethiopia and is an area of impressive physiographic, environmental, climatic and cultural diversity (Fig. 1). For purposes of this paper, however, five broad regions can be recognized on environmental, geographical, ethnic and socio-economic grounds (Lewis 1955; Simoons 1960; White 1983):
(1) the hot and humid woodland plains of lowland western Ethiopia, where Eastern Sudanic and other Nilo-Saharan-speaking peoples practise a mixed farming strategy;
(2) the steep-sided valleys, flat-topped mesas and high mountain peaks of the temperate Afromontane and the bush- and thicket-covered Ethiopian and Somali (Southeastern) Plateaux, where Omotic, Cushitic and Semitic-speaking agriculturalists cultivate a wide range of crops;
(3) the hot, dry, flat semi-desert grasslands, deciduous bushland and thickets of Somalia and the Ethiopian and Afar Rift Valleys, where Northern and Eastern Cushitic-speaking pastoral nomads live;
(4) the humid to semi-arid Inter-riverine and Lower Juba regions of southern Somalia, where riverine gallery forest, deciduous bushland and thickets and coastal mosaic vegetation are farmed by Eastern Cushitic and Bantu-speaking peoples; and
(5) the semi-desert grasslands, bushland and thickets of the hot Red Sea, Gulf of Aden and Indian Ocean beaches, dunes and coastal plains, where Cushitic-speaking peoples engage in pastoral nomadism and maritime-based economies.

Although some of the earliest recorded collections of African MSA and LSA artifacts were made in the Horn (e.g. Revoil 1882), it was not until 1929 that the first systematic excavation of a Stone Age site, Porc Epic cave in eastern Ethiopia, was attempted (Tielhard de Chardin 1930). This was followed five years later by the first documented prehistoric archaeological excavation in Somalia, the MSA/LSA site of Gogoshiis Qabe at Buur Heybe (Graziosi 1940).[3]

During the early 1940s, Stone Age research in the Horn was carried out chiefly by British military personnel, including J. D. Clark who documented numerous surface occurrences and excavated a series of stratified MSA/LSA rockshelters and open-air sites in Ethiopia and Somalia. Amalgamating his data with that of previous researchers, Clark (1954) published *The Prehistoric Cultures of the Horn of Africa*, the first (and still the only) major attempt to

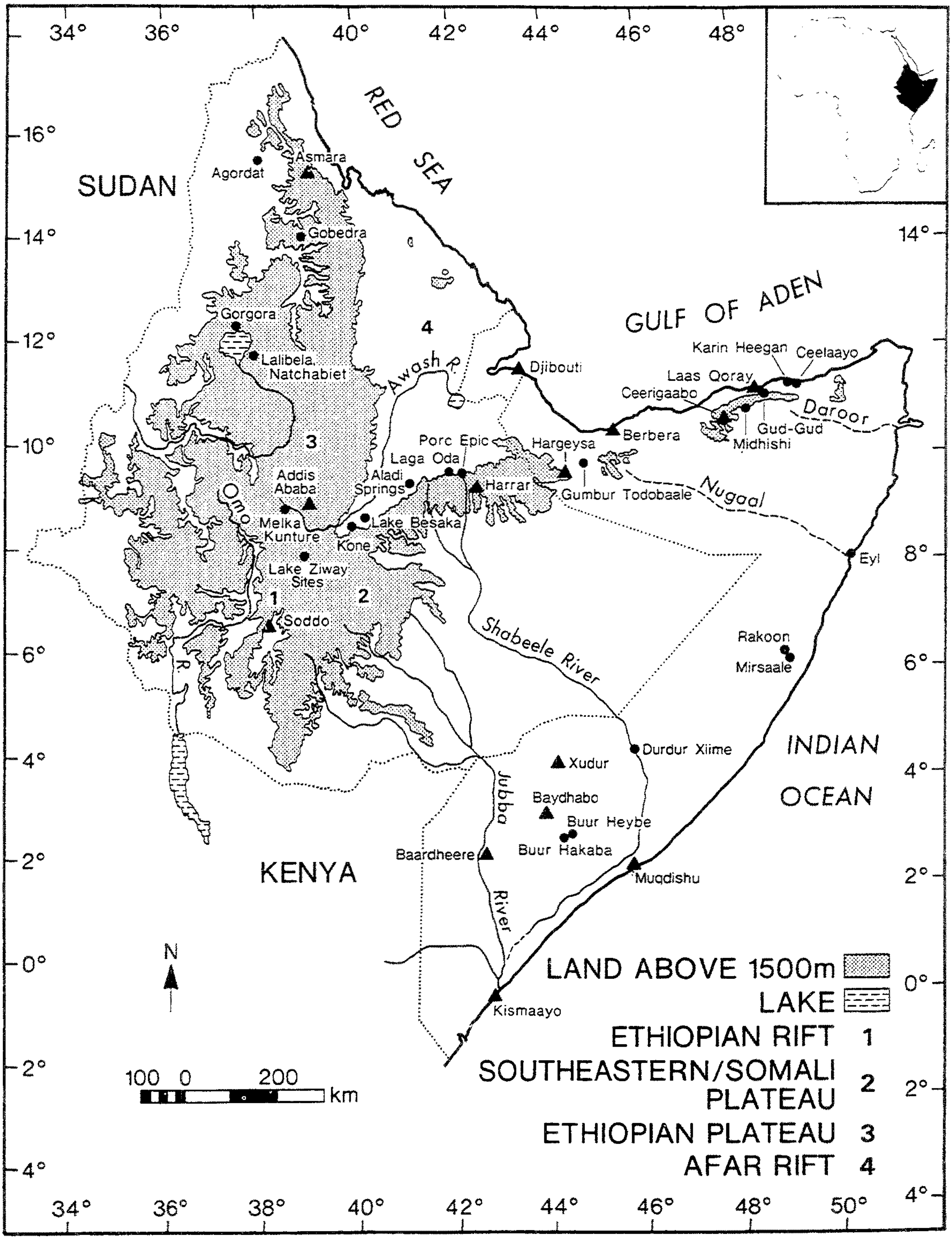


Figure 1 Map of the Horn of Africa showing archaeological sites (circles) and major towns (triangles).

develop a broad culture-historical/climatological sequence for the Horn. Clark recognized three major MSA 'culture complexes' ('Acheulio-Levalloisian', 'Levalloisian' and 'Stillbay') and four LSA complexes ('Magosian', 'Hargeisan', 'Doian' and 'Wilton'), largely from the analyses of small, often selected artifact samples collected on the surface or from stratified (but usually secondary-context) sites eroding out of valley-fill sediments, pans and banks of rivers and wadis. Several cave, rockshelter and open-air sites were also excavated. Their occupations were subsequently tied into the East African pluvial/interpluvial sequence (Leakey 1931), with the MSA complexes considered to be of late Upper Pleistocene age while the LSA industries dated to the terminal Pleistocene and/or Holocene (Fig. 2).

Relatively little Stone Age research in the Horn was conducted during the 1950s and 1960s. Graziosi returned to southern and northern Somalia in 1953 to excavate four LSA caves and rockshelters (Graziosi 1954), and again in 1958 to excavate two more LSA caves in northeastern Somalia (P. Graziosi pers. comm.). In 1963 the first of two decades of fieldwork was begun at Melka Kunture along the Awash River in central Ethiopia (Bailloud 1965; Chavaillon *et al.* 1979). Although perhaps better known for its Lower and Middle Pleistocene localities, Melka Kunture has also yielded a suite of MSA and LSA sites (Hours 1976; Hivernel-Guerre 1976).

The pace of Ethiopian archaeological research quickened considerably in the 1970s. The C.N.R.S. Fourth International Mission to the Afar located a series of LSA sites associated with high early Holocene lake levels (Roubet 1971), and following the 1971 Pan-African Congress of Prehistory and Quaternary Studies held in Addis Ababa, a number of multi-disciplinary research projects concerned with Late Quaternary prehistory were formulated. In 1971 the Combined Prehistoric Expedition to the Central Rift Valley of Ethiopia first explored the Lake Tana area, but finding only surface occurrences disturbed by cultivation moved their base of operations to the Ethiopian Rift in the vicinity of Lake Ziway (Wendorf and Schild 1974). Numerous prehistoric sites were discovered and several MSA and LSA occurrences were excavated in 1971, 1972 and 1973 (Gallagher 1973, 1977; Humphreys 1978; Wendorf 1974).

In 1974 D. W. Phillipson (1977b) conducted the first excavation of a LSA site in northern Ethiopia since the Second World War, and that same year the first of a series of interdisciplinary projects under the direction of J. D. Clark and M. A. J. Williams was intitiated, resulting in the discovery and subsequent test-excavation of a number of stratified MSA and LSA sites in the southern Afar Rift. The following year Clark and his team returned to Ethiopia to undertake, amongst other investigations, more intensive MSA/LSA research in the Southern Afar (Clark and Williams 1978). This was followed up by additional site-specific research carried out by Clark's graduate students (Brandt 1980, 1982; Clark and Williamson 1984; Kurashina 1978). In the Ethiopian Rift, LSA sites were located in the lower Omo Valley (Brown 1975; Butzer *et al.* 1969; Chavaillon and Boisaubert 1977), while further north fieldwork resulted in the discovery of open-air MSA and LSA sites south of Arba-Minch, near Soddo and around Lake Ziway (Chavaillon and Boisaubert 1977; Gasse and Street 1978; Joussaume *et al.* 1982; Jeschofnig and Humphreys 1976). Since 1982 archaeological research in Ethiopia has been temporarily suspended in anticipation of new antiquities laws.

Compared with Ethiopia, the last two decades have seen a virtual dearth of Stone Age research in Djibouti and Somalia (Mussi 1974). In the 1970s C. Thibaut excavated early Holocene LSA sites in the southern part of Djibouti, but tragically died in 1980 before his

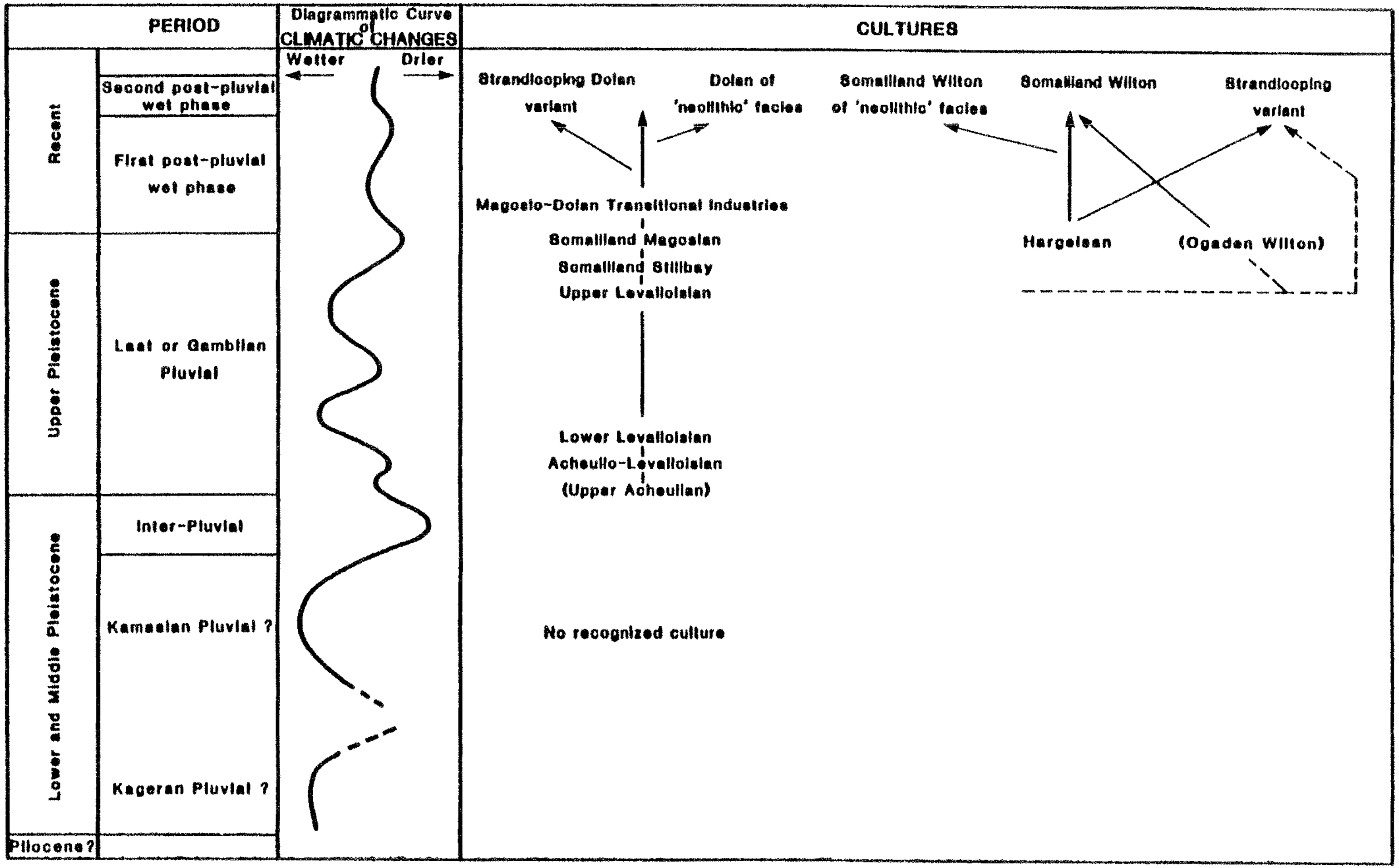


Figure 2 Climates and cultural stages in the Horn (after Clark 1954).

work could be published (Ferry 1981; M. Mussi pers. comm.). Stone Age research is presently being carried out in Djibouti by J. Chavaillon (pers. comm.) and others.

In 1981 an Italian geological team reported the discovery of LSA open-air sites near Eyl[4] on the northern Indian Ocean coast of Somalia (M. Coltorti pers. comm.) and in 1982 the first prehistoric archaeological excavation in Somalia in almost twenty-five years was undertaken when a rapid survey of selected regions of northeastern Somalia resulted in the discovery and excavation of two MSA/LSA caves (Brandt and Brook 1984; Brandt *et al.* 1984). That same year another quick survey of northeastern Somalia was performed by S. Jönsson (1983), while M. Mussi (1982, 1984) conducted a preliminary survey of Stone Age sites in the upper Juba Valley and the southern Somali coast from Kismayu to the Kenya border. In 1983 the first season of the joint Somali Academy of Sciences/University of Georgia Buur Ecological and Archaeological Project was begun when a deeply stratified MSA/LSA rockshelter at Buur Heybe was excavated. This was followed by a second major field season in 1985 when three MSA/LSA rockshelters were excavated and a systematic site survey initiated (Brandt in prep.).

Although the preceding survey is not an exhaustive account of all MSA and LSA research in the Horn, most of the major projects concerned with the MSA and pre-food-production LSA have been mentioned. Thus, in spite of recent advances in our data base, vast areas still remain virtually unexplored archaeologically and/or are dependent upon the culture-history and relative chronology first put forward by J. D. Clark more than thirty years ago.

Middle Stone Age culture-history and chronology

MSA origins

Data relevant to understanding the origins of the MSA in the Horn are very limited. The 'Acheulio-Levalloisian', the earliest of the three MSA complexes defined by Clark (1954), was based essentially upon surface occurrences from northwestern Somalia, the Ogaden, Djibouti and the Ethiopian Plateaux ('Abyssinian Fauresmith'), and was characterized by handaxes, cleavers and other tools made by Levallois and non-Levallois flaking techniques. Although the 'Acheulio-Levalloisian' is now considered to be a later phase of the Acheulian technocomplex (Clark 1972:xxvii), two recently excavated localities provide some evidence for the development of MSA traditions from later Acheulian industries. At Gademotta in the Lake Ziway area of East-Central Ethiopia, sediments containing 'Final Acheulian' tools have been argued comformably to overlie MSA-bearing deposits dated by K/Ar to >180,000 yr (Wendorf and Schild 1974, but see below for a further discussion of the age of this site), while the presence of 'Stillbay' and other small bifacial points in the most recent level at the Final Acheulian site of Garba III at Melka Kunture 'could mark the transition from Final Acheulian to the Middle Stone Age' (Chavaillon *et al.* 1979:104). An accurate age for the end of the Acheulian in the Horn remains to be determined, but Acheulian handaxes have been recovered in Djibouti from sediments Th/U dated to *ca* 200,000 yr (Roubet 1969).

The 'Levalloisian' complex, which according to Clark (1954) superceded the Acheulio-Levalloisian and was widely distributed throughout the Horn, was divided into two temporal phases: A 'Lower Levalloisian', characterized by Levallois and disc cores, facetted flakes, core-scrapers, handaxes and rare points and scrapers, and an 'Upper Levalloisian' with its generally smaller, more carefully prepared facetted flakes and a wider range of shaped tools including unifacial and bifacial points (Clark 1954). While the actual name 'Levalloisian' is no longer a valid taxonomic term, Clark (1982) still implicitly employs both phases of this complex to characterize the early MSA of Somalia. However, it needs to be emphasized that although more than 75 'Levalloisian' sites were known, all were recognized on the basis of very small non-random surface collections (Clark 1972:xxvii). It is not surprising therefore, that recent excavators have failed to recognize this inadequately defined complex.

The 'Stillbay' question

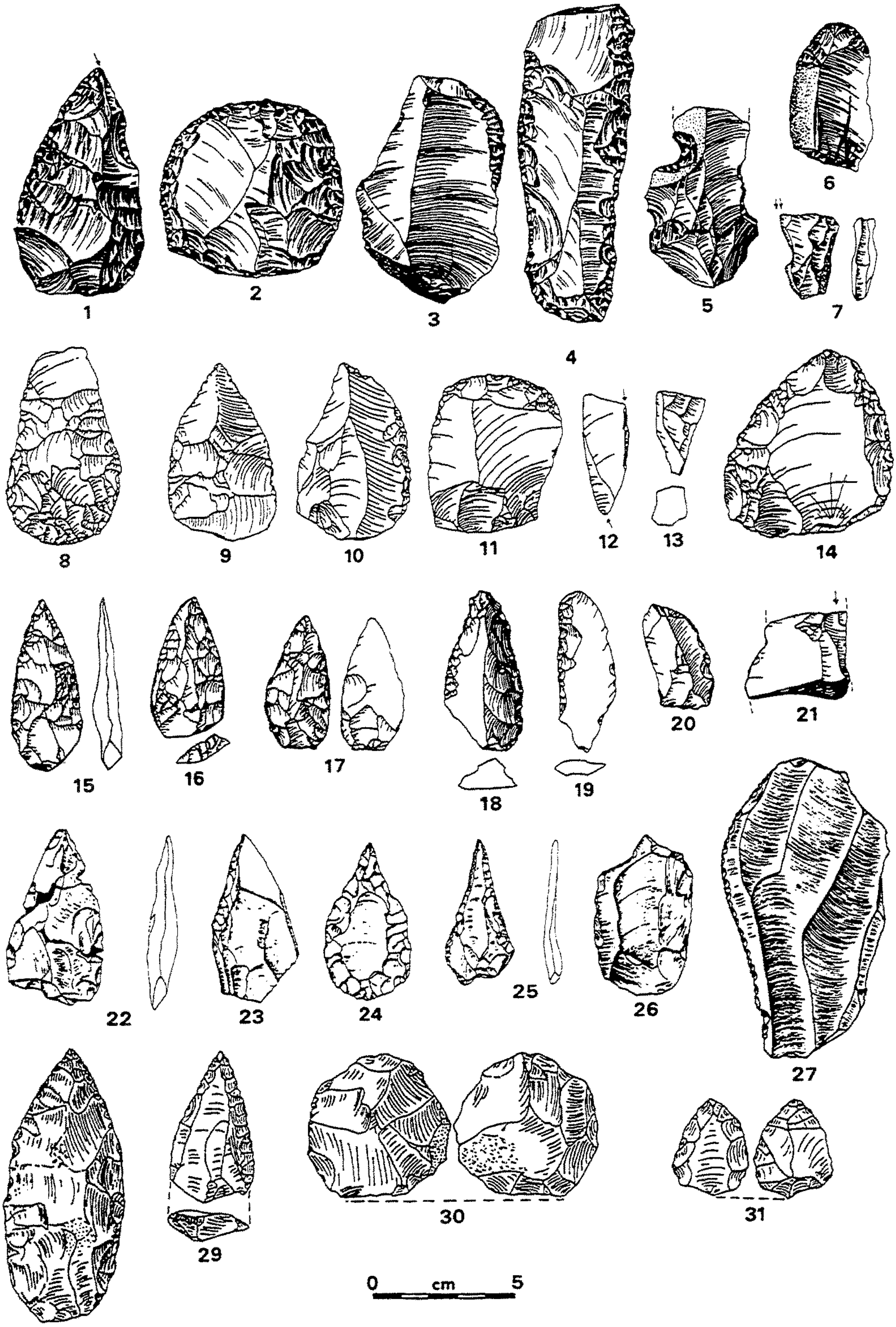
The 'Somaliland Stillbay', Clark's latest and most widespread MSA complex, was based upon prepared core technology and characterized by high frequencies of scrapers, points and backed flakes, by rare burins, as well as by the absence of certain 'Levalloisian' tools such as flakes with thinned butts. It was further divided into temporal phases on the basis of a reduction in the frequency of points and an increase in backed flakes (Clark 1954). Over 60 'Stillbay' sites were discovered, but most descriptions were based on artifacts selectively collected from surface occurrences or exposed stratigraphic sections (Fig. 3:28–31). Only three MSA assemblages were recovered by excavation, including Gogoshiis Qabe rockshelter at Buur Heybe in southern Somalia, where Graziosi (1940) uncovered a very small sample of 'Stillbay' implements from the lowest excavated levels (Fig. 5:1–4), and Porc Epic cave in eastern Ethiopia, which yielded from its lowest levels a small sample of 'Final Stillbay' tools (Breuil *et al.* 1951). The site with the longest and most detailed sequence however was Gorgora rockshelter, located north of Lake Tana on the Ethiopian Plateau.

Excavated to a depth of 3.7 m (Moysey 1943), the lower 2.8 m of deposit contained assemblages characterized by unifacial and bifacial chert points and was divided by L. S. B. Leakey (1943) into a three-phase 'Stillbay' industry. Although Clark (1982:278), drawing upon Leakey's findings, continues to acknowledge 'three stages of a well-developed Middle Stone Age' at Gorgora, these temporal divisions are based upon very small tool samples recovered from nine lithostratigraphically arbitrary 30-cm thick levels. The 'Lower Stillbay', for example, was represented by only 27 points, 1 end scraper and 1 burin; while the 'Middle Stillbay' levels contained 83 tools including 78 points, 4 backed blades and 1 end scraper. The 'Upper Stillbay' phase was represented by a total of 39 shaped tools: 32 points, 3 backed blades, 2 burins and 2 scrapers. Furthermore, the unusually high frequency of points strongly suggests selective sampling.

Since the 1950s only five or six MSA sites have been excavated. Although they provide new data for evaluating MSA spatial and temporal variability in the Horn, they also raise new questions and issues.

Lake Ziway

In 1971 MSA sites were discovered on the slopes of volcanic hills overlooking Lake Ziway in the Ethiopian Rift of east-central Ethiopia (Wendorf and Schild 1974). Three MSA sites from the Kulkuletti area and four from Gademotta were subsequently investigated in 1972 and found to lie stratigraphically within palaeosols over and underlain by reworked volcaniclastic sediments, colluvial deposits and thin ash beds (*ibid.*; Wendorf *et al.* 1975).


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
0 cm 5

Over 47,000 flaked stone artifacts from the seven MSA sites at Gademotta and Kulkuletti were analysed using a typology modified from Bordes (1961). The assemblages are characterized by bifacial and unifacial points, side and convergent scrapers, notched and denticulated pieces and rare burins, end scrapers and backed blades (Fig. 3:1–7). Although there was some indication of an increase over time in the frequency of 'Upper Palaeolithic-type' tools at the expense of bifacial points, few temporal trends could be discerned. The entire sequence was therefore classified as 'Stillbay' (Wendorf and Schild 1974:158; Wendorf *et al.* 1975).

Samples of two Upper Member pyroclastic ashfalls considered to form distinctive and widespread stratigraphic markers were obtained from a gully at Kulkuletti and K/Ar dated to 0.181 ± 0.006 myr (UAKA-73-131) for the lower ashfall and 0.149 ± 0.013 myr (UAKA-73-132) for the upper one (Albritton 1974). By correlating these dated ashfalls with the stratigraphic sequence at Gademotta, about 2 km southwest of Kulkuletti, Wendorf *et al.* (1975) have argued that the MSA sites range from greater than *ca* 181,000 to younger than 149,000 years in age. Although Albritton (1974:55) points out the need for the K/Ar dates 'to be confirmed by additional analyses', to my knowledge this has not been done. Furthermore, given the complexities of the stratigraphic sequence (Gasse *et al.* 1980; Laury and Albritton 1975), the absence of additional K/Ar determinations (in particular from the Gademotta ashfalls), methodological difficulties in dating young K/Ar samples (Dalrymple 1969) and the need for more detailed information on the specific K/Ar procedures carried out, the Kulkuletti dates should be considered unconfirmed pending further research.[5] Nevertheless, there is no *a priori* reason why the Ethiopian MSA could not have such an antiquity, especially in light of the increasing evidence elsewhere in sub-Saharan Africa for MSA sites of pre-last interglacial age (e.g. Clark 1982; Volman 1984).

Melka Kunture

Situated 50 km south of Addis Ababa on the banks of the Awash River is the site complex of Melka Kunture. It is here, at an altitude of over 2400 m, that a series of MSA sites characterized by 'Stillbay'-like obsidian bifacial and part-bifacial points, end and side scrapers, backed blades and other tools made from Levallois and blade cores, have been found eroding from alluvial sediments and tuffs of Upper Pleistocene age (Chavaillon *et al.* 1979; Hours 1976). Although the assemblages from the stratified site of Garba III were once considered to be MSA in character and to display a reduction in the size and frequency of

Figure 3 Middle Stone Age artifacts. 1–7. from Lake Ziway, Ethiopia (after Wendorf and Schild 1974): 1. part-bifacial point (ETH-72-1); 2, 6. end scrapers (ETH-72–1); 3, 4. side scrapers (ETH-72–1); 5. notched piece (ETH-72-1); 7. double bec-burin (ETH-72–6). 8–14. from K'one, Ethiopia, Locality 5 Extension (after Kurashina 1978): 8. bifacial point; 9. unifacial point; 10. single side scraper; 11. end scraper; 12. burin on break; 13. single platform core; 14. Levallois core. 15–21. from Porc Epic, Ethiopia (after Clark and Williamson 1984): 15. bifacial point; 16. unifacial point; 17. part-bifacial point; 18. convergent scraper; 19. inverse side scraper; 20. backed flake; 21. angle burin on break. 22–27. from Midhishi 2, Somalia (after Gresham 1984): 22, 24. bifacial points; 23. distally retouched point; 25. unifacial point; 26. bec and end/side scraper; 27. side scraper. 28–31. from Hargeysa, Somalia (after Clark 1954): 28–29. unifacial points; 30. unstruck disc core; 31. Levallois core.

bifacial tools over time (Hours 1976), it is now regarded as a Final Acheulian site dating to the late Middle Pleistocene (Chavaillon 1980; Chavaillon *et al.* 1979). Except for a short report on the source of obsidian artifacts from the MSA site of Wofi II (Muir and Hivernel 1976), further details of the other MSA sites and assemblages have yet to be published. However, it should be noted that the MSA sites at Melka Kunture have been described as restricted to surface occurrences (Chavaillon *et al.* 1979); they may therefore be of limited value.

Porc Epic

The presently dry cave of Porc Epic is situated near the top of a high limestone ridge 140 m above a wadi floor, and commands a striking view of the city of Dire Dawa and the Afar Rift. The site was first test excavated in 1929 (Tielhard de Chardin 1930) and again in 1933 (Breuil *et al.* 1951), resulting in the discovery of a MSA 'Stillbay' industry overlain by 'Magosian'. The site was re-excavated in 1974 when a 6 m^2 trench was excavated to bedrock by a team led by J. D. Clark (Clark and Williams 1978). Further excavations by K. D. Williamson were undertaken in 1975, but it has not yet been possible to complete analysis of the 1975 material (Clark and Williamson 1984).

The site has been shown to have a complex depositional history that can be summarized as follows: the earliest MSA deposits are found in the middle of a >2-m layer of calcareous clay containing angular rubble and a wedge of sand indicative of stream activity. This is overlain by about 1.5 m of a massive vesicular calcareous breccia incorporating the bulk of the MSA artifacts and fossilized faunal remains. Three flow-stone horizons toward the south wall of the cave were deposited above the breccia, only the lowest of which contained MSA artifacts and fossil bone. Sometime after cementation of the MSA-bearing deposits, a massive dripstone deposit devoid of artifacts or bone then sealed the breccia, and it is presumed that the cave was abandoned by this time due to excessive moisture. As much as 1 m of breccia near the cave entrance was subsequently eroded away by stream activity and filled in by later deposits of brown sandy loam containing LSA/Neolithic stone artifacts, bone, carbonized plant remains, pottery and charcoal (*ibid.*).

The 1974 excavation unearthed 5146 MSA artifacts from the breccia, the vast majority of which were made from chert and obsidian. Shaped tools were dominated by bifacial, parti-bifacial and unifacial points (38%—the highest frequency for any analyszed primary-context MSA site in the Horn), followed by scrapers (30%), burins (11%) and other miscellaneous retouched tools (Fig. 3:15–21). Although the 1929 and 1933 MSA assemblages were classified as 'Stillbay' (Breuil *et al.* 1951), the 1974 sample was simply designated 'MSA' (Clark 1982; Clark and Williams 1978; Clark and Williamson 1984).

Chronometric dating of the deposits has been problematic. A sample of the dripstone sealing the main artifact-bearing breccia was dated by ^{14}C and Th/U methods to *ca* 4590 ± 60 bp (Pta-2600) and 6270 ± 1020 yr (U-111) respectively, indicating that formation of part of the dripstone occurred appreciably later than MSA occupation of the cave. A few small flecks of charcoal recovered from the upper levels of the main breccia deposit produced an anomalously young date of 5700 ± 110 bp (I-7971). However, recent obsidian hydration dating of three artifacts has indicated ages of *ca* 77,565, 61,640 and 61,202 yr (Michels and

Marean 1984). To obtain these dates, unprovenanced obsidian artifacts from the 1933 excavations were selected from a small collection held at the Field Museum in Chicago. (The 1974 and 1975 collections were unavailable for study.) Although the selected artifacts are said to be typologically characteristic of the MSA, it is not known from what depth they were originally recovered. Furthermore, to obtain an accurate hydration date it is necessary to know the site's average air temperature since the time of artifact manufacture (*ibid.*). Since the MSA levels probably span tens of thousands of years, estimating prehistoric temperatures is very difficult: they could have been warmer than present during portions of the Last Interglacial and colder during the Last Glacial (Gasse *et al.* 1980; Lorius *et al.* 1985).

Michels and Marean (1984:68) used the modern monthly mean air temperature of Dire Dawa to calculate Porc Epic obsidian hydration rates, and they point out that the ages cited above are minimum estimates only: 'Glacial periods with subsequent lowering of temperature will, therefore, slow the rate of hydration. . . . Preliminary calculations would put the true age of the specimens 20,000 years earlier than the dates listed above.' Adding 20,000 years to the initial dates, however, would put the obsidian specimens firmly in the warmer, more humid last interglacial (Gasse *et al.* 1980). On the other hand, if higher mean air temperatures had been used in the initial hydration calculations, the results would undoubtedly have been different.

Although Clark and Williamson (1984:63) assert 'the time of (MSA) occupation seems to have coincided with a relatively dry and cooler climate than that of the present day . . .', it would appear that secure dating and palaeoenvironmental interpretation of the MSA deposits at Porc Epic must await further investigations.

K'one

The K'one (formerly Garibaldi) Crater complex is located in the southern Afar Rift approximately 150 km east of Addis Ababa and is composed of eight volcanic calderas of Quaternary age. Caldera 5 was surveyed in 1974 and 1975 by a team led by J. D. Clark, resulting in the discovery of MSA and LSA sites (Clark and Williams 1978). The sites are found in three erosion areas (A, B and C) across the caldera floor. While only surface occurrences eroding from the nearby slopes could be located in Area B, five sites from Area A and one from Area C were excavated (*ibid.*; Kurashina 1978). Flaked stone artifacts unearthed at all the sites from thin, often one-artifact thick, occupation horizons, were made of pitchstone or obsidian most probably obtained from hillside flows within 500 m of the adjacent caldera floor. Localities 1, 4 and 6 in Area A and the Area C East site were all investigated by means of small test trenches no larger than 2 m^2, yielding samples ranging from 433 to 1217 artifacts. At Area A, Locality 5, however, a 6-m^2 trench yielded almost 4000 flaked stone artifacts, while 20 m to the west a 15-m^2 trench, designated Locality 5 Extension, yielded over 37,000 artifacts (*ibid.*).

Over 11 m of sediment are exposed in some geological sections, including alternating dark crackling swamp clays (termed Upper, Middle and Lower Vertisols) and brown sandy loams (the Upper and Lower Loams). The fine-grained vertisols were probably deposited under marshy conditions during periods of increased rainfall, and the loams during drier periods (Clark and Williams 1978; Kurashina 1978:317). All excavated sites lie at the interface between two main strata. The earliest sites are found in the uppermost levels of the Lower Vertisol in Areas A and C, while the latest (Locality 4) lies just below the Middle Vertisol in the Lower Loam (Kurashina 1978) (Fig. 4).

A detailed technological analysis of the stone artifacts from these as well as other K'one sites was conducted by H. Kurashina (*ibid.*). Locality 5 Extension, with its large sample size, is certainly the most informative. Over half of the shaped tools, which comprise only 0.5% of all artifacts, are notched, denticulated and other scrapers, while other shaped tools include backed flakes and truncations, burins, awls and bifacial and unifacial points (*ibid.*:323–49) (Fig. 3:8–14). Of particular interest were fourteen cores with one or more conjoinable flakes. No mention is made of diachronic change in the K'one assemblages. Other than the presence of points and Levallois cores, there are apparently no resemblances to the 'Stillbay' industries of the Horn and East Africa. In fact, Kurashina (*ibid.*) suggests that the presence of Nubian cores (Marks 1968), as yet unknown from other sub-Saharan MSA sites, makes the Kóne assemblages more comparable to the Nubian Mousterian than to the 'Stillbay'. However, the value of such comparisons, as Kurashina points out, remains questionable since the 'Stillbay' as a taxonomic unit is so inadequately defined.

Unfortunately radiometrically datable material from K'one was sparse. Only two radiocarbon determinations of 14,670 ± 200 bp (I-8322) on ostrich eggshell and 6810 ± 120 bp (SUA-462) on soil carbonates (which probably suffered post-depositional alteration), were obtained from the highest levels of the Upper Loam (Williams *et al.* 1977). Assuming the single ostrich eggshell date is accurate, the Upper Loam would appear to date to the Late/

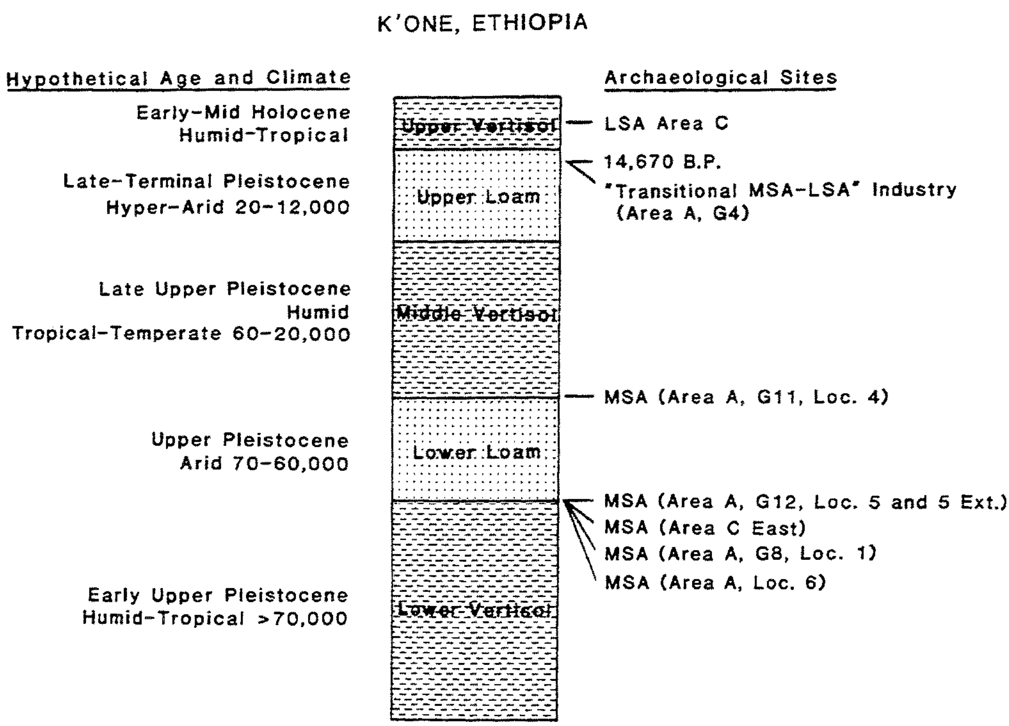


Figure 4 Idealized section at K'one showing location of sites in relation to strata, with hypothetical ages and climates. Site and stratigraphic data from Kurashina (1978) and from Clark and Williams (1978).

Terminal Pleistocene, while the Upper Vertisol, which extends to the surface, is of Holocene age. Since there are neither well defined cut-and-fill features nor obvious unconformities in the stratigraphic sequence (Kurashina 1978:317), a hypothetical chronological sequence can be constructed (Fig. 4) in which the Middle Vertisol dates to the more humid palaeoenvironments of the Late Upper Pleistocene *ca* 60–20,000 years ago, the Lower Loam to the drier Upper Pleistocene of *ca* 70–60,000, and the Lower Vertisol to the early Upper Pleistocene (>70,000 yr) when more humid conditions prevailed (Gasse *et al.* 1980; Van Campo *et al.* 1983). On this basis, MSA occupation at K'one could be more than 60,000 years old although further research and chronometric dates will be needed to test this hypothesis.

Midhishi 2

In 1982 an archaeological and geomorphological reconnaissance of northeastern Somalia resulted in the discovery of fourteen caves in Midhishi Tog, a spring-fed wadi system several kilometres long in the limestone foothills northeast of Ceerigaabo (Brandt and Brook 1984; Brandt, Brook and Gresham 1984; Gresham 1984). Six of the caves were found to contain MSA and/or LSA artifacts on the floor or apron, but time only permitted the test excavation of the most promising site.

Midhishi 2 is one of three adjacent caves located on the steep northern side of the tog, about 9 m above the valley floor. The cave is round and small, 9 m wide, 14 m deep and 8 m high with about 35 m^2 of surface floor space. During the ten days of fieldwork, breccia samples from a 1-m square outside the cave were collected and four contiguous 2-m^2 trenches excavated to a maximum depth of *ca* 0.7 m before encountering bedrock or an artifact-bearing breccia. Seven lithostratigraphic units of silts and rockfall were exposed, revealing a complex depositional history of periodic brecciation, re-solution, cementation, erosion and sedimentation. MSA artifacts and bone were essentially confined to the four deepest units. A radiocarbon date of >40,000 bp (UW-761) on charcoal from the uppermost MSA unit provides a minimum age for the MSA deposits and also indicates a very slow rate of deposition and/or erosion.

The 2950 artifacts recovered from the MSA levels, virtually all of which are made of chert, have been subjected to detailed typological and technological analyses by T. Gresham (1984). Many of the shaped tools, which represent 4% of the stone artifacts, were made from Levallois points and flakes (Fig. 3:22–27). Scrapers form over half of all shaped tools and are dominated by side, convergent and denticulated/notched types. Points represent 22% of the shaped tools, excluding Levallois points which were classed as specialized flakes. Also represented, but in low frequencies, are burins, awls, backed and truncated pieces. Although similarities with the Porc Epic material were recognized, specific taxonomic assessment of the MSA artifacts from Midhishi was not attempted due to the small sample size and difficulties in adequately defining comparative taxa.

Gud-Gud

The site of Gud-Gud is a large cave situated about 350 m above sea level in the coastal limestone foothills of northeastern Somalia south of Laas Qoray. Initially discovered in 1980 (Brandt 1981), the cave is about 50 m above a seasonal watercourse with permanent pools and is 25 m deep, 15 m wide and 9 m high at its mouth. Gud-Gud was further investigated in 1982 when a 3-m^2 test trench was excavated to bedrock *ca* 2 m below surface (Brandt and Brook 1984; Brandt, Brook and Gresham 1984). Although the upper 1.4 m of deposit were devoid of artifacts, below this was a diffuse occupation horizon containing a small sample of flaked chert artifacts, charcoal and unidentifiable bone fragments. Charcoal from the upper levels has been dated to >40,000 bp (UW-762). Although the artifact sample of less than 50 specimens is too small for taxonomic classification, it includes one end scraper, a burin, a blade core fragment and a few flakes and blades, none of which show signs of prepared core preparation or any other MSA characteristic (Fig. 5:16–19).

In summary, the MSA of the Horn still remains poorly defined and documented both chronologically and taxonomically. Attempts to compare the few MSA assemblages for which there is quantitative typological data suffer from the lack of standardized typologies, generally small sample sizes and other difficulties. Nevertheless, an overall similarity in the MSA assemblages of Ethiopia has been postulated (Clark and Williamson 1984), while the MSA asemblages of the Horn appear to be typologically more similar to one another than they are to other sub-Saharan African sites (Gresham 1984).

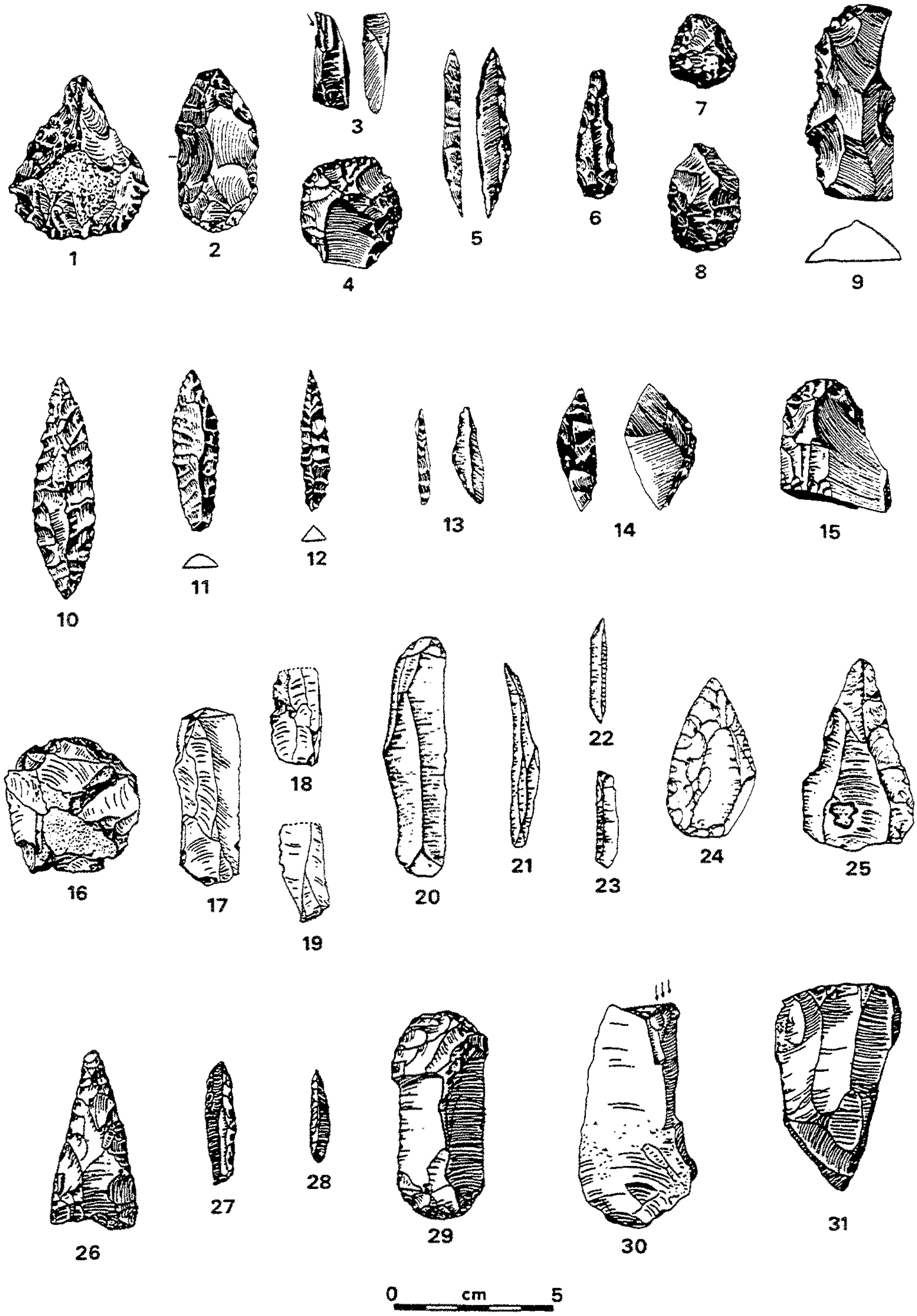
Major diachronic changes in MSA assemblages have yet to be demonstrated, although admittedly few quantitative studies have been attempted. The Lake Ziway sites are postulated to show very little change over time, even though 'the sequence of settlements near Lake Ziway possibly represents the whole time of development, or most of it, of the so-called Stillbay culture' (Wendorf and Schild 1974:154). Furthermore, Clark and Williamson (1984:59) have suggested that 'from beginning to end of the Middle Stone Age industry at Porc Epic there is no major shift in end-products or techniques', and that 'the closest resemblance to Porc Epic is the 8B site at Gademotta' (*ibid.*:60). If the K/Ar and obsidian hydration dates from these sites are substantiated, this would indicate little technological/ typological change in the MSA for almost 100,000 years. Consequently, the recent suggestion that the MSA of Somalia can be divided on stratigraphic grounds into three stages, the latest of which is what used to be called the 'Somaliland Stillbay' (Clark 1982), should be considered tentative until further research is undertaken.

Middle Stone Age adaptations

Palaeoenvironments and subsistence

What evidence there is for palaeoenvironments of the early Upper Pleistocene (*ca* 115–70,000 years ago) suggests that the Horn's climate was generally warm and humid. Relict spring

Figure 5 Middle and Later Stone Age artifacts. 1–4. 'Stillbay', 5–9. 'Magosian' and 10–15. 'Eibian', all from Gogoshiis Qabe, Somalia (after Graziosi 1940): 1–2. bifacial points; 3. angle burin; 4. end scraper; 5. backed blade; 6. unifacial point; 7–8. bifacial points; 9. side scraper; 10. bifacial lanceolate point; 11. unifacial point; 12. trihedral rod or point; 13–14. microliths; 15. end scraper; 16–19. from Gud-Gud, Somalia: 16. end scraper; 17–19. blades. 20–25. MSA/LSA from Midhishi 2, Somalia (after Gresham 1984): 20. end scraper; 21–23. backed blades; 24. unifacial point; 25. Levallois point core. 26–31. 'Hargeisan' from Hargeysa, Somalia (after Clark 1954): 26. hollow-based bifacial point; 27. double-backed blade; 28. backed blade with basal retouch on opposite edge; 29. double end scraper; 30. angle burin; 31. blade core.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
0 cm 5

tufa deposits in northern Somalia are Th/U dated to *ca* 116,000 yr at one locality and 79,000 yr at another, indicating increased and more evenly distributed precipitation patterns at these times (Isotopic Stages 5e and 5a) (Brandt and Brook 1984; Brandt *et al.* 1984). Oxygen isotope and terrestrial pollen records obtained from cores off the Gulf of Aden also indicate warm and humid conditions in the northern Horn, although the interglacial climate was punctuated by cooler conditions *ca* 115,000–105,000 years ago (Isotopic Stage 5d) (Van Campo *et al.* 1982). Increased highland river and local stream runoff into the Asal and Abhe basins of the Afar Rift resulted in high lake levels and the evolution of tropical diatom assemblages (Gasse *et al.* 1980), while much of what is now Djibouti was submerged by an interglacial Red Sea (Gasse and Rognon 1973).

During the initial stages of the Last Glacial (Isotopic Stage 4: ~72–58,000 yr) a major arid phase occurred. The Afar lake basins were considerably reduced in size and may even have dried up (Gasse *et al.* 1980), while littoral and terrestrial pollen taxa from the Gulf of Aden cores reveal a major decrease in the frequency of humid tropical species (Van Campo *et al.* 1982). However, by *ca* 60,000 yr the Afar and Ethiopian lakes were once again rising. Lake levels remained as high or higher than present from *ca* 58,000 to 31,000 years ago when diatom and pollen evidence suggests the climate was once again tropical and humid (Gasse and Street 1978; Gasse *et al.* 1980).

How MSA populations may have adapted to fluctuations in resource availability resulting from Upper Pleistocene climatic changes remains virtually unknown. Changes in material culture can as yet contribute nothing towards answering this question until MSA culture-historical units are more precisely defined and dated. Likewise, the evidence for MSA subsistence is extremely meagre, being essentially restricted to preliminary accounts of the only two sites yielding faunal remains: Porc Epic and Midhishi. Most of the faunal remains from the 1974 excavations at Porc Epic were highly comminuted and burnt, making identification difficult. Rare cranial and dental fragments included bushbuck, duiker, pig and zebra. Although no identifiable post-cranial remains were recovered in 1974, the larger 1975 excavations yielded considerably more identifiable specimens and should provide additional information once they are analysed (Clark and Williamson 1984).

The analysis of the faunal sample from Midhishi 2 has yet to be completed. It includes cranial, dental and post-cranial remains, many of which are burnt. Small to large bovids have been identified as well as a small equid (?Somali wild ass: H. T. Bunn pers. comm.). A number of unmodified ostrich eggshell fragments most likely represent food refuse and/or containers. Terrestrial snail shells were also unearthed from the MSA levels, but there is no evidence of damage or burning of the shells to suggest that these molluscs were being processed for food (A. Gautier, pers. comm.).

Although faunal remains were not present at the Lake Ziway MSA sites, a 'typical late Pleistocene fauna' (Wendorf *et al.* 1975:740) consisting of a hippopotamus molar, an equid tibia, jaw and dental fragments of large to small antelopes and numerous unidentifiable postcranial remains was collected from the Gademotta area in fluvial/colluvial wadi deposits near the base of the Upper Member of the Gademotta Formation (Gautier 1974). It has been suggested that these mammal remains can tentatively be correlated with the earliest MSA site at Gademotta (Wendorf and Schild 1974) and that they represent the MSA hunters' prey (Gautier 1974). However, since these bones were found in secondary context in channel fill, are not associated with archaeological remains and suffer from various depositional and post-depositional processes, including possible scavenging (*ibid.*), they should not be used as evidence for MSA subsistence activities. Furthermore, as is obvious from the preceeding discussion, describing a faunal assemblage as 'typical Late Pleistocene' serves little purpose as the only statement that can be made about Upper Pleistocene fauna of the Horn is that there is as yet no evidence of extinct species. Finally, questions of taphonomy and carnivory (e.g. Brain 1981; Gifford 1981) will have to be taken into consideration when drawing conclusions from the Midhishi and Porc Epic faunal assemblages.

No botanical remains have been reported from MSA sites. The only possible MSA grindstone, from Porc Epic, is a sub-rectangular limestone fragment with one very smoothed face and a burnt, reddish discoloration (Clark and Williamson 1984). It has been suggested that this fragment was used to process pigments, as the pigments in the MSA deposits show evidence of abrasion and striations indicative of rubbing (*ibid.*). However, pigment stains are not present on the fragment.

Site function and seasonality

It is remarkable how many of these small MSA excavations have been considered to provide data for determining site function. Virtually all the K'one sites, with their low frequencies of shaped tools and thin occupation deposits, have been suggested to be either flaking workshops or dumps where flaking debris were carried in containers or swept from the (as yet undiscovered) occupation floors (Kurashina 1978:359). I would argue however that the only K'one site with an excavated area large enough to provide some spatial information is Locality 5 Extension. Here Kurashina (*ibid.*: 359) has recognized from a thin horizon two or three high-density patches of flaked stone artifacts indicative of 'more prolonged or intense stone knapping activity perhaps involving several individuals'.

At Kulkuletti near Lake Ziway the high density of flaked stone artifacts at site ETH-72-1, the small clusters or piles of unmodified waste and the relatively high percentage of retouched tools (1.4%) indicated to Wendorf and Schild (1974:149–50) that the site served the dual purpose of a workshop and living site where various manufacturing and domestic tasks were undertaken. Site ETH-72-9 is considered to have served a similar purpose. It is noted, however, that post-depositional processes may have disturbed artifact distributions (*ibid.*:123). At Gademotta, site ETH-72-6 is also considered to have been a workshop/living site, while ETH-72-8B has been interpreted as a single occupation base camp where the thinness of deposits and the high frequency of shaped tools indicate a number of activities were carried out. A shallow, rounded concavity about 7.5 m in diameter and 30 cm deep excavated near the centre of the site is interpreted as the basal depression of a hut (*ibid.*:150).

Drawing upon various lines of information including (1) the relative inaccessibility of the cave and its potential as a game lookout, (2) the high frequency of points and blade or blade-like modified/edge-damaged pieces indicative of the importance of hunting, (3) the selected, comminuted and burnt nature of the identifiable faunal remains, (4) the presence of flaked stone tools from exotic raw materials (e.g. obsidian), (5) a drier and cooler climate during MSA occupation (the Last Glacial), (6) the modern seasonal movements of wild game in Awash National Park and (7) the seasonal movements of nomadic pastoralists in the Dire Dawa area, Clark and Williamson (1984:63–64), have suggested that Porc Epic cave 'was the fall and/or spring camp of a 60–70,000 year old group of MSA hunters who used to carry butchered joints of meat back to the cave. In the summer rains the group left the cave to spread out into the Afar and move westward following the escarpment to the obsidian sources at Afdem and Assabot volcanoes.' Although this represents a viable model worthy of further testing, certain problems do arise. Since the deposits at Porc Epic remain imprecisely dated, the possibility certainly exists that MSA occupation may date to warmer and more humid periods when palaeoclimates and palaeovironments were considerably different from today. Therefore, the use of modern analogues for reconstructing seasonal game and (anatomically ?pre-modern human) hunter-gatherer population movements must be regarded with caution.

Further difficulties arise when using the high frequency of MSA points as evidence for the regular use of Porc Epic as a seasonal hunting camp. Although 38% of the total shaped tools from Porc Epic are points, this still represents only 79 such tools recovered from *ca* 2 m of deposit undoubtedly spanning tens of thousands of years of encampments. If for heuristic purposes we assume a 10,000-year occupation span, only seven or eight points deposited every thousand years or so could account for Porc Epic's point total. The temporal and spatial distribution of shaped tools reveal a very irregular pattern, with only 5 of the 24 excavated 1-m^2 units accounting for 75% of all points recovered (*ibid.*). Although these point concentrations may in fact represent occasional but specific hunting-related or other activities, they could also represent artifact caches or just concentrations resulting from post-depositional processes typical of limestone caves.

Other behavioral data

Non-utilitarian items are restricted to pieces of pigment. At Porc Epic these include yellow and red ochre, red haematite and specular iron, some of which are rubbed and abraded from use as well as cracked from being subjected to heat. Pieces of red haematite were also recovered from Midhishi 2 but show no signs of intentional alteration. The function(s) of these pigments remain uncertain, but Clark and Williamson (1984) suggest that the rubbed pieces were processed into paints.

Evidence for fire is also confined to Midhishi and Porc Epic caves. At the former site small quantities of charcoal were retrieved from most levels, but no concentrated hearth was recognized. Many of the bones are burnt, while a number of stone artifacts display evidence of thermal alteration, including potlidding, crazing and angular edge fracturing (patination on most artifacts unfortunately prevented determination of color or textural changes). These types of thermal alteration are indicative of very high temperatures, and are not desirable features when intentionally attempting to heat-treat chert (Rick 1978). Although wild fires cannot be ruled out, the fact that the cave is surrounded by bedrock and situated above the valley floor makes such an event unlikely. It has been suggested therefore, that fire was not utilized for heating chert but was probably used for cooking, clearing the cave of vermin or bees, and other activities (Gresham 1984:87). Hearths were also lacking at Porc Epic, although burnt bone and heat-fractured artifacts were recovered (Clark and Williamson 1984).

Hominid remains

During the 1933 excavations at Porc Epic a fossilized but poorly preserved mandibular fragment was recovered from the MSA breccia deposits and subsequently described as

Neanderthaloid (Breuil *et al.* 1951; Vallois 1951). The Dire Dawa specimen, as the fragment has come to be known, revealed both primitive Neanderthal-like characteristics such as the lack of any chin development, as well as early anatomically modern human characteristics including the absence of a postmolar space and measurements that fell just within the range of modern human variation. More recent interpretations propose that the mandible may represent either a late archaic *Homo sapiens* (Brauer 1984:387) or early *Homo sapiens sapiens* (Howell 1982). The Porc Epic obsidian hydration dates would seem to indicate an early Upper Pleistocene age for the mandible, although the accuracy of these dates, as previously discussed, is open to question.

The only other hominid remains from the Horn possibly dating to the Upper Pleistocene are the skeletal remains from the Kibish Formation, lower Omo basin, Ethiopia. While the Omo 2 cranium has recently been classified as 'late archaic *Homo sapiens*' and the Omo 1 braincase 'early anatomically modern *Homo sapiens*' (Brauer 1984:387), both have been viewed as ancestral to later *Homo sapiens sapiens* (Howell 1982; Rightmire 1984). The Omo 1 specimen was recovered *in situ* from deltaic deposits dated by Th/U to *ca* 130,000 years ago and was discovered with a few, as yet unclassified, stone artifacts (Butzer *et al.* 1969). The reliability of this date however, has been questioned (Howell 1982).

Later Stone Age culture history and chronology

The MSA/LSA transition

Present evidence suggests that by *ca* 35,000 years ago many of Africa's MSA/Middle Palaeolithic industries had been replaced by those based on LSA blade technology, although 'evolved' or 'transitional MSA/LSA' forms may have persisted in some areas for another 20,000 years or more (Clark 1982; Smith 1982; Volman 1984). In the Horn Clark (1954) recognized two such transitional industries overlying 'Stillbay' deposits: the 'Magosian', found mainly in southern Somalia, the Ogaden and the Afar Rift, and the 'Hargeisan' of northwestern Somalia. These complexes were thought to date to the late Pleistocene/early Holocene and to reflect for the first time regional differentiation. Both however were considered transitional in that they encompassed 'Stillbay' elements such as points, Levallois cores and flakes as well as LSA forms including microliths, blade tools and blade cores.

The 'Magosian' of southern Somalia

Although the majority of 'Somaliland Magosian' occurrences identified by Clark were culturally mixed surface scatters, a few stratified sites were excavated including the southern Somali sites at Buur Heybe and Buur Hakaba, and Porc Epic cave in eastern Ethiopia. The 1935 excavations of Gogoshiis Qabe rockshelter, Buur Heybe, uncovered a transitional 'Magosian' industry stratified between the lower MSA 'Stillbay' deposits and the upper LSA 'Eibian' levels (Graziosi 1940) (Fig. 5:5–9). A similar Magosian industry was recognized by J. D. Clark (1954:207–08) from the lowest levels of his excavations at Guli Waabayo (Gure Warbei) rockshelter, Buur Heybe and the open-air Rifle Range Site at Buur Hakaba (another large granite inselberg 35 km southwest of Buur Heybe).

In 1985 a 1-m^2 unit was excavated down through the 'Magosian' levels at Gogoshiis Qabe

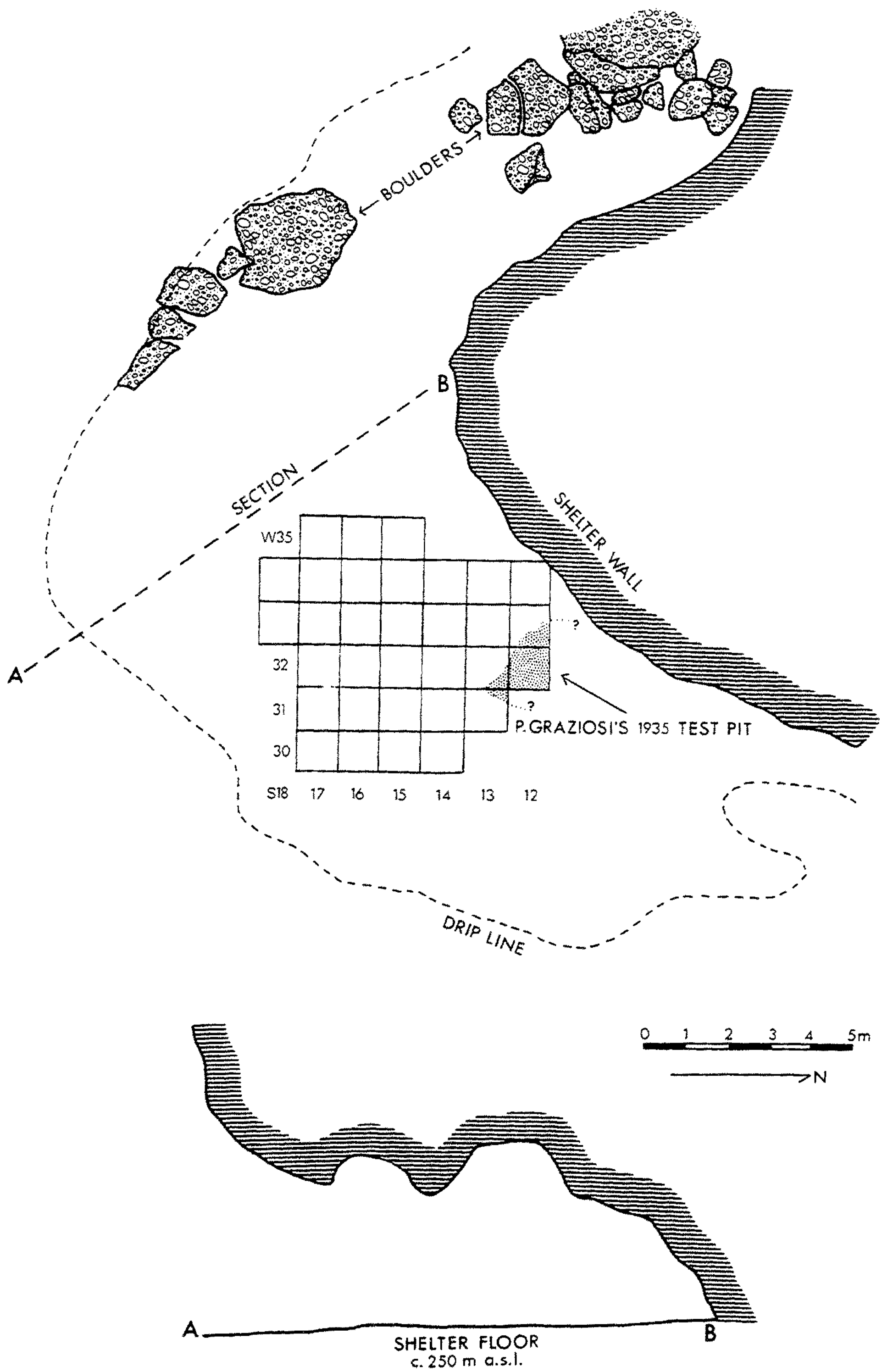


Figure 6 Plan and section of Gogoshiis Qabe rockshelter, Buur Heybe, Somalia.

(Fig. 6). Preliminary analysis of the small sample indicates the presence of an industry, conformably stratified between the MSA and LSA, composed of bifacial and unifacial points, microliths and other quartz and chert tools manufactured by both Levallois and blade core techniques (Brandt in prep.). Unfortunately materials suitable for radiocarbon dating were not recovered from these levels, although TL dating of heat-altered cherts is now being attempted and appears promising (R. Rowlett, pers. comm.). A late Upper Pleistocene age (*ca* 30,000–20,000 yr) is suggested on the basis of the overlying culture/lithostratigraphic sequence and limited radiocarbon determinations, but this needs to be tested by further research and chronometric determinations.

The 'Hargeisan' of Northern Somalia

While the 'Somaliland Magosian' was believed to have its roots in the 'Stillbay' industries of southern Somalia, Clark recognized a distinctive 'Hargeisan' industrial complex overlying 'Stillbay' deposits from sites centred around the city of Hargeysa in northwestern Somalia. 'At first glance it would seem that these northern Somaliland industries are but a local form of the Magosian, but a detailed study shows that in the angle-burins and end-scrapers . . . we have forms which are entirely foreign to the Magosian, and clearly demonstrate that we are dealing with a distinct cultural complex' (Clark 1954:218). The Hargeisan has been described therefore as a blade and burin, or mode 4, industry (Phillipson 1977a:31), with microliths and 'Magosian'-like implements such as small points, prepared discoidal/ Levallois cores and flakes also well represented (Clark 1954:218) (Fig. 5:26–31). However, the Hargeisan was described on the basis of only two or three stratified sites, none of which was excavated, and was considered a questionable complex until further research, including excavations of stratified sites, could be carried out (Clark 1954:219).

Since 1954 there has been only one reported excavated site which might shed some light on the Hargeisan. At Midhishi 2 cave in northeastern Somalia the artifact assemblages overlying the MSA deposits are associated with a radiocarbon date of 18,790 ± 340 bp (UW-787) on charcoal and have a 'transitional' character to them in that: (1) they contain typical MSA tools manufactured by the Levallois and disc core techniques as well as microliths, end scrapers, and blade cores (Fig. 5:20–25); (2) there is a reduction in the relative frequency of MSA points (particularly bifacial points) and an increase in end scrapers; (3) the relative frequency of Levallois cores, points and flakes declines; and (4) points and most other artifact classes appear to decrease in size (Gresham 1984). However, the sample size is not large (4119 total artifacts and 170 shaped tools) and the possibility of mixing (some of the artifacts have varying degrees of patination and have been recovered from strata exposed to the surface) must also be taken into consideration.

Mention should also be made of two stratified caves east of Boosaaso in northeastern Somalia excavated by P. Graziosi in 1953. Although only a short note providing few details of the excavations has as yet been published (Graziosi 1954; pers. comm.), my brief examination of the collections in the Museo Fiorentino di Preistoria suggests that both sites yielded a chert blade industry characterized by microliths, end scrapers, small unifacial and bifacial points and long blades. Although it is tempting to equate these as well as the assemblages from Midhishi with the Hargeisan, considerably more research will be needed before the status of the Hargeisan as a culture-historical unit can be evaluated.

Ethiopian 'transitional' industries

In Ethiopia the 'Magosian' industry of Porc Epic is now known to be a result of vertical mixing of deposits (Clark and Williamson 1984), as is probably the case at Gorgora rockshelter where a number of pottery sherds were found in association with the 'Magosian' (Leakey 1943). Two sites in the southern Afar Rift have been argued to provide evidence for evolved or transitional MSA occurrences dating to the late Upper or terminal Pleistocene.

The site of Aladi Springs was first test-excavated in 1974 when a step trench revealed a lithostratigraphic sequence of alternating clays and loams capped by a shell-bearing tufa deposit radiocarbon dated on shell to 11,070 ± 160 bp (I-7970) (Williams *et al.* 1977). The tufa, indicative of early Holocene humid conditions and encompassing a LSA microlithic industry, is underlain by a clay deposit devoid of artifacts that probably formed during the arid terminal Pleistocene beginning *ca* 21–17,000 years ago. Underlying the clay is a thick calcareous loam most likely reflecting the well-defined humid phase prior to the arid terminal Pleistocene. Unearthed from the upper 20 cm of the loam was a diverse collection of what was described as 'later Middle Stone Age' artifacts including MSA points, microliths, side and end scrapers, Levallois cores, micro-blade cores and a number of 'archaic' choppers and heavy duty scrapers (Clark and Williams 1978; Gasse *et al.* 1980; Williams *et al.* 1977). However, further excavations at Aladi Springs in 1976 by K. Williamson have clearly shown that these 'later MSA' deposits are disturbed and mixed (J. D. Clark and K. Williamson pers. comm.).

The site at Geologic Locality 4 (G4) is stratigraphically situated in the uppermost levels of the Upper Loam at K'one (Fig. 4), and is a small geological trench about 2 m^2 in extent. Excavated by M. A. J. Williams in 1975, the site yielded 357 obsidian artifacts characterized by only twelve shaped tools including scrapers, burins, microliths and one broken retouched piece as well as two Levallois cores, two blade cores and a number of unspecialized flakes and blades (Kurashina 1978). Although it has been suggested that this assemblage 'has the characteristics of a transitionary phase from the Middle to Later Stone Age technology' (*ibid.*:350), not only is the sample extremely small but the site may not be in primary context (*ibid.*:353). Such meagre data, therefore, cannot be used to support a terminal Pleistocene age for a MSA/LSA transition in the southern Afar (e.g. Clark and Williams 1978; Gasse *et al.* 1980).

*Late Upper Pleistocene microlithic assemblages (*ca *30,000–18,000 yr) in Ethiopia*

While the data base for northern Somalia still remains exceedingly inadaquate, there is increasing evidence to suggest that at least in southern Somalia the shift from MSA-based industries to those dependent upon LSA technology was a local and gradual one. In Ethiopia the evidence is also sparse, but there is as yet no basis to argue for any transitional or evolved industry from the regions so far investigated. The tempo and mode of cultural change from the MSA to LSA accordingly remains poorly known, but what may possibly be the earliest radiometrically dated, clearly LSA site in the Horn is from the Lake Ziway area of Ethiopia where an exposed section near the Bulbula River revealed an occupation horizon embedded within a palaeosol dated on charcoal to *ca* 27,050 ± 1,540 bp (SUA-588) (Gasse and Street 1978; Gasse *et al.* 1980). An obsidian blade industry including non-geometric microliths, scrapers and blades as well as faunal remains (F. A. Street pers. comm., S. A. Brandt pers.

obs.) was collected and, while the site has not yet been excavated, it would certainly repay further research.

Although Clark (1954) identified only two other major LSA complexes in the Horn in addition to the 'Magosian' and 'Hargeisan' (the 'Doian' and 'Wilton', to be discussed below), he also acknowledged that 'in the northern part of the (Ethiopian) plateau there existed two cultural elements in Late Stone Age times, one allied to the Somaliland Wilton culture, the other with affinities not found in the Somalilands and reminiscent of the Elmenteitan and derivative cultures of Kenya' (*ibid.*:324). This latter entity, exemplified by the assemblages from the unpublished excavation of Quiha rockshelter on the Ethiopian plateau (*ibid.*), was characterized by blade assemblages manufactured largely from obsidian and included high frequencies of microliths, scrapers, burins and long utilized blades. Recent fieldwork in the Ethiopian Plateau and the Ethiopian and Afar Rifts lends credence to such a complex, which has provisionally been described as the 'Ethiopian Blade Tool Tradition' (Brandt 1980; Clark and Williams 1975; Willey and Phillips 1958:37).

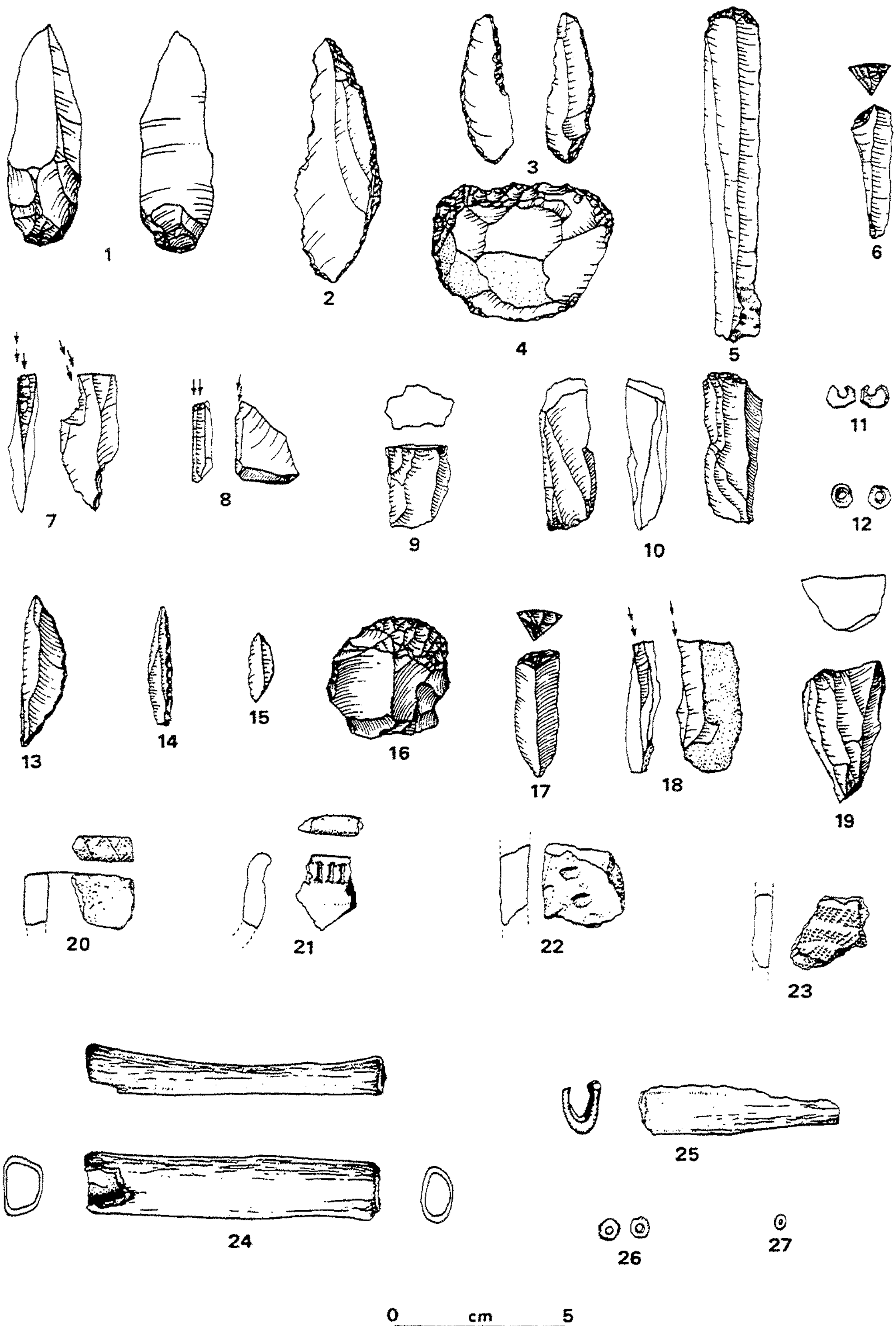
The most detailed, diachronic evidence for this tradition comes from archaeological and geomorphological work conducted during the mid-1970s along the western side of Lake Besaka, a small graben-enclosed saline lake located in the southern Afar Rift of east-central Ethiopia. Geomorphological research has shown that the lake was a deep freshwater body during the late Upper Pleistocene *ca* 20,000 years ago, only to fall rapidly during the arid terminal Pleistocene *ca* 18,000–12,000 years ago (Williams *et al* 1977; Williams *et al.* 1981). Archaeological research in 1974 and 1975 focussed upon the excavation of four open-air LSA sites (FeJx 1–4) (Clark 1982; Clark and Williams 1978), with further archaeological excavations carried out at FeJx 4 during 1977 (Brandt 1980; 1982). While prehistoric human occupation of the lake has been shown to span some 20,000 years, beginning in the late Upper Pleistocene *ca* 22,000 bp and continuing to *ca* 3500 years ago, it was not continuous, but can be divided into three phases (Brandt 1982).

The earliest 'Later Pleistocene Phase'[6] is from the lowest of two occupation horizons at FeJx 4, a deeply stratified open-air site situated in a small graben where 8 m^2 were excavatd to a maximum depth of 5.2 m below surface. The lowest stratigraphic unit, a culturally sterile pumiceous sand overlain by a palaeosol containing the lower occupation horizon, is dated by three radiocarbon dates on ostrich eggshell to 22,080 ± 305 bp (UW-495), 19,460 ± 205 bp (UW-493) and 19,280 ± 215 bp (UW-494).[7]

This is overlain by a series of sterile pumiceous sands presumably dating to the arid terminal Pleistocene. The 3800 obsidian artifacts from this phase are characterized by a relatively high percentage of shaped tools (4.1%) composed largely of microliths and scrapers (Fig. 8A), but also including burins and others tool types such as the only point from Lake Besaka (Fig. 7:1–12). The microliths, being the longest, widest and thinnest of any phase at Lake Besaka, are dominated by backed blades and truncations but lack geometric forms (Fig. 8B,C).

*Terminal Pleistocene microlithic assemblages (*ca *18,000 to 12–10,000 yr) in Ethiopia*

The only securely dated evidence for human occupation of the Horn during the arid terminal Pleistocene is from the eastern Ethiopian site of Laga Oda rockshelter in the foothills of the Chercher Mountains. In 1975 three 1-m^2 units were test-excavated, with one square taken


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
0 cm 5

down to a depth of 1.4 m, where a combined charcoal sample from the 110–140 cm levels gave an age of 15,590 ± 460 bp (SUA-475) (Clark and Prince 1978; Clark and Williams 1978). Unfortunately only 2 bone fragments and 177 flaked chert artifacts (of which 3 are shaped tools: a backed flake, awl and scraper) were recovered, thereby providing little taxonomic or behavioural information.

The 'Terminal Pleistocene Phase' of the Lake Besaka sequence, also referred to as the 'Earliest Holocene Phase' (Brandt 1982; Robertshaw 1984), is represented by the earliest occupation horizons at FeJx 2 and its eastern extension, FeJx 2-East. At FeJx 2 25 units of 1 m^2 were excavated to 1.6 m below surface, revealing a basal clay loam 20–40 cm thick containing over 25,000 obsidian artifacts (Brandt 1982; Clark and Williams 1978). A precise age for this loam is lacking, but the sterile pumice sands overlying it are provisionally dated by stratigraphic and petrographic correlation to *ca* 11,400 years ago (Williams *et al.* 1981). If the pumice sands are comformably overlain by the clay loam, this might suggest a slightly earlier age for the occupation horizon, thereby implying an earliest Holocene rather than terminal Pleistocene age. This needs to be confirmed by further research and radiometric dating. The size and frequency of shaped tools clearly set this phase apart from all others at Lake Besaka. Scrapers form the largest class (46%), while microliths are reduced to 30% and burins increase in frequency to their highest level (19%) (Fig. 8A). There are more scraper forms than in any other phase, while microliths are characterized by a high proportion of truncations and backed blades and by a lack of geometrics, a pattern also characteristic of the 'Later Pleistocene Phase' (Fig. 8B). Furthermore, both microliths and scrapers are smaller and broader than in earlier phases (Fig. 8C).

The only other possible terminal Pleistocene archaeological occurrence at Lake Besaka is represented by a few pieces of obsidian debitage recovered in a geological trench from a weakly developed palaeosol formed when the lake was very low or had dried up (Williams *et al.* 1981).

Southern Somalia

At Gogoshiis Qabe rockshelter in southern Somalia, Graziosi (1940) recognized a very distinctive LSA industry conformably overlying and typologically evolving from the 'Magosian'. This 'Eibian' industry was characterized by chert (some of which were heat altered) and quartz microliths, end scrapers, rare burins and blade cores, as well as small, distinctive pressure-flaked bifacial and unifacial points, triangular and lenticular-shaped *limaces* and trihedral rods (Fig. 5:10–15). A few small, undecorated potsherds were also believed to be associated with the uppermost Eibian levels. In 1953 Graziosi (1954) uncovered an Eibian assemblage from a small shelter at Buur Daale near Buur Heybe, but details of this site have yet to be published. At the neighbouring sites of Guli Waabayo (Buur Heybe) and Rifle Range (Buur Hakaba), Clark (1954:207–08) uncovered, above the

Figure 7 Later Stone Age artifacts from Lake Besaka, Ethiopia (from Brandt 1982). 1–12. 'Later Pleistocene phase': 1. part-bifacial point; 2–3. backed blades; 4. convex scraper; 5–6. end scrapers; 7–8. angle burins on break; 9. single platform prismatic core; 11–12. ostrich eggshell beads. 13–27. Besaka industry, Abadir phase: 13, 15. crescents; 14. straight backed blade; 16–17. end scrapers; 18. angle burin on break; 19. single platform core; 22–23. pottery; 24–25. bone 'tubes'; 26. ostrich eggshell beads; 27. carnelian bead.

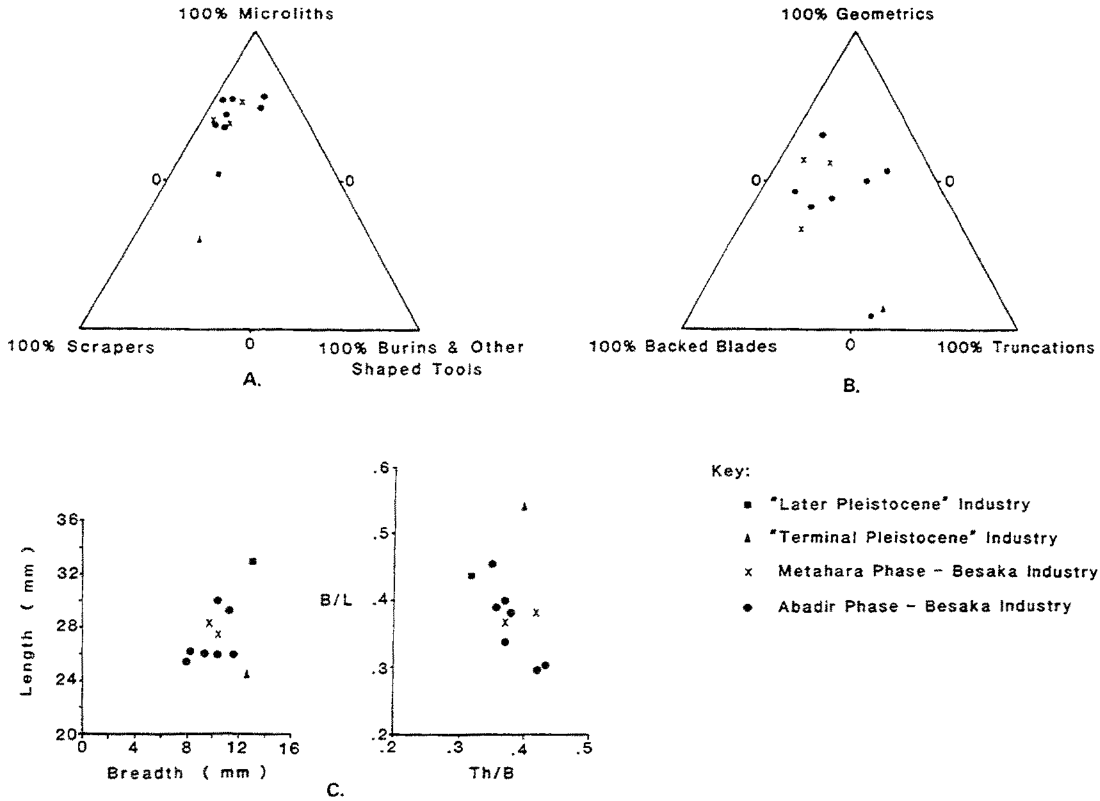


Figure 8 Frequency and morphology of Lake Besaka shaped tools: 8A graph showing percentages of shaped tools for each phase; 8B graph showing percentages of microliths for each phase; 8C plot of microlith morphology for each phase.

'Magosian' levels, a virtually identical 'Doian' industry which he divided into two temporal phases, the Lower Doian (or Magosio-Doian) and the Doian proper. In naming these assemblages Doian, Clark (1954:207–08) argued that the Eibian industry had a 'rather specialized or localized nature', while the Doian was 'a more general term . . . which would embrace all the variants of this culture' (i.e. an industrial complex).

Although the absence of domesticated animals in the faunal remains pointed to a hunting/gathering economy, the presence of potsherds in the uppermost Doian levels at Guli Waabayo as well as the 'Neolithic' pressure-flaked character of the stone artifacts indicated to Clark (1954:329–30) a mid to late Holocene age for the Doian, while Graziosi (1940) for similar reasons also considered the Eibian to date to the Holocene. Excavation of over 30 m^2 at Gogoshiis Qabe and 5 m^2 at Guli Waabayo in 1985 have clearly demonstrated however that the Eibian/Doian is an *aceramic* industry stratigraphically underlain by the 'Magosian' industry previously described, and overlain by another, very distinctive Holocene industry whose pottery-bearing levels are radiocarbon dated to the early-mid Holocene. Although no radiometric ages have as yet been obtained for the Eibian/Doian levels, litho- and culture-stratigraphic evidence as well as radiocarbon dates from overlying levels strongly suggest a terminal Pleistocene age (Brandt in prep).

Most Doian sites identified by Clark (1954) were surface occurrences concentrated in the inter-riverine region of southern Somalia between the Jubba and Shabeele rivers, although sites were also reported from central Somalia. Two regional variants were also distinguished, a 'Neolithic' variant and a 'Strandlooping' variant. The Neolithic variant was based upon a 2-m^2 test excavation and surface collection at Mirsaale Wells in east-central Somalia, where the assemblages were considered to have a more 'Neolithic' look to them (e.g. a higher degree of pressure flaking) (*ibid.*:254–59). However, this assessment was based on only seventeen shaped tools found in stratigraphic context, with the rest collected from the surface (*ibid.*). A Strandlooping or coastal Doian variant was also distinguished on the basis of five unexcavated surface exposures in and south of Muqdishu. But the data base for this variant is even smaller: four shaped tools (three crescents and one chopping tool) and a number of potsherds, most of which are undecorated (*ibid.*:252–3). Presently available data therefore provides little support for these Doian variants.

*Early Holocene microlithic assemblages (*ca *12,000–5,000 yr) in the Ethiopian and Afar Rifts*

East of Lake Besaka in the Afar Rift is the site of Aladi Springs. As previously discussed, a small microlithic industry characterized by obsidian and chert backed blades, end scrapers, a drill and blade cores was found embedded within tufa deposits and is dated on shell to *ca* 11,070 bp (Clark and Williams 1978).

In the Lake Ziway area, the same geological section along the Bulbula river that yielded the late Upper Pleistocene blade industry has yielded another occupation horizon buried within a palaeosol dated by charcoal (SUA-494) to 11,870 ± 300 bp (Gasse and Street 1978). The palaeosol is immediately overlain by lacustrine marls, indicating a major lake transgression. Occupation occurred therefore during the arid terminal Pleistocene or, perhaps more likely, very soon after the lakes first began to rise at the end of the Pleistocene. Backed blades, end scrapers, a burin and other artifacts, as well as a human parietal and numerous animal bones including those of baboons and bovids, were collected from this very promising site (F. A. Street pers. comm.; S. A. Brandt pers. obs. of artifacts).

Just southwest of Lake Ziway are the low hills of Macho and Waso where three open-air sites excavated in 1973 yielded evidence of LSA activities near the shores of an expanded early/mid-Holocene Lake Ziway (Humphreys 1978). The only site radiometrically dated is Macho (ETH-73-3-III) where 11 m^2 were dug, exposing a concentrated occupation horizon *ca* 30–35 cm below surface radiocarbon-dated on charcoal to 10,330 ± 90 bp (SMU-86). A blade industry represented by over 2200 obsidian artifacts was recovered and is characterized by non-geometric microliths, scrapers, burins, blade cores and other artifacts showing general similarities to the late Pleistocene phases at Lake Besaka.

Following the 'Terminal Pleistocene Phase' at Lake Besaka is the distinctive Besaka Industry (Fig. 7:13–27), dating to *ca* 11,000–5000 years ago and divided into aceramic and ceramic phases (Brandt 1982). Excavations totalling over 50 m^2 at four neighbouring sites yielded 150,000 artifacts of the Besaka Industry. These sites included FeJx 2 and FeJx 1, both characterized by dense surface scatters more than 80 m^2 in area. The earlier aceramic Metahara Phase horizons remain radiometrically undated, but on stratigraphic and pedological grounds are suggested to be *ca* 11,000–7000 years old.

The flaked stone artifacts, compared to the earlier phases at Lake Besaka, reveal a significant increase in the frequency of microliths (~70% of shaped tools), the majority of which are geometric crescents. There is also a reduction in microlith size; and although there are fewer scrapers overall, end scrapers increase in frequency over other scraper sub-types (Fig. 8). Burins are also less common; and the microburin technique is observed for the first time, as are cores-on-flakes (Brandt 1982).[8] The overlying Abadir Phase is differentiated from the earlier Metahara Phase by the first appearance of pottery and grindstones. The age of the earliest pottery-bearing deposits has not yet been securely determined, but could be as old as *ca* 6000–7000 years based on a single radiocarbon determination of 4785 ± 120 bp (I-8330) (Williams *et al.* 1977) on charcoal from near the surface of FeJx 2.

At K'one a 1-m^2 test excavation into the Upper Vertisol Holocene deposits at Area C revealed a diffuse scatter of 482 artifacts (Kurashina 1978). Although the sample size is very small, the artifacts include curved backed blades, scrapers, burins, microburins and a blade core, and resemble the Holocene assemblages from Lake Besaka (S. A. Brandt pers. obs.).

Highland Ethiopia

At Laga Oda a small assemblage of flaked stone artifacts lacking any shaped tools is associated with a radiocarbon date (SUA-474) of 10,270 ± 170 bp (Clark and Prince 1978), while at Melka Kunture a series of LSA sites featuring obsidian microliths, end scrapers and occasional potsherds has been discovered. These latter sites, however, provide little information as they are virtually all undated surface or eroded occurrences (Hivernel-Guerre 1976; Muir and Hivernel 1976). In the northern Ethiopian plateau just outside Axum is the site of Gobedra rockshelter where a 4-m^2 test-trench was excavated to a maximum depth of 1.27 m (Phillipson 1977b). According to Phillipson (1982:434), 'the earliest industry is one of large backed blades which bear only minimal retouch. It was replaced around the ninth millennium BC by a microlithic industry in which two phases are recognized, only the second of which is associated with pottery'. Elsewhere he states: 'at Gobedra rockshelter . . ., a mode 4 industry was replaced by a microlithic one some 10,000 years ago' (Phillipson 1985:82). In my opinion however, his conclusions cannot as yet be supported by the available data.

The three lowest stratigraphic units comprising the earliest recognized industry date to 10,110 ± 140 bp (P-2238) or earlier on a single charcoal sample (Phillipson 1977b). While over 2200 chert, basalt, quartz and other flaked stone artifacts were recovered from these units, only twelve shaped tools, including a single microlith (a backed flake less than 25 mm in length), a few irregular scrapers and four retouched blades were identified. Overlying this was the aceramic microlithic industry represented by 3470 artifacts, of which a total of only 14 tools were recognized including 8 lunates, 2 backed flakes and 2 retouched tools. This in turn was superceded by the pottery-bearing phase, the lowest level of which is dated on bone apatite to 7130 ± 165 bp (GX-4680). Although mean B/L ratios are not provided, the B/L scattergrams presented do not appear to reveal any significant changes between levels, while it is also questionable whether there is any statistically significant reduction in mean flake/blade length (from 25 to 23 mm). Clearly a considerably larger artifact sample will be required before claims for major technological changes at Gobedra can be substantiated.

Southern Somalia

In his excavations at Guli Waabayo and the Rifle Range Site, Clark (1954:230–41) recognized, from the levels overlying the Doian deposits and extending to the sub-surface, microlithic industries lacking the pressure flaked tools and other implements characteristic of the Doian, but incorporating a higher frequency and wider range of potsherds. Rarely if ever mentioned in the literature, these 'Early Eile(?)' and 'Early Elai(?)' cultures (Clark 1954:241) were considered to be relatively late in time as the excavated pottery appeared to be similar to the traditional ceramics made by the present-day clans of the Eyle of Buur Hebye and the Eylei of Buur Hakaba. Graziosi (1940) also identified an analogous industry from the upper 1.0 m of deposit at Gogoshiis Qabe, while his 1953 excavation of a rockshelter at Muunay, Buur Heybe (P. Graziosi 1954, pers. comm.; S. A. Brandt pers. obs. of artifacts) provided even further evidence of this industry. Graziosi (1940) considered these post-Eibian assemblages 'Neolithic' in age as rare domesticated cattle and sheep/goat bones were recovered from the associated levels.

Preliminary analyses of the >30 m² of deposit excavated at Gogoshiis Qabe, the 5 m² at Guli Waabayo and 2 m² at Guli Garesso rockshelter in 1983 and 1985 indicate that these post-Eibian/Doian assemblages are part of a three-phase LSA industry spanning most if not all of the Holocene. The earliest phase is characterized by a microlithic quartz and chert industry lacking the distinctive Eibian/Doian tools but including rare grindstones and bone tools. Two radiocarbon determinations from Gogoshiis Qabe—9180 ± 100 bp (UGa-5) on calcium carbonate from the lower levels, and 6900 ± 350 bp (Beta-7474 on the organic fraction of human bone) or 5210 ± 90 bp (Beta-7473 on apatite) from the upper levels—provide an approximate age. The overlying second phase reveals little change in the lithic industry but encompasses the earliest evidence of pottery, and shows conclusively that the few sherds recovered by Graziosi and Clark from the Eibian/Doian deposits were intrusive. A date of 5225 ± 280 bp (UCLA-2705C) on the organic fraction of human bone from the upper levels at Gogoshiis Qabe provides an approximate age for the end of this phase and also furnishes a lower estimate for the age of the final, 'Neolithic' phase for which a charcoal date of 3380 ± 210 bp (GX-11496) is also available (Brandt in prep). Additional dates are awaited.

The 'Somaliland Wilton'

Throughout much of northern Somalia and Djibouti as well as at scattered localities in Ethiopia, central Somalia and the Ogaden, Clark (1954:260) recognized the presence of a diverse set of 'Somaliland Wilton' sites with assemblages characterized by microliths, small end and thumbnail scrapers, rare burins, utilized blades and occasional potsherds. While most of these assemblages were derived from surface occurrences or exposed sections, five excavated sites were known. At Gumbur Todobaala rockshelter, the 'type site' of the 'Somaliland Wilton', located northeast of Hargeysa, Clark (1954:262–68) uncovered from a 9-m² excavation a small assemblage of chert flaked stone artifacts. Of the 773 artifacts analysed, 68 were shaped tools composed essentially of microliths and small scrapers. Three potsherds were also thought to be associated. Further evidence for the Somaliland Wilton was obtained from a small rockshelter south of Berbera where a small trial trench revealed a lithic assemblage similar to that at Gumbur Todobaala. Clark (*ibid.*:266) concluded that 'this culture is the logical development of the Hargeisan industries and its distribution covers approximately the same area'.

Clark also recognized four so-called variants of the Wilton. The 'Ogaden Wilton' was essentially based on artifact collections derived from surface sites and exposed geological sections where the assemblages differed from the typical Wilton 'in certain elements of technique, secondary retouch and the apparent absence of the angle burin and the end scraper' (*ibid.*:270). The only known excavated site was Durdur Xiime (Durdur Heime), a small mound situated not in the Ogaden, but some 200 m from the Webi Shabeele river south of the Ethiopian border. Here Clark (*ibid.*:273–75) sunk a 2-m^2 trench to a depth of 1.2 m, uncovering a microlithic industry manufactured largely from chert. The 636 artifacts selected for analysis included 292 shaped tools, all of which were microliths apart from a few burins, a crude point and one scraper. The 'Abyssinian Variant' was represented by pottery-associated microlithic assemblages from such sites as Yavello in southern Ethiopia (Clark 1954), Gorgora (Leakey 1943; Clark 1954:40) and Porc Epic (Breuil *et al.* 1951).

The 'Neolithic Variant' was known from only one site, the shallow pan of Rakoon in east-central Somalia where a 1-m^2 excavation uncovered 888 artifacts in addition to numerous surface specimens. The excavated sample was characterized by microliths, small end scrapers and utilized blades as well as pressure-flaked (hence 'Neolithic') points reminiscent of the Doian. The final 'Strandlooping Variant' was based on sites along the eastern coast, and in particular near Eyl where a 4-m^2 trench at Badey (Biede) rockshelter yielded 420 artifacts from the lower midden deposits. Only thirteen tools were identified including a few microliths, a burin, one scraper and a crude pick. Also recovered was a piece of iron slag which, if not intrusive, suggests a relatively late date. Graziosi (1940) also excavated a rockshelter near Eyl, uncovering a 'Mesolithic' industry which Clark (1954:20) considered to be identical to the Strandlooping Variant.

Since there has been so little new research in northern Somalia, the 'Somaliland Wilton' continues to float in both time and space and remains one of the most inadequately defined culture-historic units of the Horn. I suspect that these 'Wilton' sites range anywhere in age from the Upper Pleistocene through the late Holocene, since some contain pottery (and in one instance iron) while others represent LSA aceramic industries. In 1982 a small test excavation was conducted at the painted rockshelter of Karin Heegan near the Gulf of Aden coast in northeastern Somalia (Brandt and Brook 1984; Brandt *et al.* 1984). A small microlithic assemblage recovered from the test unit dates to 2060 ± 65 bp (UW-764) on charcoal, but any typological comparison of the 'Somaliland Wilton' with this or any other excavated assemblage in the Horn such as that from Laga Oda (Kurashina 1978), will remain impossible until the taxonomic status of the Somaliland Wilton and its variants are properly worked out. Since the Somaliland Wilton, as Clark (1972:xxvii) recently stated, '. . . never implied anything other than the broadest typological comparability', new definitions and new terms will be required.

Later Stone Age adaptations

Late Upper Pleistocene

Hydrogeological, pollen and diatom evidence indicates that from *ca* 58,000 to 31,000 years ago climatic conditions in the Horn were generally warm and tropical. But by around 31,000 yr the climate, although still humid, became increasingly cooler and more temperate until *ca* 20,000–18,000 yr when it turned hyper-arid (Bonnefille *et al.* 1979; Gasse *et al.* 1980; Lezine

1983; Street 1981; Van Campo *et al.* 1982). Since this is the general period when the change from MSA to LSA technology in the Horn must have taken place, it is worth considering Phillipson's (1977a:31) hypothesis that the origins of microlithic industries in eastern Africa can be traced to the development of the bow and arrow, a technological adaptation to 'increased density of vegetational cover in areas which had previously been relatively open . . . the result was an increased reliance on the bow and microlith-tipped arrow, more effective for hunting the smaller solitary game of the now increasing woodlands than were the large projectiles which had been used by their predecessors for hunting on the more open plains'.

Unless the MSA/LSA transition is eventually found to date to 60,000–50,000 years ago (which cannot as yet be ruled out given the lack of data), or the cooler but equally humid conditions of *ca* 30,000 years ago resulted in major vegetational changes (which seems unlikely), the available climatic data from the Horn would appear to provide little support for Phillipson's hypothesis. Unfortunately faunal remains dating to this crucial period are still too meagre to provide an additional test. Knowledge of late Upper Pleistocene LSA subsistence practices is restricted to a very small sample of faunal remains from the Lake Besaka site of FeJx 4, dated to *ca* 22,000 yr where warthog, hippo, and small to large bovid dental fragments have been identified, as were bird and reptile bones (Dechant and Crader 1982). Two sizes of fish, including catfish, were also recognized and suggest (but do not establish) that Late Pleistocene hunter/gatherers were fishing, and perhaps hunting hippo, in the fresh waters of Lake Besaka and/or the nearby Awash river. A small faunal sample from the 'transitional' levels at Midhishi 2 dated to *ca* 19,000 yr has also been recovered and is currently under analysis (H. Bunn pers. comm.).

In addition to unmodified ostrich eggshell fragments, 5 ostrich eggshell beads ranging in diameter from 7 to 9 mm were recovered from levels *ca* 22,000–19,000 years old at Lake Besaka (Fig. 7:11,12) and are the earliest radiometrically dated evidence in the Horn (and perhaps the rest of eastern Africa) for ornamentation. At Midhishi 2 a couple of cowrie shells were unearthed from levels *ca* 19,000 years old (A. Gautier pers. comm.) and may represent one of the earliest dated occurrences in eastern Africa of inland contact with the sea.

Terminal Pleistocene

The exceptionally arid conditions of the terminal Pleistocene (Isotopic Stage 2: ~18,000 to 12–10,000 yr) represent one of the most distinctive climatic events of the African Quaternary (Hamilton 1982). With lower temperatures and perhaps as little as half of today's rainfall, the Afar lakes (and probably many of the Ethiopian Rift lakes) dried up or became ephemeral. Extensive pediments formed in the Afar, the creation of which 'would require torrential storms capable of generating sheetflow depths great enough to move boulders and gravel on very gentle slopes. Yet the rainfall regime was too irregular to allow a closed vegetation cover to develop on these surfaces. And indeed the presence of dunes . . . would indicate an almost complete absence of vegetation on the plains between drainage lines.' (Gasse and Street 1978:308)

Hunter/gatherer adaptations to such dramatic changes in climate and plant/animal resources remain poorly known. Data are presently restricted to two sites. The faunal remains from the upper Eibian levels at Gogoshiis Qabe, when analysis is completed, should provide valuable data on subsistence strategies in southern Somalia (H. Bunn pers. comm.), while the 'Terminal Pleistocene Phase' at Lake Besaka has provided a small faunal sample composed of small to medium size bovids and rare fish bones. It is tempting to view the scraper dominated assemblages of this phase of the Besaka sequence as reflecting an adaptation to dry conditions in the terminal Pleistocene or early Holocene, when the lake and surrounding environs were just beginning to recover from thousands of years of aridity. However, this must remain speculation until additional terminal Pleistocene sites are located and studied.

Early Holocene subsistence and settlement patterns

With the onset of warm and humid conditions at the end of the Pleistocene *ca* 12,000–10,000 years ago the Horn experienced major environmental changes. Lake levels rose during the early Holocene to their highest levels in 15,000 years (Gasse *et al.* 1980), while tufa deposits about 9600 years old in northern Somalia indicate increased humidity (Brandt and Brook 1984). The pollen record also documents important changes in vegetation, with an extension of forests in the Ethiopian highlands (Bonnefille and Riolett 1976; Lezine and Bonnefille 1982), and a dramatic increase of tropical taxa in the northern Horn (Van Campo *et al.* 1982). Between *ca* 8500 and 6500 years ago a severe arid episode set in, followed by a return to warmer and more humid conditions in the mid-Holocene. By *ca* 5000–4000 years ago this last warm and humid episode came to an end. Except for a short period of increased humidity about 2000 years ago, relatively dry conditions have prevailed ever since (Gasse *et al.* 1980; Gillespie *et al.* 1983; Lezine and Bonnefille 1982).

Even though the archaeological record of the early Holocene in the Horn is scanty, the one adaptive strategy for which we have adequate data is hunter/gatherer utilization of the rich and varied resources of the Ethiopian and Afar Rift lakes. At Lake Besaka a significant increase in the thickness and density of archaeological deposits and in the amount of faunal remains recovered, probably attests to the development of more sedentary lifeways geared to predictable, abundant aquatic resources such as fish, hippos and crocodiles, an early Holocene adaptation witnessed elsewhere in Africa (e.g. Sutton 1974). However, terrestrial resources were certainly not abandoned as a wide spectrum of animals whose habitats today range from grassland to woodland and riverine to lacustrine were also successfully hunted. These included oryx, hartebeest, warthog, wild boar, zebras, lizards and birds (Brandt 1982; Dechant and Crader 1982).

Although the large quantity of faunal remains from the early Holocene deposits at Buur Heybe are still being analysed, they appear to be dominated by such mammals as bushbuck, duiker, bushpig, warthog and especially dik-dik. Also included in the faunal assemblage are baboon, rhino, giraffe, monitor lizard and birds (H. Bunn pers. comm.). This indicates a broad spectrum hunting pattern with a concentration upon locally available game.

Unfortunately virtually nothing is known about early Holocene subsistence strategies in the other habitats of the Horn. The freshwater shell middens at Durdur Xiime and the marine shell middens exposed in the excavations of the Eyl rockshelters, if attributable to the early Holocene, would provide evidence for alternative forms of subsistence. In fact, evidence for patterns of mobility, seasonality, site location and site function remains depressingly meagre. All four of the excavated sits at Lake Besaka are situated on top of a fault scarp that formed the western boundary of the expanded late Upper Pleistocene and early Holocene lake. From this vantage point, foraging groups would have had easy access to the lakeshore as well as the river and woodlands to the south and west. Although at least part of the high concentration of artifacts at FeJx 1 and 2 is due to deflation, it may also reflect longer and more frequent occupation suggestive of a more sedentary settlement pattern.

An intensive, systematic surface survey of the Buur Heybe region has been initiated and should provide important data on site distribution when it is completed (Brandt in prep). Worthy of mention here is the obsidian 'Wilton' microlithic industry collected from the Red Sea island of Dahlak Kebir off the coast of Eritrea (Blanc 1955). If this material dates to the early Holocene it could indicate movement of obsidian and other commodities by boat.

Behavioural aspects of material culture

The appearance at Lake Besaka and Buur Heybe of less portable objects such as pottery and grindstones indicates new methods of processing and storing food and other commodities, and perhaps a more sedentary lifestyle. The absence of bone harpoons, hooks or other fishing gear at Lake Besaka and the concomitant increase in the frequency of geometric microliths from early Holocene assemblages might imply that these latter tools played some role in fishing technology, although they certainly could have been used for other purposes (e.g. Clarke 1976; Deacon 1984). Perhaps use-wear analysis of the microliths could provide a test of this. The lack of Eibian-type pressure-flaked and other implements from the early Holocene deposits at Buur Heybe, as well as a reduction in the use of exotic chert as raw material for stone-tool making, cannot yet be explained adequately. However, hypothetical explanations concerning shifts in mobility patterns and information exchange, access to raw-material sources and changes in hunting strategies and technological requirements merit consideration. At both Lake Besaka and Gogoshiis Qabe, bone tools, ostrich eggshell beads and marine shells were found, the latter indicating some form of contact with the sea.

Prehistoric populations

The early Holocene deposits at Lake Besaka and Buur Heybe have provided the earliest evidence in the Horn of intentional human burial. At the site of FeJx 2 at Lake Besaka the incomplete remains of five human skeletons were found buried in Abadir Phase sediments alongside an irregular pile of stones, with the most complete specimen composed of the upper half of the body only. No evidence of carnivore activity could be observed, while many of the bones were burnt (Clark and Williams 1978). However, no cut marks or any other indication of cannibalism was discovered, while the texture of the bones indicated they were probably surrounded by flesh when buried (Dechant and Crader 1982). Of particular interest was a fragment of a human long bone through which a hole approximately 6 mm in diameter had been intentionally drilled as if for suspension (McCown n.d.). Needless to say, 'some unusual burial custom' is suggested (Clark and Williams 1978:37). No evidence of grave goods was found in direct association with the burials, although two bone tubes and a cache of over thirty gastropod shells pierced as if for suspension were found next to the stone pile (*ibid.*). Morphological features of the crania indicate Negroid affinities and can best be compared to the Sudanese skeletons of Jebel Sahaba and Wadi Halfa (McCown n.d.).

For many years the only prehistoric human skeletal evidence from Somalia was the highly fragmentary remains of at least two individuals recovered during World War II by workmen digging a trench at the Rifle Range Site, Buur Hakaba (Clark 1954:251). The 1983 and 1985 excavations at Gogoshiis Qabe have now yielded 12 complete human burials from the Holocene deposits, bones of three of which have been ^{14}C dated to the early Holocene (Brandt in prep.). One individual dating to 6900 ± 350 bp (Beta-7474) on the organic fraction and 5210 ± 90 bp on apatite (Beta-7473) was buried on his stomach, with at least thirteen complete sets of lesser kudu horn cores, still attached to the frontlets, placed directly over the body. A man and a woman dating to 5225 ± 280 bp (UCLA-2705C) on the organic fraction were buried side by side and a pile of stones placed directly over them. Preliminary morphological analysis of these and the other skeletons (L. A. Schepartz pers. comm.; Brandt and Schepartz in prep.) indicates the presence of a regionally distinct population at this time, although affinities with the late Pleistocene/early Holocene Sudanese and Kenya Rift Valley populations are suggested.

Finally, mention should be made of the highly fragmented remains of a human skull and various postcranial fragments recovered from Gobedra rockshelter in northern Ethiopia. Dated by bone apatite to the early Holocene, no other information concerning the skeleton is available (Phillipson 1977b).

Conclusions

In spite of rapid advances in the accumulation of data, our understanding of the Upper Pleistocene and early Holocene prehistory of the Horn remains in its infancy. Chronologically all that can be safely said is that the MSA is radiometrically dated to greater than 40,000 years (Tab. 1), but could conceivably be more than 180,000 years in age if the K/Ar determinations from Kulkuletti are substantiated. The MSA/LSA transition is also inadequately known, with southern Somalia providing evidence for a gradual transition perhaps 20,000 or more years ago. In other areas the change could have been much more rapid, but the lack of data prevents any kind of temporal resolution. In any case, probably by 27,000 and certainly by 22,000 years ago true microlithic blade industries were present in Ethiopia. Available evidence suggests pottery and grindstones were added to the material culture of the LSA around 7000 years ago or shortly thereafter.

It is now clear that most of the culture-historic units formulated by Clark (1954) more than 30 years ago are in need of revision. While some complexes such as the southern Somali 'Magosian' and 'Doian' simply require name changes and/or minor redefinition based on quantitative data, others such as the 'Levalloisian', 'Stillbay' and 'Wilton' (regardless of whatever new names are applied to them) are so inadaquately defined taxonomically, spatially and temporally that they probably should be abandoned. Still others like the 'Hargeisan' remain in a state of taxonomic limbo until further data are forthcoming.

MSA and LSA adaptations also remain poorly understood, but the potential of the Horn of Africa for making important contributions to issues of Late Quaternary bio-cultural change is, in my opinion, great. If future research confirms the age of the MSA Lake Ziway sites and the general uniformity of its industries, one implication would be that the MSA of the Horn represents a period of over 100,000 years of relative stasis before the major cultural transformations of the LSA are witnessed. This would be in keeping with recent thoughts on

Table 1 Chronometric dates for Upper Pleistocene and Early–Mid Holocene sites in the Horn.

Site	Site type	Cultural stage	Age (bp)	Dating technique	Lab. no.	Reference
Kulkuletti	Open Air	MSA	181,000±6,00	K/Ar	(UAKA-73-131)	Wendorf and Schild 1974
			149,000±13,000	,,	(UAKA-73-131)	,,
Porc Epic	Cave	,,	77,565±1,575*	Obs Hydration	Artifact 12020	Michels and Marean 1984
			61,640±1,083*	,,	Artifact 12018	,,
			61,202±958*	,,	Artifact 12022	,,
Gud-Gud	,,	?MSA	>40,000	14C/Charcoal	(UW-762)	Brandt and Brook 1984
Midhishi 2	,,	MSA	>40,000	,,	(UW-761)	,,
		?MSA/LSA	18,790±340	,,	(UW-787)	,,
Bulbula	Open Air	LSA	27,050±1,540	,,	(SUA-588)	Gasse and Street 1978
			11,870±300	,,	(SUA-494)	,,
Lake Besaka-Fejx 4	,,	,,	22,080±305	14C/Ostr-shell	(UW-495)	Brandt 1982
			19,469±205	,,	(UW-493)	,,
			19,280±215	,,	(UW-494)	,,
Laga Oda	Rockshelter	,,	15,590±460	14C/Charcoal	(SUA-475)	Clark and Prince 1978
			10,270±170	,,	(SUA-474)	,,
Aladi Springs	Tufa	,,	11,070±160	14C/Shell	(I-7970)	Williams *et al.* 1977
Macho ETH-73-3-111	Open Air	,,	10,330±90	14C/Charcoal	(SMU-86)	Humphreys 1978
Gobedra	Rockshelter	,,	10,110±140	,,	(P-2238)	Phillipson 1977
			7,130±165	14C/Apat-bone	(GX-4680)	,,
Gogoshiis Qabe	,,	,,	9,180±100	14C/Carbonate	(UGa-5)	This paper
			6,900±350	14C/Organ-bone	(Beta-7474)	,,
			5,210±90	14C/Apat-bone	(Beta-7473)	,,
			5,225±280	14C/Organ-bone	(UCLA-2705C)	,,
Lake Besaka	Open Air	,,	4,785±120	14C/Charcoal	(I-8330)	Williams *et al.* 1977

* True age possibly 20,000 years greater (Michels and Marean 1984)

European Mousterian chronology and the Middle Palaeolithic/Upper Palaeolithic transition (Dennell 1983; Zvelebil 1984). However, if it can be conclusively shown that the makers of the African MSA were anatomically modern humans (Brauer 1984; Rightmire 1984), and/or if the change from MSA to LSA technology occurred gradually in some areas as late as 20,000 bp, archaeologists must develop hypotheses for explaining the MSA/LSA transition other than that recently proposed for the European Upper Palaeolithic which 'required advances in planning and, possibly, advances in manual dexterity that might have been beyond neanderthal's mental and physical capabilities' (Zvelebil 1984:314).

Although the later prehistory of the Horn may not be well known, its palaeoenvironments offer an excellent opportunity for developing and testing hypotheses concerned with the relationship between environmental and cultural change (e.g. Butzer 1983; Dyson-Hudson and Smith 1978; Harpending and Davis 1977). A particularly important topic for future research is how hunter-gatherers adapted to what must have been radical changes in resource availability during the hyperarid terminal Pleistocene, when rainfall may have been no more than half of what it is today. Were foragers restricted to, or concentrated in, specific regions or refugia such as the highlands of Ethiopia, the banks of perennial rivers, springs or the coast? Did they adapt by changing their mobility patterns (e.g. Binford 1980, Kelly 1983), population size and density (Wobst 1974; Yellen and Harpending 1972), foraging strategies (e.g. Keene 1979), material culture (e.g. Hayden 1981; Testart 1982; Torrence 1983), information networks (e.g. Wiessner 1983; Wobst 1977) and/or social organization (e.g. Cashdan 1980)? Similarly, how did hunter/gatherer populations of the Horn adapt to the humid conditions and abundant, predictable resources of the early Holocene when rainfall may have been 50% more than it is today? Were there changes in the degree of hunter/gatherer cultural complexity, as was the case in other regions of the world (Price and Brown 1985)? What stresses, if any, were placed upon early Holocene systems when the Horn experienced another severe arid phase *ca* 8500 years ago, and what role did hunter/gatherers play in the events that led up to the development of food-producing systems in the Horn?

While the limited evidence available in the Horn from such sites as Lake Besaka and Gogoshiis Qabe provides tantalizing bits of information on late Quaternary socioeconomic organization, it is clear that if archaeologists want answers to the questions outlined above they must begin to move away from the short-term, site-specific or small-area research strategies that have characterized past MSA/LSA investigations in the Horn. Instead we need to focus first upon the big picture by developing predictive models of hunter-gatherer adaptation at the macro-regional scale based on detailed studies of past and present environments and resources. Once this is completed the models can be tested by telescoping down to various temporal and spatial scales of analysis, including site-specific micro-scale studies and the obtainment of detailed chronologies and culture-histories (Brandt and Peters in prep.). Although the testing of these models will require archaeologists (and granting agencies) to dedicate themselves to long-term research projects, I am convinced it is only through such avenues of investigation that we will be able to make major contributions towards understanding Upper Pleistocene and early Holocene culture change in the Horn of Africa.

Endnotes

1. The evidence for food production and rock art in the eastern Horn will be the subject of a forthcoming paper by this writer, while the Ethiopian data have been reviewed by Brandt (1984) and Jaussaume (1980).

2. Definitions for the MSA and LSA used in this paper can be found in Clark (1982) and Deacon (1984) respectively.

3. Graziosi (1940) originally named the site Bur Eibe, while Clark (1954) subsequently referred to it as Gure Makeke. The present local name is Gogoshiis Qabe, the 'place of the mat'.

4. Place names are given in official Somali orthography whenever possible. For English readers, *c* is not pronounced (e.g. Ceerigaabo reads Erigabo) while *x* refers to an aspirate *h* (e.g. Xudur reads Hudur).

5. Although correlation of K/Ar dated strata suggest an age of between 181,000 and 149,000 yr for site ETH-72-7B (Wendorf *et al.* 1975), it is of interest to note a TL date of *ca* 97,000 yr obtained from a level of ash and pumice pebbles stratified just below ETH-72-7B. However, this as well as the other TL dates have been rejected as they are argued to be in serious conflict with the stratigraphy (Albritton 1974).

6. The two earliest phases of the Lake Besaka sequence: the 'Later Pleistocene Phase' and 'Terminal Pleistocene Phase', have not been assigned specific taxonomic terms as they are each known from only one site.

7. Robertshaw (1984) mistakenly gives the age of the 'Later Pleistocene Phase' as *ca* 17–10,000 yr.

8. Various authors have commented on similarities between the Lake Besaka assemblages and the Eburran and Elmenteitan (Ambrose 1984) industries of the Central Rift Valley of Kenya, and have even suggested the possibility of some form of contact between these regions (Clark and Williams 1978; Phillipson 1977a:32–33, 1982). However it seems much more likely that future research will show these resemblances to be simply a result of similar technology and identical raw material (obsidian), with the origins of the Ethiopian Blade Tool Tradition lying within the local Ethiopian MSA industries (Clark and Williams 1978).

Acknowledgements

My fieldwork in Somalia was made possible by grants from the L. S. B. Leakey Foundation, the Foundation for Research into the Origins of Man, the University of Georgia Research Foundation, the United States Information Agency (Fulbright Research Award), the Swedish Agency for Research Cooperation and the National Science Foundation (BNS-8419209). In Ethiopia I was funded by grants from the National Science Foundation (to J. D. Clark) and the Wenner Gren Foundation. I would like to thank the Somali Academy of Sciences and Arts and the Ethiopian Centre for Research and Preservation of the Cultural Heritage for permission to do research and for logistical and field support. I would also like to acknowledge the assistance of the American Embassy, USIS and USAID (Somalia), Air Survey and Development (West Germany), HVA Metahara Sugar Estate (Ethiopia), the International Afar Research Expedition, J. D. Clark and the University of California/

Macquarie University Research Expedition to Ethiopia and the field crews and many individuals who made working in the Horn so enjoyable. Melanie Brandt drafted Figs 4, 6, and 7, while Gisela Weis drew Figs 2, 3:22–27 and 5:16–25.

References

Albritton, C. C. 1974. Geological setting. In *A Middle Stone Age Sequence from the Central Rift Valley, Ethiopia* (eds F. Wendorf and R. Schild): pp. 15–27. Warsaw: Ossolineum.

Ambrose, S. H. 1984. The introduction of pastoral adaptations to the highlands of East Africa. In *From Hunters to Farmers: The Causes and Consequences of Food Production in Africa* (eds J. D. Clark and S. A. Brandt): pp. 212–39. Berkeley: University of California Press.

Bailloud, G. 1965. Les gisements paléolithiques de Melka-Kunture (Choa). *Cahiers de l'Institut Ethiopien d'Archéologie*, 1.

Binford, L. 1980. Willow smoke and dogs' tails: hunter-gatherer settlement systems and archaeological site formation. *American Antiquity* 45:4–20.

Blanc, A. C. 1955. L'industrie sur obsidienne des Iles Dahlac, Mer rouge. In *Actes du II Congrès Panafricain de Préhistoire* (ed. L. Balout): pp. 355–57. Paris: Arts et Métiers Graphiques.

Bonnefille, R., Gasse, F., Azema, C. and Denefle, M. 1979. Palynologie et interpretation paléoclimatique de trois niveaux Pleistocene superieur d'un sondage du lac Abhe (Afar-Territoire de Djibouti). *Mem. Mus. natn. Hist. nat.* 27:149–64.

Brain, C. K. 1981. *The Hunters or the Hunted?* Chicago: University of Chicago Press.

Brandt, S. A. 1980. Archaeological investigations at Lake Besaka, Ethiopia. In *Proceedings Eighth Panafrican Congress of Prehistory and Quaternary Studies.* (eds R. E. F. Leakey and B. A. Ogot): pp. 239–43. Nairobi: TILLMIAP.

Brandt, S. A. 1981. *Report of a Paleo-anthropological Reconnaissance of Somalia.* (Unpublished report to the L. S. B. Leakey Foundation).

Brandt, S. A. 1982. *A Late Quaternary Cultural/Environmental Sequence from Lake Besaka, Southern Afar, Ethiopia.* (Ph.D. thesis, University of California, Berkeley). Ann Arbor: University Microfilms.

Brandt, S. A. 1984. New perspectives on the origins of food production in Ethiopia. In *From Hunters to Farmers: The Causes and Consequences of Food Production in Africa.* (eds J. D. Clark and S. A. Brandt): pp. 173–90. Berkeley: University of California Press.

Brandt, S. A., and Brook, G. A. 1984. Archaeological and Paleoenvironmental Research in Northern Somalia. *Current Anthropology* 25:119–21.

Brandt, S. A., Brook, G. A., and Gresham, T. H. 1984. Quaternary paleoenivironments and prehistoric human occupation of northern Somalia. In *Proceedings Second International Congress of Somali Studies* vol. II (ed. T. Labahn): pp. 7–22. Hamburg: Helmut Buske Verlag.

Brauer, G. 1984. A craniological approach to the origin of anatomically modern *Homo sapiens* in Africa and implications for the appearance of modern Europeans. In *The Origins of Modern Humans: A World Survey of the Fossil Record.* (eds F. H. Smith and F. Spencer): pp. 327–410. New York: Alan R. Liss.

Breuil, H., Teilhard de Chardin, P. and Wernert, P. 1951. Le paléolithique du Harar. *L'Anthropologie* 55:219–30.

Brown, F. H. 1975. Barbed bone points from the lower Omo valley. *Azania* 10:144–48.

Butzer, K. W. 1982. *Archaeology as Human Ecology: method and theory for a contextual approach.* Cambridge: Cambridge University Press.

Butzer, K. W., Brown, F. H. and Thurber, D. L. 1969. Horizontal sediments of the lower Omo valley: the Kibish Formation. *Quaternaria* 11:15–29.

Cashdan, E. A. 1980. Egalitarianism among hunters and gatherers. *American Anthropologist* 82:116–20.

Chavaillon, J. 1980. Chronologie archéologique de Melka-Kunture, Ethiopie (fouilles 1972–1976). In *Proceedings Eighth Panafrican Congress of Prehistory and Quaternary Studies* (eds R. E. F. Leakey and B. A. Ogot): pp. 200–01. Nairobi: TILLMIAP.

Chavaillon, J. and Boisaubert, J. L. 1977. Prospection archéologique dans le Gemu-Gofa. *Abbay* 8:3–10.

Chavaillon, J., Chavaillon, N., Hours, F. and Piperno, M. 1979. From the Oldowan to the Middle Stone Age at Melka-Kunture (Ethiopia): understanding cultural changes. *Quaternaria* 21:87–114.

Clark, J. D. 1954. *The Prehistoric Cultures of the Horn of Africa*. Cambridge: Cambridge University Press.

Clark, J. D. 1972. *The Prehistoric Cultures of the Horn of Africa* (reprint). New York: Octagon Books.

Clark, J. D. 1982. The cultures of the Middle Palaeolithic/Middle Stone Age. In *The Cambridge History of Africa* vol. 1, (ed. J. D. Clark): pp. 248–341. Cambridge: Cambridge University Press.

Clark, J. D. and Prince, G. R. 1978. Use-wear on Later Stone Age microliths from Laga Oda, Harraghi, Ethiopia, and possible functional interpretations. *Azania* 13:101–10.

Clark, J. D. and Williams, M. A. J. 1975. *Archaeological and Palaeo-Ecological Field Studies in East-Central Ethiopia (January through March 1974)*. Unpublished Report to the U.S. National Science Foundation.

Clark, J. D. and Williams, M. A. J. 1978. Recent archaeological research in southeastern Ethiopia (1974–1975): some preliminary results. *Annales d'Ethiopie* 11:19–44.

Clark, J. D. and Williamson, K. D. 1984. A Middle Stone Age occupation site at Porc Epic cave, Dira Dawa (east-central Ethiopia). Part I. *African Archaeological Review* 2:37–64.

Clarke, D. L. 1976. Mesolithic Europe: the economic basis. In *Problems in Economic and Social Archaeology* (eds G. Sieveking, I. H. Longworth and K. E. Wilson): pp. 449–82. London: Duckworth.

Dalrymple, G. B. 1969. $^{40}Ar/^{36}Ar$ analyses of historic lava flows. *Earth and Planetary Science Letters* 6:47–55.

Deacon, J. 1984. Later Stone Age people and their descendents in southern Africa. In *Southern African Prehistory and Paleoenvironments* (ed. R. G. Klein): pp. 221–328. Rotterdam: A. A. Balkema.

Dechant, D. and Crader, D. 1982. The faunal remains from Lake Besaka. In *A Late Quaternary Cultural/Environmental Sequence from Lake Besaka, Southern Afar, Ethiopia*. Appendix A. (S. A. Brandt): pp. 332–82. Ph.D. thesis, University of California, Berkeley.

Dennell, R. 1983. A new chronology for the Mousterian. *Nature* 301:199–200.

Dyson-Hudson, R., and Smith, E. A. 1978. Human territoriality: an ecological reassessment. *American Anthropologist* 80:21–41.

Ferry, R. 1981. L'archéologie à Djibouti. *Archéologia* 60:48–52.

Gallagher, J. 1973. Preliminary report on archaeological research near Lake Zuai, Ethiopia. *Annales d'Ethiopie* 9:64–80.

Gallagher, J. P. 1977. *Ethnoarchaeological and Prehistoric Investigations in the Ethiopian Central Rift Valley*. Ph.D. thesis, Southern Methodist University, Dallas.

Gasse, F. and Rognon, P. 1973. Le Quaternaire des bassins lacustres de l'Afar. *Revue Géogr. Phys. Géol. Dyn.* 15:405–14.

Gasse, F., Rognon, R. and Street, F. A. 1980. Quaternary history of the Afar and Ethiopian Rift lakes. In *The Sahara and the Nile* (eds M. A. J. Williams and H. Faure): pp. 361–400. Rotterdam: A. A. Balkema.

Gasse, F. and Street, F. A. 1978. Late Quaternary lake-level fluctuations and environments of the northern Rift Valley and Afar Region (Ethiopia and Djibouti). *Palaeogeography, Palaeoclimatology, Palaeoecology* 24:279–325.

Gautier, A. 1974. Some mammalian remains from a fossil wadi near the base of the Gademotta Formation. In *A Middle Stone Age Sequence from the Central Rift Valley, Ethiopia* (eds F. Wendorf and R. Schild): pp. 160–65. Warsaw: Ossolineum.

Gifford, D. P. 1981. Taphonomy and paleoecology: a critical review of archaeology's sister discipline. *Advances in Archaeological Method and Theory* 4:365–438.

Gillespie, R. and Street-Perrott, F. A. 1983. Post-Glacial arid episodes in Ethiopia have implications for climatic prediction. *Nature* 306:680–83.

Graziosi, P. 1940. *L'Eta della Pietra in Somalia*. Firenze: Centro di Studi Coloniali.

Graziosi, P. 1954. Missione preistorica Italiana in Somalia (Estate 1953). *Rivista di Science Preistoriche* 9:121–23.

Gresham, T. H. 1984. *An Investigation of an*

Upper Pleistocene Archaeological Site in Northern Somalia. M.A. thesis, University of Georgia, Athens.

Hamilton, A. C. 1982. *Environmental History of East Africa*. London: Academic Press.

Harpending, H. and Davis, H. 1977. Some implications for hunter-gatherer ecology derived from the spatial structure of resources. *World Archaeology* 8:275–83.

Hayden, B. 1981. Research and development in the Stone Age: technological transitions among hunter-gatherers. *Current Anthropology* 22:519–48.

Hivernel-Guerre, F. 1976. Les industries du Late Stone Age de la région de Melka-Kontoure. In *Proceedings Seventh Panafrican Congress of Prehistory and Quaternary Studies* (eds B. Abebe, J. Chavaillon and J. E. G. Sutton): pp. 93–98. Addis Ababa: Provisional Military Government of Socialist Ethiopia, Ministry of Culture, Sports and Youth Affairs.

Hours, F. 1976. Le Middle Stone Age de Melka-Kontoure. In *Proceedings Seventh Panafrican Congress of Prehistory and Quaternary Studies* (eds B. Abebe, J. Chavaillon and J. E. G. Sutton): pp. 99–104. Addis Ababa: Provisional Military Government of Socialist Ethiopia, Ministry of Culture, Sports and Youth Affairs.

Howell, F. C. 1982. Origins and evolution of the African Hominidae. In *The Cambridge History of Africa*. vol. 1 (ed. J. D. Clark): pp. 70–156. Cambridge: Cambridge University Press.

Humphreys, G. K. 1978. A preliminary report of some Late Stone Age occurrences in the Lake Ziway area of the central Ethiopian Rift Valley. *Annales d'Ethiopie* 11:45–66.

Jeschofnig, P. and Humphreys, G. K. 1976. Report on the 1973 archaeological survey of the central Ethiopia Rift Valley. *Annales d'Ethiopie* 10:19–23.

Jönsson, S. 1983. *Archaeological Research Cooperation between Somalia and Sweden*. Stockholm: Civiltryck.

Joussaume, R. 1981. L'art rupestre de l'Ethiopie. In *Préhistoire Africaine: Mélanges Offerts au Doyen Lionel Balout* (eds C. Roubet, H. J. Hugot and G. Souville): pp. 159–75. Paris: A.D.P.F.

Joussaume, R., Anfray, F., Bouville, C., Cassen, S. and Baudouin, Y. 1982. *Tiya: Site à Stèles Gravées du Soddo, Ethiopie*. S.E.V.

Keene, A. S. 1979. Economic optimization models and the study of hunter-gatherer subsistence settlement systems. In *Transformation: Mathematical Approaches to Culture Change* (eds C. Renfrew and K. Cooke): pp. 369–404. New York: Academic Press.

Kelly, R. L. 1983. Hunter-gatherer mobility strategies. *Journal of Anthropological Research* 39:277–306.

Klein, R. G. (ed). 1984. *Southern African Prehistory and Paleoenvironments*. Rotterdam: A. A. Balkema.

Kurashina, H. 1978. *An Examination of Prehistoric Lithic Technology in East-Central Ethiopia*. (Ph.D. thesis, University of California, Berkeley). Ann Arbor: University Microfilms.

Laury, R. L. and Albritton, C. C. 1975. Geology of Middle Stone Age archaeological sites in the main Ethiopian Rift Valley. *Geological Society of American Bulletin* 86:999–1011.

Leakey, L. S. B. 1931. *The Stone Age Cultures of Kenya Colony*. Cambridge: Cambridge University Press.

Leakey, L. S. B. 1943. The industries of the Gorgora Rock Shelter, Lake Tana. *Journal of the East Africa and Uganda Natural History Society* 17:199–203.

Lewis, I. M. 1955. *The Peoples of the Horn of Africa* (Ethnographic Survey of Africa: Northeastern Africa, Part 1). London: International African Institute.

Lezine, A. M. 1982. Etude palynologique des sédiments Quaternaires du Lac Abiyata (Ethiopie). *Palaeoecology of Africa* 14:93–98.

Lezine, A. M. and Bonnefille, R. 1982. Diagramme pollinique Holocène d'un sondage du Lac Abiyata (Ethiopie, 7°42′ Nord). *Pollen et Spores*. 24:463–80.

Lorius, C., Jouzel, J., Ritz, C., Merlivat, L., Barkov, N. I., Korotkevich, Y. S. and Kotlyakov, V. M. 1985. A 150,000-year climatic record from Antarctic ice. *Nature* 316:591–96.

Marks, A. E. 1968. The Mousterian industries of Nubia. In *The prehistory of Nubia*, vol. 1, (ed. F. Wendorf): pp. 194–314. Dallas: Southern Methodist University.

McCown, E. *n.d.* Human skeletal remains from Lake Besaka, Ethiopia. *Ms.*

Michels, J. W. and Marean, C. A. 1984. A Middle Stone Age occupation site at Porc Epic cave, Dira Dawa (east-central Ethiopia): Part II. *African Archaeological Review* 2:64–71.

Moysey, F. 1943. Excavation of a Rock Shelter at Gorgora, Lake Tana, Ethiopia. *Journal of the East Africa and Uganda Natural History Society* 17:196–98.

Muir, I. D. and Hivernel, F. 1976. Obsidians from the Melka-Konture prehistoric site, Ethiopia. *Journal of Archaeological Science* 3:211–17.

Mussi, M. 1974–75. Etats des connaissances sur le Quaternaire de la Somalie. *Quaternaria* 18:161–83.

Mussi, M. 1982. Archaeological survey in Southern Somalia. *Nyame Akuma* 20:45.

Mussi, M. 1984. Excavations in southern Somalia. *Nyame Akuma* 24/25:18.

Phillipson, D. W. 1977a. *The Later Prehistory of Eastern and Southern Africa*. London: Heinemann.

Phillipson, D. W. 1977b. The excavation of Gobedra rock-shelter, Axum: an early occurrence of cultivated finger millet in northern Ethiopia. *Azania* 12:53–82.

Phillipson, D. W. 1982. The Later Stone Age in sub-Saharan Africa. In *Cambridge History of Africa*. vol. 1, (ed. J. D. Clark): pp. 410–77. Cambridge: Cambridge University Press.

Phillipson, D. W. 1985. *African Archaeology*. Cambridge: Cambridge University Press.

Price, T. D. and Brown, J. A. (eds) 1985. *Prehistoric Hunter-Gatherers*. Orlando: Academic Press.

Revoil, G. 1882. *La Vallée du Daroor*. Paris: Challamel.

Rick, J. W. 1978. *Heat Altered Cherts of the Lower Illinois Valley* vol. 2. Evanston: Northwestern Archaeological Program Prehistoric Records.

Rightmire, G. P. 1984. *Homo sapiens* in sub-Saharan Africa. In *The Origins of Modern Humans: A World Survey of the Fossil Record* (eds F. H. Smith and F. Spencer): pp. 295–325. New York: Alan R. Liss.

Robertshaw, P. 1984. Archaeology in eastern Africa: recent developments and more dates. *Journal of African History* 25:369–93.

Roubet, C. 1969. Essai de datation absolue d'un biface-hachereau paléolithique de l'Afar (Ethiopie). *L'Anthropologie* 73:503–23.

Roubet, C. 1971. La préhistoire dans la IV mission internationale en Afar (Ethiopie). *L'Anthropologie* 75:324–27.

Simoons, F. J. 1960. *Northwest Ethiopia: peoples and economy*. Madison: University of Wisconsin Press.

Smith, P. E. L. 1982. The Late Palaeolithic and Epi-Palaeolithic of northern Africa. In *The Cambridge History of Africa*. vol. 1, (ed. J. D. Clark) pp. 342–409. Cambridge: Cambridge University Press.

Sutton, J. E. G. 1974. The aquatic civilization of middle Africa. *Journal of African History* 15:527–46.

Testart, A. 1982. The significance of food storage among hunter-gatherers: residence patterns, population densities, and social inequalities. *Current Anthropology* 23:523–37.

Tielhard de Chardin, P. 1930. La paléolithique en Somalie française et en Abyssinie. *L'Anthropologie* 49:331–34.

Torrence, R. 1983. Time budgeting and hunter-gatherer technology. In *Hunter-Gatherer Economy in Prehistory* (ed. G. Bailey), pp. 11–22. Cambridge: Cambridge University Press.

Trinkaus, E. (ed) 1983. *The Mousterian Legacy: Human Biocultural Change in the Upper Pleistocene*. Oxford: BAR International Series, 164.

Vallois, H. V. 1951. La mandibule humaine fossile de la Grotte du Porc-Epic près Diré-Daoua (Abyssinie). *L'Anthropologie* 55:231–38.

Van Campo, E., Duplessy, J. C. and Rossignol-Strick, M. 1982. Climatic conditions deduced from a 150-kyr oxygen isotope-pollen record from the Arabian Sea. *Nature* 296:56–59.

Volman, T. P. 1984. Early prehistory of southern Africa. In *Southern African Prehistory and Paleoenvironments* (ed R. G. Klein): pp. 169–220. Rotterdam: A. A. Balkema.

Wendorf, F., Laury, R. L., Albritton, C. C., Schild, R., Haynes, C. V., Damon, P. E., Shafiqullah, M. and Scarborough, R. 1974. Dates for the Middle Stone Age of East Africa. *Science* 187:740–42.

Wendorf, F. and Schild, R. 1974. *A Middle Stone Age Sequence from the Central Rift Valley, Ethiopia*. Warsaw: Ossolineum.

White, F. 1983. *The Vegetation of Africa* (Natural Resources Research, 20). Paris: UNESCO.

Wiessner, P. 1983. Style and information in

Kalahari San projectile points. *American Antiquity* 48:253–76.

Willey, G. R. and Phillips, P. 1958. *Method and Theory in American Archaeology*. Chicago: University of Chicago Press.

Williams, M. A. J., Bishop, P. M., Dakin, F. M. and Gillespie, R. 1977. Late Quaternary lake levels in southern Afar and the adjacent Ethiopian Rift. *Nature* 267:690–93.

Williams, M. A. J. and Faure, H. (eds) 1980. *The Sahara and the Nile*. Rotterdam: A. A. Balkema.

Williams, M. A. J., Williams, F. M. and Bishop, P. M. 1981. Late Quaternary history of Lake Besaka, Ethiopia. *Palaeoecology of Africa* 13:93–104.

Wobst, H. M. 1974. Boundary conditions for Paleolithic social systems: a simulation approach. *American Antiquity* 39:147–78.

Wobst, H. M. 1977. Stylistic behavior and information exchange. In *Papers for the Director: research essays in honor of James B. Griffin* (ed. C. E. Cleland): pp. 317–42. University of Michigan: Museum of Anthropology, Anthropological Papers, 61.

Yellen, J. E. and Harpending, H. 1972. Hunter-gatherer populations and archaeological inferences. *World Archaeology* 4:244–53.

Zvelebil, M. 1984. Clues to recent human evolution from specialized technologies? *Nature* 307:314–15.