

■ KENYA

Middle Pleistocene sites from the "southern" Kapthurin Formation of Kenya

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Introduction

Fossil and genetic evidence is consistent with an African origin for *Homo sapiens* during the Middle Pleistocene (Stringer and Andrews 1988; Howell 1999; McBrearty and Brooks 2000). One notable feature of the African Middle Pleistocene archaeological record is the end of the long-lived Acheulian Industrial Complex and its replacement by diverse industries of the Middle Stone Age (MSA) (Isaac 1982; Clark 1994; McBrearty 2001). Evidence for a suite of novel behaviors that characterize modern and recent foragers is associated with Middle Pleistocene MSA sites, and the earliest *Homo sapiens* fossils are found with MSA artifacts (see Clark 1988; Deacon and Deacon 1999; McBrearty and Brooks 2000 for recent summaries).

These data suggest significant behavioral changes during the Middle Pleistocene by hominids employing MSA technology. Previously, only broad contrasts between Acheulian and MSA sites were possible due to a lack of African sites with a well-preserved, dated, continuous sedimentary and archaeological record spanning the Acheulian-MSA transition (Clark 1982; Wendorf *et al.* 1994). By examining this transition in detail, we may begin to understand the causes underlying hominid behavioral adaptations that drove this change, as well as begin to test recent hypotheses correlating the advent of the MSA with hominid speciation and dispersal (Foley and Lahr 1997; Lahr and Foley 1998, 2001). Recent research in the Kapthurin Formation of Kenya, which preserves a well-dated sequence of Acheulian and MSA sites, is therefore relevant to this discussion.

The Kapthurin Formation

The Kapthurin Formation is exposed west of Lake Baringo, Kenya, and forms the Middle Pleistocene portion of the Tugen Hills sequence (see Hill 2002 and references therein). Hominid remains have been recovered from sediments bracketed by the Pumice Tuff member (K2) and the 'Grey Tuff,' now dated by the $^{40}\text{Ar}/^{39}\text{Ar}$ method to between 509 ka and 543 ± 4 ka (Deino and McBrearty 2002; Wood 1999). Archaeological sites are attributable to the Acheulian, MSA and possibly Sangoan and Fauresmith. These occur within the Middle Silts and Gravels member (K3) and the overlying Bedded Tuff member (K4), the latter a complex of tuffaceous deposits and intercalated sediment (Tallon 1976, 1978, Cornelissen *et al.* 1990; McBrearty *et al.* 1996; McBrearty 1999; Tryon and McBrearty 2002a). Tephrostratigraphic correlation and a sequence of $^{40}\text{Ar}/^{39}\text{Ar}$ dates on tuff and lava document the temporal succession and age of these sites. This work has demonstrated the complexity of the Acheulian-MSA transition, with interstratified Acheulian and MSA sites, and shown that this transition within the Baringo basin had begun by ~285 ka (Tryon and McBrearty 2002a; Deino and McBrearty 2002).

Prior archaeological research in the Kapthurin Formation focused on exposures north of the Ndaui River, with only cursory examination of more southerly areas (McBrearty *et al.* 1996:566-570). Survey in 2001 focused on ~40 km² of additional geologically mapped Kapthurin Formation sediments (Martyn 1969; Tallon 1976) south of the Ndaui River, an area informally designated the "southern" Kapthurin Formation.

Survey Objectives and Results

Field investigations conducted in the southern Kapthurin Formation were directed at the recovery of additional archaeological sites and fossil collecting localities, as well as detailed tephrostratigraphic observations of the Bedded Tuff member. Walkover survey of known exposures lasted from 8 May-1 June 2001, followed by test trenching at GnJh-75 and Koimilot (GnJh-74). Koimilot was later chosen for full-scale block excavation, with some 52-m² excavated in 2001. Twenty sites, primarily surface scatters, were discovered during the survey, with four sites re-investigated (Table 1 and Figure 1). The

Figure 1: Archaeological and fossil sites from the southern Kaphurin Formation. Included are archaeological and palaeontological sites from the 2001 survey (see Table 1). Localities 26-28 were initially reported by McBrearty *et al.* 1996; plant fossil localities were first reported by Tallon (1976).

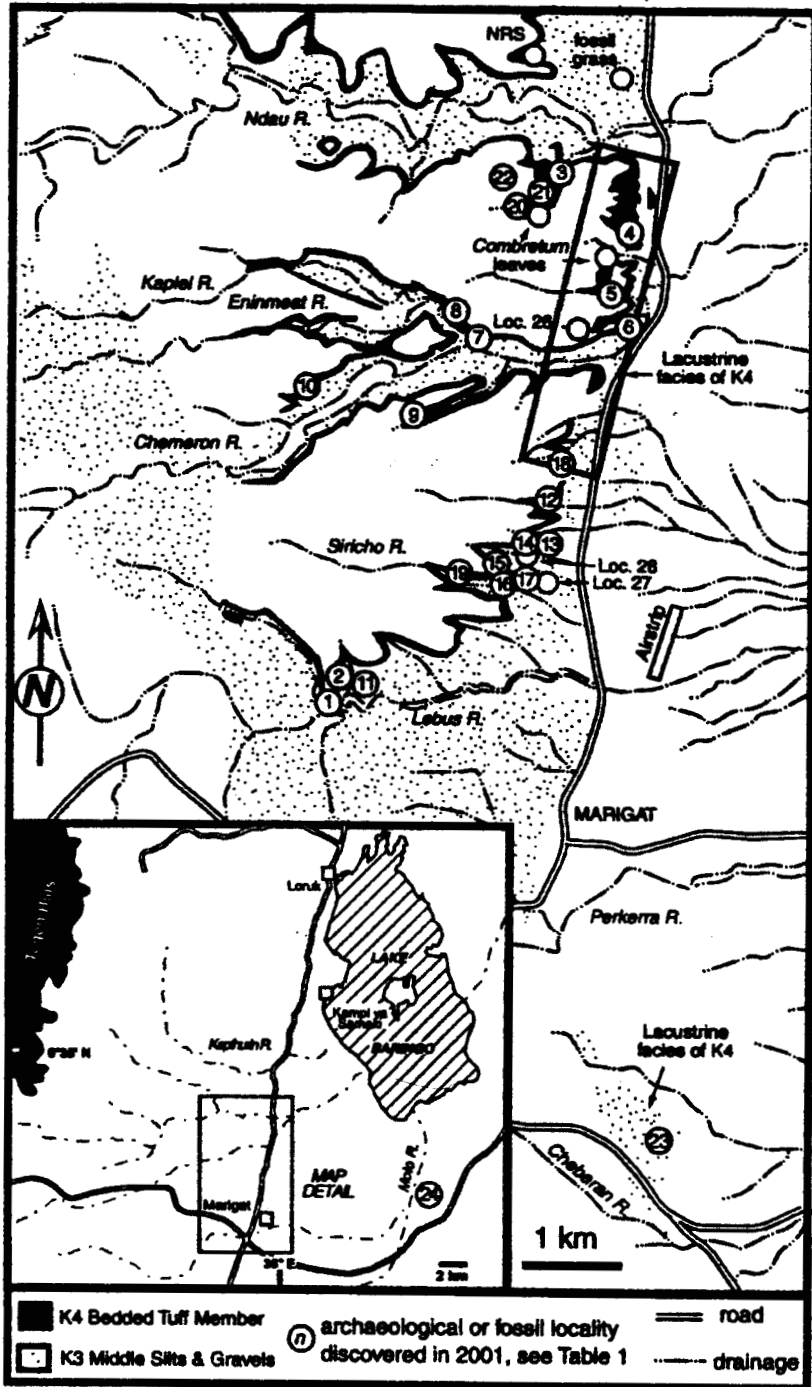


Table 1: Southern Kaphurin Formation sites found during 2001 survey

Map No.	Site Name	SASES	Content	Stratigraphy	Attribution
1	Loc. 39	GoJh-13	artifacts and fauna	K4	Acheulian-MSA
2	Loc. 40	GoJh-12	artifacts and fauna	K3	Acheulean
3	Loc. 100	GnJh-64	artifacts	K4	?Sangoan-MSA
4	Loc. 101	GnJh-65	artifacts and fauna	K3	Acheulian
5	Loc. 102	GnJh-66	artifacts and fauna	K3	Acheulian
6	Loc. 103	GnJh-67	artifacts and fauna	K3	Acheulian
7	Loc. 104	GnJh-68	artifacts	K3	Indeterminate
8	Loc. 105	GnJh-69	artifacts	K3 and K4	?Acheulian
9	Loc. 106	GnJh-70	artifacts	K3	Indeterminate
10	Loc. 107	GnJh-71	artifacts	K3	Acheulian-MSA
11	Loc. 108	GoJh-6	artifacts	K4	Acheulian
12	Loc. 109	GnJh-72	fauna	K3	N/A
13	Loc. 110	GnJh-73	artifacts and fauna	K3	?MSA
14	Loc. 111	GoJh-7	artifacts and fauna	K3	Acheulian
15	Loc. 112	GoJh-8	artifacts and fauna	K4	Acheulian
16	Loc. 113	GoJh-9	fauna	K3	N/A
17	Loc. 114	GoJh-10	artifacts	K3	Acheulian
18	Loc. 115	GnJh-76	artifacts	K4	Acheulian
19	Loc. 116	GoJh-11	artifacts	K4	Acheulian
20	Loc. 117	GnJh-75	artifacts and fauna	K4?	MSA
21	Koimilot (Loc. 118)	GnJh-74	artifacts and fauna	K4	MSA
22	Loc. 119	GnJh-77	artifacts	K4	MSA
23	Nyogonyek	GoJh-1	artifacts and fauna	K4/Holocene sed.	MSA-LSA
24	Logumkum	GoJi-7	artifacts and fauna	Ilosowuani Fm.	MSA-Recent

approximate spatial extent of each site was determined in the field, as was sedimentary and stratigraphic context. A Magellan 315 GPS unit provided precise locational data, and artifacts useful for attribution of a site to period or industry were collected. Artifacts and fossils are presently housed at the Archaeology Division of the National Museums of Kenya (NMK) in Nairobi.

Southern Kapthurin Formation Paleontology and Archaeology

The 2001 survey was successful in identifying a suite of previously unknown paleontological and archaeological localities from southern exposures of the Kapthurin Formation. Sites occurred within alluvial and lacustrine sediments, in multiple temporal/stratigraphic contexts. Although *in situ* fossils were observed and recovered from multiple localities, fossil fauna are generally neither abundant nor well preserved in the southern Kapthurin Formation. Plant fossils are occasionally found, at times in growth position, within layers of air-fall tuff (Tallon 1976, personal observation). Two tephra layers rich in both grass and leaf impressions bracket the excavations at Koimilot.

Archaeological variability in the southern Kapthurin Formation is comparable to that found north of the Ndau River (e.g. Cornelissen 1992; McBrearty *et al.* 1996; McBrearty 1999). Sites attributable to the Acheulian Industrial Complex are well represented by handaxes and cleavers, produced from a range of fine-to-coarse grained lavas. These implements were produced from side and end-struck flakes, from cobbles (GoJh-12) and the Kombewa method (GnJh-76). A large Levallois flake, similar to those used for handaxe production at LHA (Leakey *et al.* 1969) was also recovered *in situ* from within the Bedded Tuff at GnJh-62. Picks, found in the Acheulian but often considered characteristic of the Sangoan, were found *in situ* at GnJh-66, and have been reported from elsewhere in the Kapthurin Formation (Cornelissen 1995). Cores include a variety of single and multiple platform, discoidal and rare Levallois types.

Middle Stone Age sites from the southern Kapthurin Formation include sparse surface scatters

containing rare points and Levallois cores at GoJh-13 and GnJh-71, and more extensive surface scatters at Logumkum (GoJi-7), Nyogonyek (GoJh-1), and Koimilot (GnJh-74). Artifacts from Logumkum (Logumkum IV of Farrand *et al.* 1976) include Levallois and discoidal cores, Levallois points as well as scrapers and bifacial points made on Levallois flakes; rare artifacts are of obsidian. These lie on an up-faulted sedimentary sequence of lacustrine sediment and tuff, assigned to the Ilosoiwani Formation (Tiercelin and Vincens 1987; Le Turdu *et al.* 1995). Nyogonyek is a large eroded area containing multiple dense patches of artifacts, many of them typologically Later Stone Age, first reported by Farrand *et al.* (1976). An artifact concentration discovered in 2001 consists of numerous Levallois cores, flakes and points, produced by lineal as well as convergent and unipolar recurrent methods (cf Boëda 1994). The artifacts are apparently within down-faulted sediments of a lacustrine facies of the Middle Silts and Gravels member (Tallon 1976; Farrand *et al.* 1976; McBrearty 1999).

Excavation at Koimilot (GnJh-74) recovered two stratified MSA assemblages (Tryon and McBrearty 2002b) (Figures 3 and 4). Over 2000 artifacts were recovered from the 36-m² excavation at Locus 1, the stratigraphically lower of the two assemblages. Artifacts occur in a ~10-cm-thick horizon within fine-grained overbank sediments, with refitting sets from within the excavated area as well as between the excavation and surface finds. Isolated teeth and tooth fragments comprise the recovered fauna. The lithic assemblage consists of casually flaked large cobbles, as well as a dense debitage concentration and associated centripetally flaked cores that apparently reflect a Levallois mode of flake production. Retouched pieces are rare. Locus 2 is adjacent to and stratigraphically higher than Locus 1 (Figures 3, 4 and 6). The 12-m² excavation recovered ~150 artifacts from within a 10-cm-thick zone from five of the excavated meters. Artifacts are associated with fine-to-coarse sands, and include large (max. length ≥ 10 cm) Levallois points and elongated flakes, a centripetally flaked Levallois core, a blade core and ochre. Future research will systematically explore differences observed between Locus 1 and Locus 2 at Koimilot, as well as comparison of these assemblages with other sites, seeking to document

and explain temporal or functional variability within the MSA.

Tephrostratigraphy

Multiple tephra samples were collected from measured stratigraphic sections, and energy-dispersive electron microprobe (EMP) analysis is currently in progress, using equipment housed at the Kline Geology Laboratories, Yale University. Preliminary field stratigraphic, petrographic and EMP analysis of glass geochemistry suggest that tuffs underlying the archaeological deposits at Koimilot are comparable to the "upper basaltic" portions of the Bedded Tuff identified by Tryon and McBrearty (2002a). Importantly, this makes Locus 1 and Locus 2 at Koimilot, both assigned to the MSA, the youngest excavated assemblages thus far from the Kapthurin Formation, as all other known sites underlie these "upper basaltic" Bedded Tuff deposits. Additional tephra at Koimilot include deposits not previously observed. These include the "Koimilot tuff" and basaltic tuff deposits that are not part of the established tephrosequence of the Bedded Tuff member. The "Koimilot tuff" serves as a local marker bed, and is a fine-grained dacitic tuff which likely has a distant source outside the Baringo basin, offering the potential for long distance correlation such as has been achieved with deposits in the Lake Turkana basin (e.g. Brown 1994; Feibel 1999).

Additional preliminary EMP analyses have been undertaken for tephra at Logumkum, Nyogonyek and GoJh-12. Ash deposits at Logumkum are unlike any presently known from the Kapthurin Formation, while those at Nyogonyek and GoJh-12 are tentatively identified as Bedded Tuff, with confirmation pending subsequent laboratory reanalysis as well as the collection of additional field samples.

Conclusions

The end of the Acheulian is a major Middle Pleistocene archaeological event. The highly resolved stratigraphic record of the Kapthurin Formation provides the opportunity to examine basic issues of the chronology of the Acheulian to Middle Stone Age transition (Deino and McBrearty 2002; Tryon and McBrearty 2002a). Construction and comparison of local sequences of archaeological and paleoecological change, such as those from the

Kapthurin Formation and Kalambo Falls (Clark 2001) is a necessary step for the formulation of hypotheses regarding hominid behavioral adaptations during and subsequent to the Acheulian-MSA transition. The additional sites discovered during the survey of the southern Kapthurin Formation, as well as excavation at Koimilot, expand both the site sample, as well as the time span of observable archaeological change in the Baringo basin.

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