Prehistory of Northeastern Africa
New Ideas and Discoveries
Studies in African Archaeology 11
Poznań Archaeological Museum 2012

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Loiyangalani: A Cultural Isolate in the Middle Stone Age of Northern Tanzania

The Loiyangalani site (SASES identity HcJd1) is a predominantly Middle Stone Age (MSA) occurrence located in the Serengeti National Park, Tanzania. The site lies in the floodplain of the Loiyangalani River a short distance east of its juncture with the Mbalageti River which flows westward to Lake Nyanza (cf. Victoria). Just upstream of this confluence the Loiyangalani has cut a gap through a quartzite ridge bordering the western edge of the plains, a gap through which the renowned Serengeti migration passes on its way westward around the end of the annual long rains (March to May). Thus, the site is strategically located from a predator's perspective, as is confirmed by the habitual presence of numerous live carnivores, particularly lions and hyaenas, in the vicinity of our excavations.

The Loiyangalani site was discovered by one of us (JB) in the course of an archaeological survey of the Serengeti National Park in 1977 (Bower and Gogan-Porter 1981). It was first tested over a three-week period in 1979 (Bower 1985), followed by additional tests in 2000 and 20003, each of which also spanned three weeks. A small block excavation was opened in 2004 and enlarged in 2005, at which time further test trenches were also excavated. The excavation layout shown in Fig. 1 represents all but the full array of 1979 test trenches, the bench mark for which had disappeared by 2000. However, a surface expression of one of the 1979 test pits has been located (1979 Test Unit 1), making it possible to correlate data from the initial test with more recent finds. Fig. 2 illustrates the relationship between the excavation area and the present channel of the Loiyangalani River.

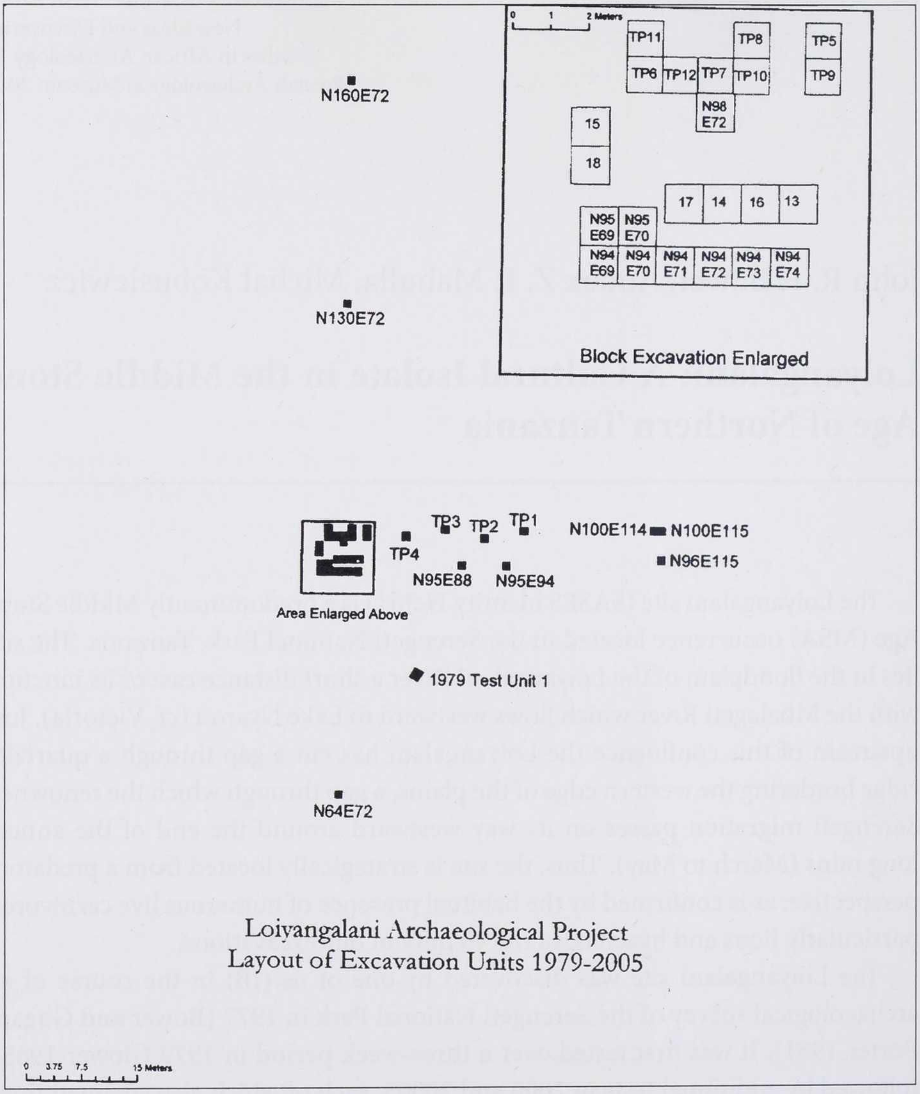

Fig. 1. Layout of Excavation Units (HcJd1).

The five episodes of excavation have recovered both MSA and Later Stone Age (LSA) material, but the latter is generally sparse and largely confined to the uppermost stratigraphic unit so far exposed. Overall, the excavated remains are mainly of MSA character and have been recovered from deposits that are, for the most part, stratigraphically isolated from LSA bearing sediments. The total surface area so far excavated amounts to 47 m^2, with penetration to depths ranging from about

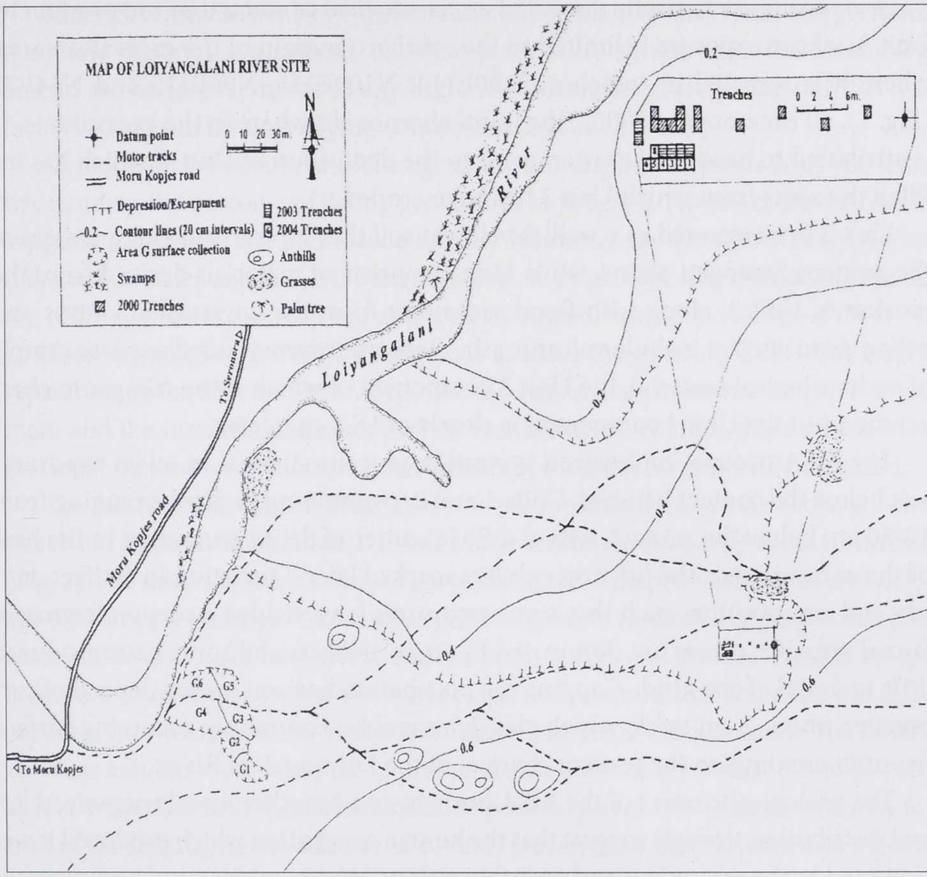

Fig. 2. Map of Environs (HcJd1).

1-1.5 m. Thus, the volume of excavated sediments amounts to about 59 m^3, of which only about 10% (5.9 m^3) sampled the MSA occurrence.

The site's archaeological remains are contained in highly alkaline deposits (pH of 9 and above), which accounts for the excellent state of preservation evident in much of the faunal remains. The stratigraphic and sedimentary context of MSA material exposed in each of the five episodes of excavation is essentially the same, although some of the 2005 test pits revealed a unit that was absent from all other exposures. The MSA-bearing sediments, designated Unit 1, are interpreted as proximal overbank alluvial floodplain deposits, with an upper limit at about 90-100 cm below surface and a lower limit that exceeds 150 cm below surface, where the water table was reached. Overlying these sediments are about 50 cm of more distal floodplain deposits (Unit 2) with a marked prismatic to blocky structure.

These deposits are basically devoid of archaeological content; they are overlain by Unit 3, whose exposure is limited to the southern margin of the excavation area, where it is revealed in trenches N100E114, N100E115, N96E115 and N64E72 (Fig. 1), all excavated in 2005. The units' absence elsewhere in the excavations is attributed to headward erosion prior to the deposition of Unit 4, which has infilled the areas from which Unit 3 has been eroded.

Unit 3 is interpreted as a well-developed soil that supports the long grasses of the western Serengeti plains, while Unit 4 consists of materials derived from the erosion of Unit 3, along with flood sediments from the Loiyangalani River and eolian deposits that include volcanic ash. Both units have yielded a sparse sample of archaeological material, the Unit 3 component of which is too meager to characterize, but the Unit 4 component is clearly of LSA character.

The MSA occupation horizon is stratigraphically situated in all its exposures just below the contact between Units 1 and 2, penetrating to depths ranging from 10-30 cm below the contact, with a diffuse scatter of debris extending to the base of the excavations. The horizon exhibits marked lateral variation in artifact density and composition, such that some exposures have yielded a preponderance of faunal remains, others are dominated by stone artifacts and some have produced little material of any kind. Capping the occupation horizon is a lag deposit of carbonates, about 2 cm thick, which closely resembles commonly occurring surface deposits proximal to the present channel of the Loiyangalani River.

The geological context of the MSA horizon and its rather loosely organized lateral distribution strongly suggest that the human occupation which produced it was restricted to the dry season and probably reflects ephemeral foraging occupancy of the floodplain, rather than habitation. This inference is supported by characteristics of the MSA lithic assemblage presently to be discussed. However, before turning in that direction, a brief comment on the LSA occurrence is in order.

As previously noted, the LSA material so far recovered from the Loiyangalani site is sparse, consisting essentially of a light scatter of stone artifacts and fragmentary faunal remains that are basically confined to Unit 4, the uppermost stratigraphic layer, but may also be represented in the underlying Unit 3. Although the LSA sample is too limited to admit of taxonomic identification, several features of its lithic assemblage deserve comment because of their bearing on the distinctiveness and integrity of the MSA horizon. The preferred LSA raw material was vein quartz, but obsidian is represented in the assemblage. Both the débitage and the formal tools are essentially microlithic, averaging 1-2 cm in maximum diameter, and backed elements such as segments and triangles are included.

The MSA lithic assemblage differs radically in all respects. Thus, the predominant raw material is quartzite, obsidian is virtually absent from the assemblage and so are backed elements of any kind. Moreover, the average size of MSA artifacts is substantially larger, lying somewhere around 3-5 cm.

Chronometric assessment of the age of the Loiyangalani deposits is, as yet, tentative pending the outcome of dating procedures in progress. However, the dates so far available indicate a final Pleistocene to early Holocene age for Unit 4 based on two radiocarbon dates and an OSL determination. A single OSL determination near the top of Unit 1, where the MSA horizon is concentrated, has yielded an age of 65 +/- 4.4 ka (Feathers and Fusch 2005). Taking into account the generally clear stratigraphic separation of the LSA and MSA deposits, the substantial chronometric gap between them and the marked differences in their archaeological content, there is little room for doubt that the two occurrences are culturally distinct and essentially unmixed.

The MSA artifact assemblage consists predominantly of stone tools, most of which are basically unabraded, but some have moderate to heavily abraded surfaces (Fig. 3). All classes of lithic artifacts are represented – shaped tools, cores and débitage that range from large flakes and angular fragments to nondescript, pointed pieces on flakes and flake fragments, such as becs, borers and burins. Various scraper forms are also represented in the assemblage: endscrapers, side scrapers, etc. Cores are rare; they include a few radial specimens and some bipolar cores. The macro-débitage exhibits clear evidence of prepared core technology (radial, Levallois, etc.) as is also the case with the aforementioned pointed pieces. Another noteworthy feature of the débitage is the scarcity of cortical pieces; their limited presence, together with the low incidence of cores, suggests that flint-knapping activities at the site were largely confined to tool repair and final stages of tool preparation, while earlier stages of lithic reduction were usually performed elsewhere, probably at habitation sites. This aspect of the Loiyangalani lithic assemblage supports the previously mentioned inference of seasonal foraging activity rather than habitation.

As also noted earlier, the predominant raw material is fine-grained quartzite, while quartz represents a minor part of the lithic assemblage. The lithic data shown in Figure 3 were obtained through analysis of the piece-plotted artifact assemblage recovered by the 2003 excavations; they are broadly consistent with an analysis of the 1979 assemblage (Bower 1985) and cursory examination of all other excavated samples.

Also included in the MSA assemblage are a few worked bone pieces and several ochre (mainly hematite) pencils, one of which includes an embedded quartz flake of undetermined purpose. Three complete ostrich eggshell beads and two fragmentary

CHARACTERISTICS OF THE 2003 PIECE-PLOTTED LITHIC ASSEMBLAGE

ÉTAT PHYSIQUE (N = 221)

UNABRADED (#/%)	<10% (#/%)	10-40% (#/%)	>40% (#/%)
138/62.4%	63/28.5%	17/7.7%	3/1.3%

CORTEX (N=221)

NONE (#/%)	<10% (#/%)	10-40% (#/%)	>40% (#/%)
190/86.0%	2/00.9%	13/5.8%	16/7.2%

RAW MATERIAL (N=238)

QUARTZITE (#/%)	QUARTZ (#/%)	OBSIDIAN (#/%)	OTHER (#/%)
186/78.2%	50/21.0%	1/00.4%	1/00.4%

TYPOLOGICAL SUMMARY

TYPE (#)*	#	%
Scrapers (1, 2, 4, 6, 7, 8, 12)	18	07.6
Various Other Formal Tools (17, 37, 43)	4	01.6
Burins (39)	7	02.9
Becs (44)	25	10.5
Composite Tools (46, 48)	7	02.9
Outil Ecaillés (49)	2	00.8
Other Modified Pieces (53, 54)	3	01.2
Cores (57, 62, 68, 71, 74)	8	03.4
Débitage (78, 84, 86)	110	46.2
Utilized (79, 85, 89)	35	14.7
Pestle Rubber (98)	1	00.4
Stream Pebbles (105)	18	07.6
TOTAL	238	99.8

*Mehlman's Types (1989)

Fig. 3. Analysis of the Loiyangalani 2003 Lithic Assemblage.

specimens have been recovered, but their association with the MSA assemblage is open to question, as a radiocarbon determination on one of the fragments yielded an uncalibrated age of 13, 920 +/- 70 years BP (Woodborne 2004).

The Loiyangalani faunal assemblage is of particular interest not only because of its generally well-preserved condition, but also because of its rarity as an open air MSA occurrence probably reflecting episodic foraging activity, rather than habitation. Analyses of the Loiyangalani fauna to date (Bower 1985; Bower and Marean 1994; Thompson *et al.* 2004) indicate that rapid burial with little redeposition characterizes the assemblage. Cut, percussion and tooth marks point toward a complex history of both human and carnivore interactions. Small and large bovids, equids, carnivores and a wide range of non-identifiable mammals are all represented, with size 2 bovids predominant. From the data that are presently available, it seems that humans were the primary bone accumulators, though non-human carnivores also contributed to the faunal debris.

The Loiyangalani fish remains are significant because of their general absence or rarity at other MSA sites. Although it is likely that some of the fish remains accumulated naturally in the alluvial deposits, examination of the fish from the 2000 season has revealed at least one specimen displaying possible human modification. Though most of the elements were very fragmented, a total of 415 fish elements have so far been identified. The assemblage was virtually monotaxic, with 98% of the identifiable elements represented by *Clarias* – catfish.

Turtle remains all represent the Pelomedusidae, a family of side-necked semi-aquatic mud turtles that inhabit shallow, slow-moving or marshy freshwaters. They estivate in the mud during seasonal drying and may be found along rivers or even in nearly-dry water holes. Several fragments of carapace and plastron appear to have been modified by humans, as evidenced by cut marks.

In summary, the data so far recovered by the Loiyangalani excavations appear to represent a human population that existed around 65 ka, practiced MSA lithic technology, seasonally exploited a broad spectrum of faunal resources that spanned not only various mammalian forms but also aquatic species and produced a non-lithic material culture that included bone artifacts, ochre pencils and perhaps ostrich eggshell beads. How does this compare with the regional picture of the MSA in northern Tanzania? To answer this question, we turn to the two nearest, well-documented MSA-bearing sites: Mumba rock shelter, approximately 100 km south of the Loiyangalani site, and Nasera rock shelter, about 70 km east of our site. Both have been extensively excavated by Mehlman (1989), who has described MSA archives at the two sites that are broadly comparable in age and typology with the Loiyangalani occurrence.

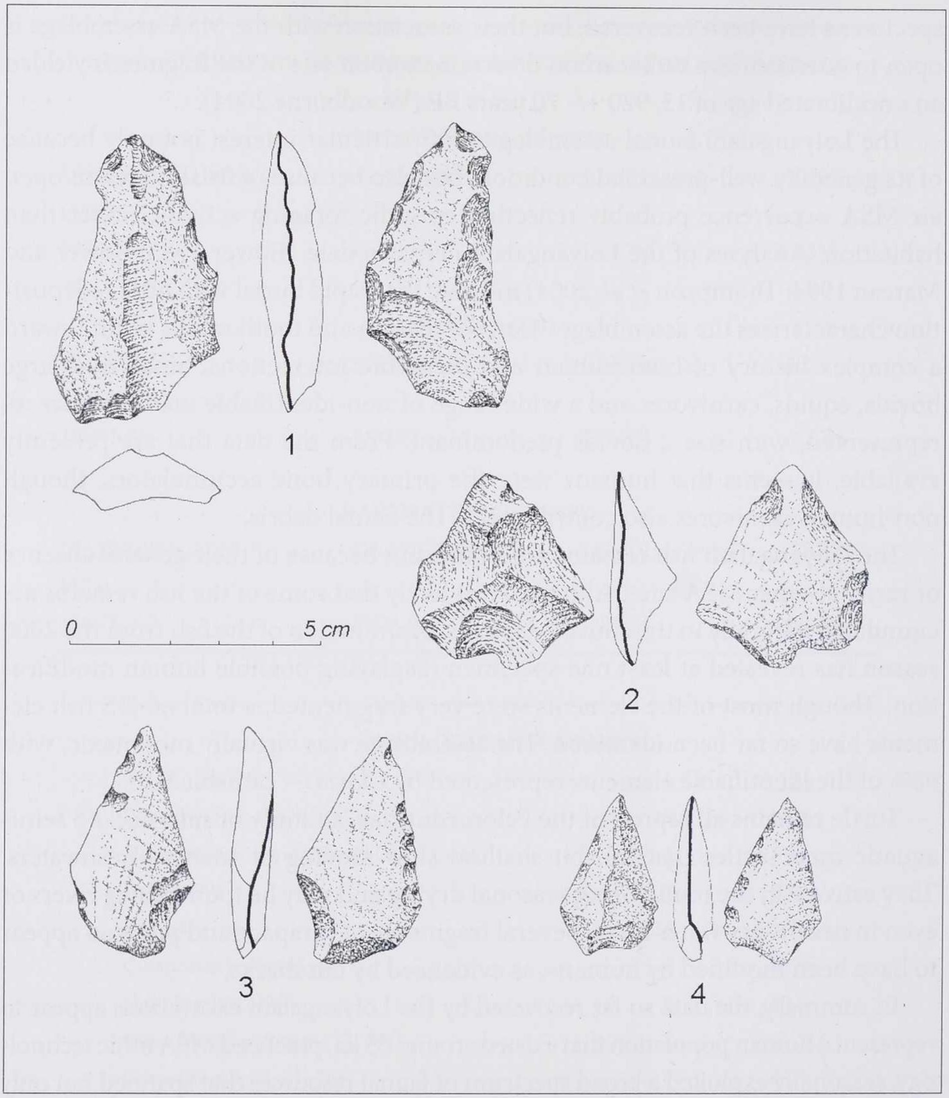

Fig. 4. Loiyangalani Points.

The MSA sequence at the Mumba shelter comprises three industries: in chronological order from oldest to youngest, Sanzako, Kisele and Mumba. The Nasera sequence includes all but the Sanzako industry, which Mehlman (*op. cit.*) has characterized as "early MSA" based on its macrolithic content and dates of around 130 to 100 ka. At the other end of the sequence, the Mumba industry is characterized as transitional MSA/LSA based on the inclusion of such typological features of LSA aspect as backed geometric pieces combined with artifacts of distinctly MSA character and dates of around 45 to 30 ka.

Bracketed between these two industries is the Kisele industry, which is present at both sites, is typologically MSA *sensu stricto* and is dated to about 110 to 45 ka (Mehlman *op. cit.*:297). Although Mehlman's chronology may be open to revision (cf. McBrearty and Brooks 2000), the closest regional match to the Loiyangalani MSA in both cultural aspect and "best estimate" chronology is clearly the Kisele industry. But despite probable chronological overlap and broad technological resemblance between the two occurrences, they differ markedly in typology. For example, the salient typological elements of the Kisele formal tool inventory include scrapers and both bifacial and unifacial points, while the Loiyangalani assemblage is dominated by nondescript "pointy" pieces (becs, borers, etc.). Moreover, to the extent that points are represented in the Loiyangalani MSA, they differ typologically (and possibly functionally) from the Kisele points. As shown in Figure 4, the "typical" Loiyangalani point is shaped on a corner struck flake, is basically unifacial except for bulbar thinning (for hafting?) and has a distinctly asymmetrical, almost "shouldered" configuration.

Other notable differences between the Kisele and Loiyangalani lithic assemblages include crudely geometric, backed elements and occasional obsidian pieces from sources in Kenya, both evident in the Kisele industry but virtually absent from the Loiyangalani MSA. The absence of obsidian from the Loiyangalani raw material inventory is particularly noteworthy in view of the fact that this material is evident in the Mumba and Nasera sequences all the way from earliest MSA through LSA levels and is also present in Serengeti LSA occurrences that are widely distributed in space and time. Thus, the absence of obsidian from the Loiyangalani MSA is a distinct anomaly. It is worth noting that, while regional variation in MSA lithic industries is well documented throughout Africa (Clark 1988; McBrearty and Brooks 2000), MSA industrial variation on the small geographic scale evident in northern Tanzania has rarely, if ever, been detected elsewhere in the continent.

What accounts for the striking dissimilarities between the more or less neighboring Kisele and Loiyangalani MSA occurrences? One possibility that could be suggested stems from the fact that the Loiyangalani archive is regionally exceptional as an open air site and is also so far the only such occurrence in northern Tanzania to have been investigated in some depth. This, together with evidence pointing toward a non-residential, basically food gathering range of human activity at the Loiyangalani site, suggests that the difference could reflect behavioral variation related to settlement type.

While the data needed for definitively testing such a hypothesis are presently unavailable, we can point toward evidence that tends to support the null hypothesis. This is the fact that all surface occurrences of the MSA that we have observed in the western Serengeti Plain exhibit the distinguishing typological features of the Loiyangalani MSA, as recognized in the formal definition of the Loiyangalani industry (Bower 1985: 47). It is extremely unlikely that none of the occurrences in question were habitation sites. This being the case, the distinctive features of the Loiyangalani industry are decoupled from the difference between habitation behavior and the activities that characterize ephemeral foraging episodes.

It could also be argued that the typological distinctions between the Kisele and Loiyangalani industries are attributable to differences in predominant raw material (quartz in the former, quartzite in the latter). Although this argument is as yet untested, it is intuitively unlikely that manufacturing constraints account for the two most salient typological contrasts between the industries, namely, the marked differences in point form and the absence of backed elements from the Loiyangalani industry.

Perhaps a more plausible hypothesis is simply that the human population represented by the Loiyangalani MSA, if not the more broadly distributed Loiyangalani industry, was somehow isolated from neighboring MSA populations, as represented by the Kisele industry. This could account for not only marked typological differences between the Kisele and Loiyangalani industries but also the absence of obsidian from the latter, since the former is geographically situated between the Loiyangalani area and the Kenya obsidian sources.

If the Loiyangalani industry represents an isolated human population, what was the nature of the barrier that separated it from neighboring people? What gave rise to the barrier? In the present state of knowledge, answers to such questions are necessarily speculative. On this basis, we propose a scenario that is rooted in well-documented environmental and human demographic crises from which antagonistic relations could have emerged.

The scenario is derived in part from Ambrose's (1998) inference concerning the human demographic consequences of the climatic catastrophe caused by the eruption of Mt. Toba (Sumatra) about 71-70 ka. Ambrose notes that the human population bottleneck revealed at about this time by genetic studies of living populations (Harpending et al. 1993) may have been caused by the "volcanic winter" brought on by Toba's immense pyroclastic cloud. In such a case, the largest surviving populations would probably have been found in isolated tropical refugia, such as East Africa. Within that region, the inhabitants of the western Serengeti Plain may well have occupied a favored location with respect to food resources, an area from which they may have felt it necessary to exclude neighboring populations. In so doing, they may have established a social identity that united them in opposition to all others whom they wanted to exclude from their highly valued foraging grounds. In other words, they may have constituted an identity conscious group – anthropologically speaking, a tribal culture whose members were "the people" as against all others, toward whom a generalized antagonistic sentiment could have resulted in a measure of mutual avoidance, leading to isolation of the Loiyangalani culture.

We are, of course, aware that this scenario smacks a bit of science fiction. Nevertheless, we feel it deserves consideration because of its possible bearing on the complex issues that have arisen in modern human origins (MHO) research. As one of us has proposed (Bower 2008), some of the more vexatious problems in this arena of inquiry hinge on our ability to identify the time and circumstances from which culture in the anthropological sense emerged. For the birth of culture was clearly an inflection point in human biocultural evolution, broadly comparable in significance with such landmark developments as the origins of bipedalism, the dawn of technology, the emergence of food production and so on. And one of the key attributes of culture in the anthropological sense is its partitioning into cultures. Thus, early archaeological indications of such partitioning may help lead us toward an understanding of the causes and consequences of the birth of culture.

In closing, we would like to draw attention to some broader implications of our speculations concerning the Loiyangalani MSA. Specifically, we call attention to a recent paper by the psychologist Jonathan Haidt (2007) concerning the new synthesis in moral psychology. Among various observations he offers that relate to our scenario for the emergence of identity conscious groups, one that refers to group selection seems particularly noteworthy; we quote: "If group selection did reshape human morality, then there might be a kind of tribal overlay – a co-evolved set of cultural practices and moral intuitions that are not about how to treat other individuals but about how to be part of a group, *especially a group that is competing with other groups*" (ital. added).

Acknowledgements

We wish to acknowledge contributions from many individuals who should not be held responsible for errors or omissions in this paper, but without whose work on the Loiyangalani project the paper could not have been written. Included are the following, with apologies in advance for any inadvertent omission: Jan Bower (research administrator), Pastory Bushozi (lithic analyst), Erich Fisher (GIS specialist), Curtis Marean (faunal analyst), Joanna Sawicka (illustrator), Kathy Stewart (fish analyst), Jessica Thompson (faunal analyst), Carl Vondra (geologist) and many volunteer excavators and University of Dar es Salaam archaeology field school students too numerous to list here. Also deserving appreciation is the Luminescence Dating Laboratory (James Feathers, Director), University of Washington, for providing OSL dates and two other labs (CSIR Environmentek, Beta Analytic) for radiocarbon dating services. We also extend thanks to the following organizations that have supported the Loiyangalani project over the years: LSB Leakey Foundation, Marshalltown Trowel Company, National Geographic Society, Sabes Family Foundation, Serengeti Genesis, Serengeti National Park, Tanzania Antiquities, University of California UREP Program, University of Dar es Salaam (Tanzania) and Wenner-Gren Foundation for Anthropological Research.

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