

Obsidian Use in Archaeology: A New Insights from Ethnoarchaeological Perspective in Lake Eyasi Basin, Northern Tanzania

Musa S. Mwitondi¹, Hassan H. Kihanzah², Hildegarda Lelio³ & Pastory M. Bushozi⁴

¹*Department of Archaeology and Heritage Studies, University of Dar es Salaam, Tanzania*
(*mussachiko@gmail.com*)

^{2,3,4}*Department of Archaeology and Heritage Studies, University of Dar es Salaam, Tanzania*

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Abstract

Obsidian, a material of enduring archaeological fascination, has been the research focus due to its diverse applications within ancient societies. Its presence at archaeological sites has led scholars to attribute various uses to it, particularly during the Middle and Later Stone Age. This study was conducted to shed light on the social-cultural and symbolic utilization of obsidian in the Lake Eyasi Basin, revealing its intricate role in early and contemporary cultures. The investigation occurred in Mang'ola ward, Karatu District, and Olpiro village within the Ngorongoro Conservation Area (NCA) in the Arusha Region. Ethnographic data and direct observations were conducted on the Datoga people of Lake Eyasi Basin, with participants deliberately selected from diverse age groups. The research uncovered the multifaceted uses of obsidian, revealing that it serves as a protective shield against bad omens and evil spirits, and wards off misfortune.

Keywords: Obsidian, Ethnoarchaeological, Lake Eyasi Basin, Tanzania

Introduction

Datoga is the generic name of a large number of small, scattered groups of pastoralists found in northern Tanzania. They regard themselves as Datoga or Tatoga, but their neighboring groups also refer them to as Taturu (Moffett et al., 1952). Collectively, Datoga associates themselves with Nilo-Saharanans who migrated from the Horn of Africa. From the Horn of Africa, they moved down to Kenya (descendants of modern Nandi), and northern Tanzania, specifically in Ngorongoro, Eyasi Basin, Karatu, Hanang, and Mbulu districts (Ndagara, 1991). The Datoga settled peacefully on the slopes of Hanag Mountain in the Mbulu District where the first groups to arrive were Bajut or Abajuta, around 300 years ago (Moffett et al., 1952). The Buradik, the eponymous founder of the largest group of the Barabaig arrived at Eyasi Basin and Hanang and found that the region was already inhabited by the Daregwajega clan who used the landscape surrounding the Lake Eyasi Basin for grazing (Moffett et al., 1952).

The settlement of the Datoga in the Lake Eyasi Basin was primarily influenced by the enormous grazing pastures and ubiquitous natural springs for their herds. The arrival of other Datoga groups, such as the Simjega and Abajuta brought significant conflicts and competition over rangeland. The Abajuta (*Watemi*) usually moved with a large number of herds leading to the confrontation with other clans, specifically the Daregwajega. Oral account has it that in one incident, the chief of the Abajuta clan went to the Daregwajega *boma* to claim his two astray cattle but ended up being beaten. Such an act angered the chief's sister, who used the magic power "*bomb*" to destroy the Daregwajega clan, including the stone structures at Olpiro and Oldogom, and turned Lake Eyasi water saline. Such destruction occurred in the 10th generation (approximately 300 years ago) (Moffett et al., 1952). The few Daregwajega survivors of the Olpiro and Oldogom massacre moved from their ancestral region to other places in central Tanzania, especially the Singida region.

Ethnographic evidence indicates that the Datoga people use objects including beads and necklaces made on ostrich eggshells, gastropod shells, pangolin or tortoise scabs as well as brittle rocks such as obsidian and chert (Bushozi, 2020). Across the history of humankind, obsidian was used for making hunting weapons and sharp cutting tools (Merrick et al., 1994; Bushozi, 2011). However ethnographic evidence indicates that Datoga uses well-crafted obsidian blades as surgical scalpels for circumcision or female genital cutting. They also regard ornaments made on obsidian rock to be objects of clarity, with the ability to release emotional, physical, and spiritual blockages with the ability to draw out stress and tension. Archaeologically, obsidian is widely documented for its ability to make stone tools with sharp edges and make objects for personal ornaments such as necklaces (Bushozi, 2020).

Evidence from the Mumba rock shelter in the Lake Eyasi Basin indicates that the use of obsidian for making hunting weapons and knives started during the Middle Stone Age (MSA) around 131,000 years ago but flourished during the Later Stone Age and Neolithic culture when obsidian rocks were used for making objects for personal ornaments and other religious aspects (Mehlman, 1989; Merrick et al., 1994; Bushozi, 2020). Likely, tools made on obsidian raw materials were first accumulated for functional uses such as making hunting weapons and cutting devices other than ornamentations and ritual practices. Along with other socio-cultural requirements, artifacts made from obsidian raw materials were first gathered to fulfill practical, routine needs such as making stone points for hunting and blades for dismembering carcasses as part of subsistence requirements.

As time passed, obsidian objects served multifunctional roles especially during the Later Stone Age (LSA) and post-Stone Age cultures, suggesting a long-standing norm of personal ornamentation, indicating an awareness of social presence and ethnic identity across generations in the Lake Eyasi Basin and other places in sub-Saharan Africa. The occurrence of artifacts made on obsidian raw materials in multiple archaeological logical layers at Mumba and other sites across the Lake Eyasi Basin (Figure 1), allows for alternative explanations. It may reflect human adaptability and social-cultural interactions as a part mobility system, visitation, and trade network during the Stone Age periods (Mehlman, 1989; Merrick et al., 1994). Probably, at some stages in prehistoric, obsidian may have served as symbolic and religious aspects.

Geographical Location of the Lake Eyasi Basin

The Lake Eyasi Basin (746058 E and 9608875 N) was selected due to its unbroken cultural sequences starting in the MSA sequence at Mumba. Geographically, it is located in the Mang'ola ward in the Karatu District and Ngorongoro Conservation Area (NCA), Arusha, northern Tanzania. The Lake Eyasi Basin is characterized by a distinctive environment with its shallow waters, subsaline composition (2.39%), and alkaline nature (pH 9.5). This lake experiences seasonal fluctuations in water levels, resulting in periods of dryness and occasional deflation of its lakebed (Schagerl and Renault, 2016; Scoon, 2018).

Lake Eyasi Basin is semi-arid with an average of around 60 mm rainfall per year with a variation of 450mm and 900 mm. Rainfall is bimodal falling mainly from April to May and from November to December with slightly more rainfall on the Oldeani Mountain and Ngorongoro highlands in the northern end of the lake basin. The lake basin lies within the eastern branch of the East African Rift System (EARS), which runs from the southern margin of Lake Eyasi Basin northwards to the Jordan Valley (Mwitondi et al., 2021). The vegetation is dominated by open grassland and scattered shrubs in the lowlands and montane forests in the highlands that surround Olpiro and Oldogom villages in the northern end (Mwitondi et al., 2021). The Olpiro village, an ethnographic central point of this study, is located approximately 3 kilometers (km) inland from the lakeshore within the boundaries of the NCA. The Olpiro village sits approximately 35 km from the notable Mumba rock shelter (0755359 E and 9608921 N). Olpiro village is nestled on the foothills and mosaic range of the Oldeani Mountain, situated to the west of the Ngorongoro highlands (Figure 1).

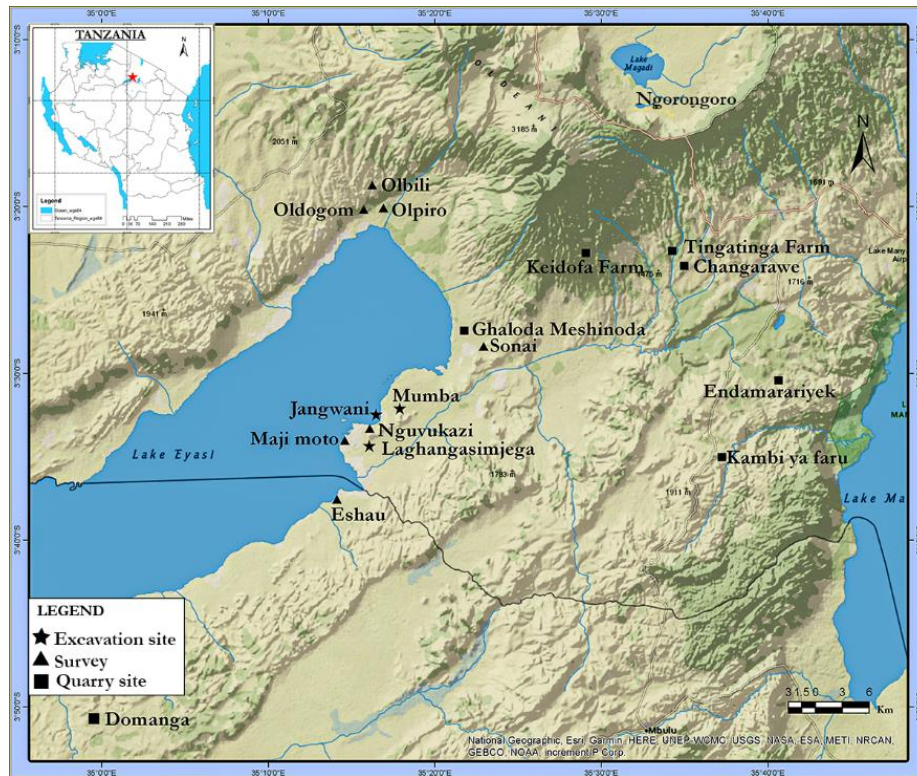


Figure 1: The map of Tanzania (on the top left) shows the location of the study area and some archaeological sites and places mentioned in the text.

This region is characterized by distinct topographical features, including granitic inselbergs and a steep river that flows from Oldeani Mountain to Lake Eyasi. Notably, this area lies within the eastern branch of the East African Rift, which stretches from the southern margin of the Lake Eyasi Basin, extending northwards to the Jordan Valley (Manega, 1993; Bushozi, 2011).

Archaeological evidence shows that farmers, foragers, and pastoralists have co-lived in the Lake Eyasi Basin for several centuries (Marlowe, 2010). The Eyasi Basin has long been an interaction zone between different socio-economic groups, evidenced by the co-existence of four primary language families (the Afro-Asiatic-the Iraqw, the Nilo-Saharan-Datoga, Niger-Congo-Bantu, and the Khoisan-Hadza). The area also remains one of the few places where hunter-gatherers, farmers, herders, and mixed farmers live side by side, using the landscape in distinctive ways (Mabulla, 1996; Marlowe, 2002). The Datoga, in particular, has a rich history in this region, with their settlement influenced by the presence of natural springs and verdant rangelands, which provided sustenance for their herds. Over time, the arrival of various Datoga clans, such as the Abajuta, Simjega, and others, introduced significant changes to the dynamics of the Daregwajega people.

The Datoga people maintain a rich tradition of rituals aimed at appeasing gods, seeking blessings, averting curses, and more. These rituals are performed at various locations, including Majimoto village, a hot spring, and rock shelters located at Laghangarer village, approximately 1km northwest of Majimoto hot spring. Each Datoga family conducts its rituals, and there are no specific designated areas for these practices. Key elements of these rituals involve the use of black sheep to symbolize concepts like the forest, rain, or a prosperous season, while white sheep represent drought, and red sheep symbolize bloodshed. Ritual

offerings commonly include milk or tobacco, with the belief that the spirits of the deceased consume these materials as sustenance. This intricate tapestry of beliefs and practices showcases the Datoga people's deep-rooted connection with their cultural heritage and the environment of the Lake Eyasi Basin.

Literature Review

Use of Obsidian: Ethnoarchaeological Perspective

Obsidian is a volcanic glass formed by the sudden cooling of lava rich in silicon (Rapisarda, 2019; 267). Its characteristics of vitreous luster, conchoidal fracture, and variable color (Tuffen et al., 2020), made it a material suitable for crafting tools, weapons, and jewelry, turning it into one of the most wanted assets of the prehistoric age (Rapisarda, 2019: 267). The worldwide distribution of obsidian is controlled by both geological settings and age. Because obsidian is metastable, it slowly devitrifies and recrystallizes, and is prone to surface hydration over geological timescales (Tuffen et al., 2020). Volcanism of the East African Rift, where the African tectonic plate is splitting in two, created one of the world's most obsidian-rich landscapes, where this volcanic glass has been used, perhaps continuously, to make tools during the Pleistocene-Holocene periods (Frahm et al., 2017). In most cases, obsidians have been used to explain ancient trade and contact among early humans, as well as being used in dating and explaining human cultural evolution (Ambrose et al., 2002; Blumenschine et al., 2008; Gliganic et al., 2012).

In the EARS, the use of obsidians can go as far as 1.7 million years ago during the Early Stone Age (ESA) (Mehlman, 1989; Büttner et al., 2017; Bushozi et al., 2017). However, its popularity and wide usage were witnessed during the MSA as many archaeological sites of this time have yielded several obsidians (Ibid). Further development in the usage of obsidian materials in large numbers was witnessed during the LSA and specifically the Neolithic period (Mehlman, 1989. Bower, 1991; 1995; Gliganic et al., 2012). The ESA is characterized by occurrences of fewer obsidians compared to later phases (Merrick & Brown, 1984). Although a movement of 100 km has been reported in Ethiopia, generally during this period, it is certain that in Kenya and northern Tanzania, the movement of obsidian from source to site was confined to 50 km (Merrick & Brown, 1984).

During the MSA, obsidian is found in frequent use in almost all sites within a 50 km radius of major obsidian sources in the central Rift Valley and Ethiopia near major sources. During this time, distant sites from sources, such as Mumba and Nasera rock shelters continued to exhibit a lower frequency of obsidian (Mehlman, 1979; Merrick & Brown, 1984; Mehlman, 1989). It was during the MSA that obsidian was found in areas between 65 and 135 km from source to site (Merrick & Brown, 1984). Meanwhile, obsidian occurrences dominate in LSA contexts near central Rift sources. The movement of obsidian between 50 and 150 km from the major central Rift sources increased compared to the preceding MSA (Merrick & Brown, 1984). It was during the LSA evidence of obsidian use at the Olduvai Gorge Naisiusiu Beds, that a distance of 250 km from the source was reported (Merrick & Brown, 1984).

Generally, an increase in the use of obsidian in EARS is attested during the MSA and LSA. The overall scarcity of obsidian during the Early Stone Age (ESA) sites may be a function of either a preference for other raw materials or the proximity to obsidian sources (Merrick et al., 1994). During the MSA there is evidence of movement of “modest quantities” of obsidian up to 190 km from source to site, and obsidian occurs in very high frequencies in many sites which are within 50 km of major sources (Merrick et al.,

1994). Obsidian use increases over time to the extent that it forms almost 100% of the raw material found in assemblages within 50 km of major sources during the LSA (Biittner et al., 2017). In EARS, the spread of food production in the form of mobile pastoralism during the Mid-to-late Holocene is closely associated with increased volume and frequency of obsidian movement relative to earlier periods. It has been proposed that this is evidence for the development of more organized forms of regional exchange stemming from specialized quarry sites BP (Goldstein & Munyiri, 2017).

The source of these obsidian materials has been linked to Lake Naivasha in the Kenyan Rift Valley area and Mount Eburru, more than 250 km from Olduvai and approximately 300km from Lake Eyasi Basin (Rubaka, 2002; Gliganic et al., 2012). The distance covered to procure obsidians is indicative of a long journey and contact among early humans at a time when communication and transportation were somehow limited (Ibid). Three proposed phases in the procurement of obsidian lithic materials from the source have been suggested (Rubaka, 2002).

The initial phase took place during the Early Stone Age, and it involved hunter-gatherers who traveled to procure obsidian remains within 10-20 km. The second phase saw obsidian usage gaining momentum during the Middle Stone Age where hunter-gatherers expanded the area of coverage in obsidian procurement to almost 40 km. The last phase took place during the Later Stone Age and Neolithic period where hunter-gatherers and later Neolithic people expanded the resource base in obsidian procurement to areas more than 300km from the source (Rubaka, 2002).

In the EARS, studies on obsidian have been structured to establish and characterize the source, contact, and long-distance exchange and tool functions (Merrick et al., 1994; Merrick & Brown, 1984; Kusimba, 1999; Blumenschine et al., 2008; Goldstein, 2018, 2019; Goldstein & Munyiri, 2017). In this region, limited to non-existent literature has addressed topics on the symbolic, ideological, or ritualistic value of obsidian to socio-cultural aspects. On the contrary, in Mesoamerica for instance, studies have established that from ca. 1500 BC to the Spanish conquest and beyond, obsidian was centrally located in the physical and symbolic worlds of indigenous societies (Saunders, 2001). Ancient Mesoamericans viewed obsidian as having an inherent or symbolic spiritual power, often based on the mythological origins of obsidian as the creation of gods hurling lightning from the sky (Walton, 2021). Obsidian is linked to landscape, cosmology, and myth (Saunders, 2001; Aoyama et al., 2014; Aoyama et al., 2017; Pierce, 2022). For the ancient Maya, obsidian implements, frequently in the form of long, thin blades, were among the most common funerary items included in burials. Recovery of obsidian blades from Maya graves was often interpreted as evidence of their use as bloodletters (Stemp et al., 2019). Hence, this study employed an ethnoarchaeological study in the Lake Eyasi Basin to unravel to symbolic and ritualistic use of obsidian among the Datoga society.

Methods and Results

Theoretical and Methodological Approach

The study delved deeply into the cultural ecology theory emphasizing on the arrangements of technique, economy, and social organization through which culture mediates the experience of the natural world (Marlowe, 2010). The intention is to assess how beliefs and institutions in a culture regulate its interchanges with the natural ecology that surrounds it. As noted before, Lake Eyasi Basin is lying at the eastern end of the EARS in northern Tanzania. The landform surrounding the lake basin is characterized by a volcanic

landscape coupled with escarpments, mountains, highlands, and fossiliferous sediments. Information regarding the adaptability of people to their cultural landscape was underpinned by a set of carefully crafted open-ended questions (Kumar, 2011), which formed the bedrock of our data collection process. These questions were precisely designed to draw comprehensive responses that would reveal not only how obsidian was valued and used within the Datoga society but also the underlying beliefs, customs, and practices associated with obsidian material.

Through unstructured interviews and direct observations, it became apparent that the Datoga people understand the meaning and benefits of using objects made of obsidian (referred to as “*laghenga duwasi*” or “black stone” in the Datoga language. Interviews also aimed at unraveling complex ways in which ancient communities viewed and harnessed the potential power of obsidian. To extract the most comprehensive insights, our approach involved engaging with a diverse set of individuals belonging to various age groups, predominantly comprising the youth and the respected elders of the Datoga society (Figure 2). This deliberate selection of participants was instrumental in capturing a scenic view of obsidian's role in their lives, as different age groups often hold unique perspectives and experiences (i.e., the use of purposive sampling). By drawing from the knowledge of the elders and the eagerness of the youth, we aspired to piece together a holistic understanding of the significance of obsidian within their cultural and practical contexts.

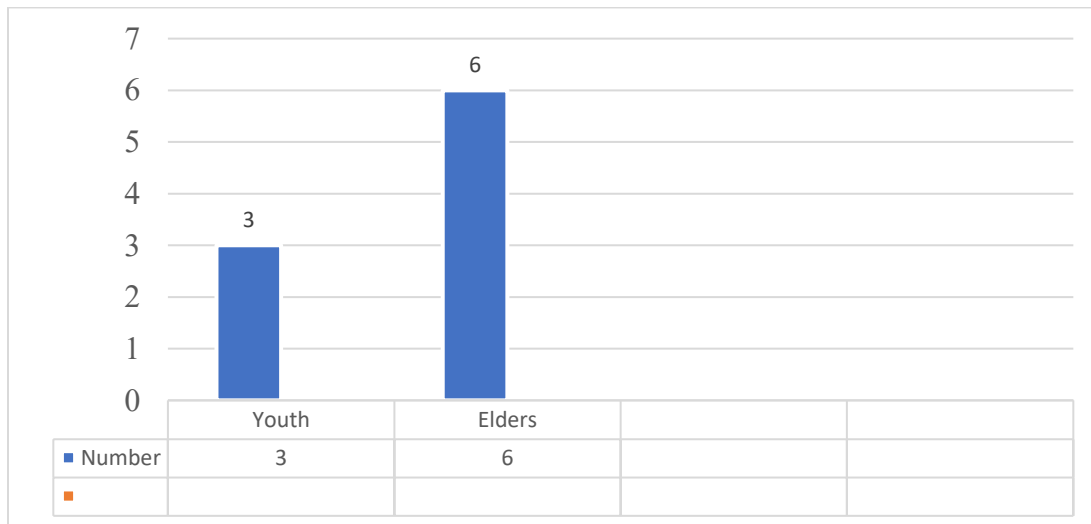


Figure 2: Demographic characteristics of Respondents

The gathered information was analyzed based on the qualitative approaches to investigate the holistic factors associated with the use of objects made of obsidian raw materials among modern communities and how such objects are perceived. Collected data was used for the description of the situations restraining influence over the use of obsidian among Datoga society, to conclude the intangible aspects of past communities who inhabited the region. For those reasons, the descriptive case study approach based on unstructured interviews was adopted.

The set of gathered information from respondents was integrated with direct observation and the literature review regarding the use of obsidian for symbolism and other multifunctional requirements. The symbolic aspects were established according to the aspects of culture such as norms, values, beliefs, rituals, and other

conventional representations. The request was shared with knowledgeable individuals from the Datoga society regarding cultural aspects embodying the physical landscape and human interactions. Accumulated evidence was organized in chronological order to historicize information by the time sequence. Literature shows that the belief system regarding the use of obsidian goes as far as the MSA period 131,000 years ago (Figure 3) when inhabitants of Lake Eyasi Basin traded on obsidian objects from Lake Naivasha in central Rift in Kenya (Merrick and Brown 1984; Mehlman 1989). However, extensive use of obsidian for making tools flourished during the LSA, and later cultures presumably emerged due to growing requirements of adornments as decent symbolic and religious aspects.



Figure 3: The MSA lithic artefacts made on obsidian raw materials from Lake Eyasi Basin: a utilized blade, b, point c & d cores.

Ethnographic inquiries regarding the use of obsidian for symbolic aspects from the Datoga society suggest that they were carefully made and deliberately used for ritual practices such as surgical scalpels for circumcision or female genital cutting; healing devices for invoking good fortune and releasing emotional, stress or tension; as well as other spiritual blockages to bring well-being clarity such as malevolent forces. Such application suggests succession in cultural traits over generations from the Stone Age period to the present day. The widespread use of obsidian in the MSA and LSA contexts in Lake Eyasi Basin is not controversial across the EARS, but the use of obsidian for symbolic aspects is creating a new widely distributed acceptance of the utilization of ecological resources in the surrounding landscape. Through oral information, we acquired a rich tapestry of cultural heritage, traditions, and the fusion of ancient wisdom with contemporary living.

Oral accounts and direct observations revealed a multifaceted role that obsidian played in their daily lives, transcending the boundaries of practicality and aesthetics to encompass spiritual and metaphysical dimensions. It became evident that obsidian was not merely an archaeological curiosity; it was an integral part of the Datoga identity and worldview. As we navigated this jumble of knowledge, we discovered that

obsidian served as more than just a tool or ornament within the Datoga culture. It was a guardian against malevolent forces, a conduit for invoking good fortune, and a symbol of belonging to a special clan, with the exclusive right to procure and process this cherished material. The Datoga people's relationship with obsidian is far from superficial; it was living evidence of the enduring power of tradition and the intricate ways in which cultures intertwine with the resource's nature provides.

It was further revealed that obsidian is procured and processed by a member of a special clan (the Abajuta or the Ghaoga). It is a restrictive practice and only these clan members are the ones with such permission to practice this ritualistic act. The two clans descend from chiefdom and because of this lineage, they have the responsibility to protect their people and assure their wellbeing. In the process of preparing obsidian as protective gear or charm, usually, they prefer to use animal skin specifically the skin of an eland or a lion. The choice of eland skin is based on its durability and its association with bringing good luck and fortune. On the other hand, a lion's skin is purposely chosen because it symbolizes strength power, and protection against all bad omen and evil spirits. Obsidian is usually broken into small chunks, then the chunks are wrapped in wild animals' skin. Once wrapped in the animal skin the necklet is worn by an individual, with such a necklet, the belief is that no harm is going to affect this person and good luck will always prevail his or her way. This view of obsidian as a protective gear is shared across ancient Anatolia and Egypt amulets (Frahm et al., 2019).

The concept of protective gear or charm played by the obsidian stones also goes beyond the ordinary uses at an individual level; embracing the large unit of family surrounded by the enclosures or *bomas*. Usually, *bomas* are residential areas for Datoga society altogether with their herds. To be safe (both humans and animals), obsidian stones are placed on top of the main entry to the *boma* symbolically representing protection to all inhabitants of the *boma*. A person in need of obsidian pendants or necklaces is supposed to bring a calf or a sheep as an offering in exchange. This is a popular myth among the Datoga of Lake Eyasi Basin. As mentioned earlier, the use of obsidians goes beyond ordinary stone tools. In Mesoamerica, it has been associated with funerary activities and also used in sacrificial as bloodletters. The symbolic use of obsidian is still widely used in the Americas (Hodgson, 2007), and still, the symbolic value of obsidian persists among the Datoga people of the Lake Eyasi Basin.

Conclusion and Way Forward

Our study of the Datoga society's understanding and utilization of obsidian materials was a fascinating odyssey, revealing not only the practical uses but also the intricate tapestry of beliefs, customs, and identity joined around this enigmatic material. This study brightens how the Datoga people, living at the intersection of tradition and modernity, continue to cherish and harness the intrinsic power of obsidian in their daily lives, safeguarding a cultural heritage that is as resilient as the volcanic glass itself.

From these ethnographic inquiries, it became apparent that obsidians hold a very respectful and special advantage among local Datoga and they are used for spiritual purposes rather than utilitarian or implements. It was noted that obsidian serves as a protective shield against any bad omen or evil spirits and avoids bad luck. Besides, it was also noted that obsidian plays a key significant role in bringing good luck (good omen). This is a very common obsidian myth among the Datoga who live in the Lake Eyasi Basin and is shared with ancient Anatolia and Egyptians. Therefore, from this myth surrounding the use of obsidians among

the Datoga, it is high time now that archaeologists rethink their interpretation of the obsidian beyond commonly accepted usage of obsidian as stone tools.

The symbolic use of obsidians was probably intensified during the Pastoral Neolithic in the EARS as the population increased and settlement was consolidated. The belief systems about obsidian as a protective gear may have been consolidated at this time as people needed protection for themselves and their domesticates. Probably, this is the reason why we see the intensification of travel a long distance to procure obsidian to approximately 300 km from source regions. Altogether, it is now clear that obsidian had multiple uses in prehistory. Therefore, we suggest that there is an urge for archaeologists to conduct more ethnoarchaeological inquiries by expanding more samples in wide regions that could shed more light on the use of obsidians in both ancient and modern times.

There is a demanding task to carry out a systematic inquiry into the source of obsidian artifacts widely distributed in the MSA, LSA, and Neolithic sites across northern Tanzania. Similarly, the role of the use of obsidian artifacts for symbolism should be revisited because they reveal important information regarding the understanding of human past lifeways. Presumably, symbolic relics revealed by the Datoga society were consistently upheld and gradually inherited from the ancient communities that inhabited the Lake Eyasi Basin and other places across the EARS. Referring to the trading network of obsidian raw materials (Merrick et al. 1994), it is well substantial to argue that the dates of the symbolic and ritual practices using objects made of obsidian raw material are considerably older in Africa than was previously perceived.

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