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Living the high life: the early arrival of hunter-gatherers in the glaciated Ethiopian Highlands

by **Alexander R. Groos**[1] | PhD student

[1]: Institute of Geography, University of Bern, Bern, Switzerland

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ABSTRACT

High mountains around the globe have long been thought to represent pristine ecosystems that have been reshaped by humans quite late in the earth's history. The recent discovery of a 47-31 thousand-year-old residential site at 3,500 m in the Ethiopian Highlands contradicts this view and highlights the early expansion of Middle Stone Age hunter-gatherers into the cold and glaciated mountains.

Bale Mountains, Southern Ethiopia. – Image credits: Alexander R. Groos ©

Eastern Africa is known for a vast number of famous archaeological and paleoanthropological findings. Among those, the discovery of the 3.2 million-year-old skeleton "Lucy" in the Afar region. Excavations of fossils and archaeological remains over the last decades shed light on the hominin evolution. They also uncovered the geographic origin and early migration of anatomically modern humans in Africa. However, one particular period in the younger earth history about 20 to 24 thousand years ago, which is termed the Last Glacial Maximum, stands out. It lacks archaeological and paleoanthropological discoveries. During the Last Glacial Maximum, when inland ice sheets covered much of North America, Europe, and Asia, the East African plains were dry and probably uninhabitable. This raises the question of where humans found refuge at that time.

An international research group, consisting of archaeologists, ecologists, and environmental scientists, hypothesized that humans spread out into the highlands and mountains to escape from the drought. But why exactly there? Hypoxia, extreme weather, and high doses of ultraviolet radiation pose a threat to the human body and challenge survival in alpine environments. It has therefore long been assumed that the arrival of our ancestors in the high mountains occurred rather late in human history. However, new prehistoric archaeological findings from the Andes and Tibetan Plateau contradict this

view. The argument for high mountains as an ice-age refuge in Eastern Africa is that they were more humid and stable than the lowlands and provided necessary resources for the survival of early hunter-gatherers.

To test the "mountain exile hypothesis", we chose the Bale Mountains in southern Ethiopia. The Bale Mountains are of volcanic origin and rise above 4,000 m. They are an ideal study site since they comprise Africa's largest alpine environment and provide archaeological and paleoecological records. All these data together enable the reconstruction of paleoclimatic changes, landscape evolution, and human history. We performed archaeological excavations in a rock shelter at ca. 3,500 m to find remains of the material culture of humans who might have dwelled there in the past. We analyzed soil samples from the rock shelter to trace human activities like the burning of firewood or preparation of food. For the reconstruction of the paleoclimate and environment, we mapped large boulders in the valleys near the rock shelter. These boulders were deposited by extensive glaciers and are an indicator for the former ice extent. Dating of the boulders allows reconstructing the chronology of past glaciations in the region.

The archaeological excavations uncovered numerous animal bones and many Middle Stone Age obsidian artifacts. Radiometric dating of these bones and additional charcoal fragments revealed that humans repeatedly settled in the Bale Mountains already 31 thousand years ago. The rock shelter in the Bale Mountains is, therefore, the oldest known residential site at high elevation worldwide. Most of the excavated bones from the rock shelter show burning marks and originate from the giant mole rat – an endemic rodent. These findings imply that the Middle Stone Age foragers specialized in hunting and roasting of this abundant rodent, which represents a proper food package of about 1 kg. Sufficient calories and a reliable food source were essential at that time. As the climate and landscape reconstructions show, the new arrivals were facing harsh environmental conditions. It was much colder than today. Large glaciers were covering the valleys and provided fresh water all year round. However, the ridges between the glaciated valleys were ice-free and cleared the way to the highest outcrop of obsidian (volcanic glass) yet discovered on the African continent. A similar chemical signature of the raw material at 4,200 m and the obsidian artifacts in the rock shelter highlights that the foragers were familiar with the glacial environment. It also suggests that they accessed high elevations for the procurement of volcanic glass.

The new interdisciplinary findings from the Bale Mountains in south Ethiopia demonstrate that humans expanded into the East African mountains and highlands much earlier than previously assumed. They adapted to the harsh and glaciated alpine environment and used the available resources near the rock shelter. Since additional residential sites from the same period have not yet been identified in the region, it remains unclear whether the hunter-gatherers resided permanently or only recurrently in the highlands. Archaeological discoveries from lower elevations in Ethiopia suggest a coeval presence of humans in the lowlands and mountains at that time and do not support the hypothesis of the Bale Mountains as a climate-driven human refuge. Where humans in Eastern Africa survived during the dry Last Glacial Maximum remains an unsolved mystery – at least for now.