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Guest Editorial

Equatorial eastern Africa: Quaternary climate change and variability

1. The Eastern Africa Quaternary Research Association (EAQUA)

The Eastern Africa Quaternary Research Association (EAQUA) is a multidisciplinary scientific organization formed to enhance the growth of the Quaternary Science community in the eastern Africa region through promotion of collaborative research. In addition, the Association aims to facilitate active communication on Quaternary research issues and information exchange on palaeoclimate, palaeoenvironment, archaeology, palaeontology and palaeoanthropology among eastern African and international researchers with interests in various aspects on the Quaternary sciences in the region. The Association hosts biennial rotational conferences of eastern African and international researchers working in various aspects of the Quaternary period in the region to share research results and deliberate on various issues of Quaternary sciences research. The first three conferences of the Association were held in 2007, 2009 and 2011 in Kampala (Uganda), Addis Ababa (Ethiopia) and Zanzibar (Tanzania), respectively. The conferences were aimed at bringing together eastern African Quaternary researchers together with their international counterparts to promote collaborative research and exchange of research results.

2. Fourth EAQUA conference

The EAQUA conference series and this special issue of *Quaternary International* are the culmination of a realization that a great amount of research work has been undertaken on the Quaternary period in the region. However, there lacks a forum for result sharing and collation to deciphered information that can inform modeling of future climate and environmental change and to inform decision making on mitigation and adaptation strategies for these changes.

The 4th EAQUA conference held in Nanyuki, Kenya between 23rd and 27th July 2013, had an overarching theme of "*Equatorial eastern Africa Quaternary climate change and variability*" and provided a forum for exchange of research results and ideas among the eastern African Quaternary community. The conference emphasized that ongoing work on palaeoclimate, palaeoenvironment, archaeology, palaeontology and palaeoanthropology in the region needs to be enhanced and complimented by more multidisciplinary research and correlating evidences from these fields and need to be shared and networked for a clearer understanding of the attendant climatic and environmental changes and associated adaptations.

Papers at the conference were presented in thematic session formats: the thematic sessions *"Habitat and paleoenvironmental reconstruction of pre-historic sites (paleobotany, isotopes, fauna and sedimentology)"* and *"Highland biodiversity and ecosystems"* explored the proxies used in paleoclimate and paleoenvironmental reconstructions of prehistoric sites and various depositional environments and how they help with understanding the environmental context of evolution and adaptation and the dispersal of humans. The sessions *"Late Pleistocene–Holocene climate and rainfall variability, and human environment interactions"* and *"Global change impacts, adaptations and vulnerability assessment"* explored patterns and evidences of climate change, and its effects on ecosystems, human populations and adaptation. The session *"The Quaternary fossil and archeological record"* explored various fossil and archeological records from early Pleistocene and Holocene from Africa in general and eastern Africa in particular and their historical contexts. Finally the session *"Heritage resource governance and sustainable development"* showcased selected heritage resources, their vulnerabilities, enhanced management and conservation statuses, and their use as instruments for improving local community livelihoods and sustainable development. These themes aimed at reconstructing climate change and variability and environmental climate during the Quaternary using different proxies and disparate archives. Papers presented also showcased the impact of climate and environmental change on ecosystems and human communities.

The conference also served as a forum for the initiation of two collaborative research areas in carnivore ecology and heritage resource development.

3. Equatorial eastern Africa Quaternary climate change and variability

This special issue contains six selected papers from those presented during the 4th EAQUA Conference. These papers are a sample of the diverse topics covered by the conference participants in understanding climate and environmental change from different archives and proxies.

Posnansky gives a detailed account, though anecdotal as the author admitted, of the history of the beginnings of palaeoanthropological research in the eastern Africa region during the period of late 1950s and early 1960s. The paper outlines the intellectual and social context of palaeoanthrological and archaeological research and the discoveries made thereof, and considered the period 1956–1963 as critical in the Quaternary research in eastern Africa. The paper asserted that this was a period when collaboration and an openness to new ideas provided momentum.

Actualistic and comparative studies between modern and archaeological assemblages is an important way of making inference about what may have occurred in the past based on observed modern occurrences, hence the use of modern faunal and plant microfossil assemblages to infer past human behaviour and

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palaeoenvironments. With this respect ***Albert et al.*** present the results of their study of phytoliths from modern soils at the Serengeti National Park, Lake Eyasi and Lake Manyara, in Tanzania and reconstructed the palm landscapes and their interaction with other geographical. The scarcity of characteristic palm phytoliths and the non-correspondence of the short cell phytoliths of grasses, common in the area, to the grasses growing in the spots where the samples were collected, prompted the authors to conclude that the absence in the archaeological and paleontological/paleoecological record of some phytolith morphotypes is not always related to their absence on the past. ***Fourvel et al.*** present taphonomic studies at dens of extant hyaenas in eastern (Djibouti) and southern Africa (Namibia), where they compare taphonomically relevant aspects of 6 bone accumulations produced by extant spotted hyaenas, striped hyaenas and brown hyaenas. Their study confirmed that modern analogues are essential baseline tools for elucidating characteristics that might distinguish each species and that the development of neo-taphonomic models is the first step towards comparison and greater understanding of the palaeo-ethology of extinct Pleistocene hyaenids. ***Grove*** surveys the fossil and genetic evidence for the origin and dispersal of modern humans, and situates this evidence within the context of biological theories of plasticity and dispersal. The paper formulated a model that allows for the identification of features in climatic records that are conducive to the evolution of plasticity, and thus to the development of dispersal capabilities. The results are discussed within the context of the origin and initial dispersal of *Homo sapiens* out of East Africa and into the Levant.

Late Pleistocene to Holocene climate and rainfall variability, and human environment interactions in the eastern African region has been a subject routinely addressed in eastern African Quaternary research. In this context **Twesigye** examines the geologic history and paleoclimate of the East African Great Lakes, human influence and the impact of these forces on the region's endemic cichlid fishes using evidence from geologic and molecular data. The study showed a drastic decline in the size of cichlid fishes populations in the last 1000 years, due to an increase in the size of the human population and increased fishing pressure and fish introductions. The paper also shows that the consequence of such a decline is a reduction in the amount of genetic diversity in the surviving populations due to increased effects of random genetic drift.

The eastern African region is not only one of the regions highly impacted by global climate changes but also a region inherently vulnerable to the consequences due to the low socio-economic base of its population. Therefore, vulnerability assessment and adaptation strategies are crucial issues of discussion in eastern African Quaternary research. In this context ***Ngongondo et al.*** present analysis of spatial patterns and temporal trends in annual water balance components to deduce patterns of local rainfall and temperature variation over time in Malawi. The paper concludes that the decline in rainfall coupled with temperature increase suggests that Malawi became more water limited during 1971–2000.

4. Dedication to Dr. Mohammed Umer

The 4th EAQUA conference and this volume is dedicated to the memory of Dr. Mohammed Umer, who dedicated his life to Quaternary research in Ethiopia in particular and in eastern Africa in general, before he passed away on November 26, 2011 while conducting fieldwork in the Afar region of Ethiopia. Mohammed Umer, among his numerous achievements, was a founding member of the Eastern African Quaternary Research Association (EAQUA) and was elected its President in February 2011 during the third EAQUA conference in Zanzibar, and was diligently serving the Association until his death. The untimely death of Mohammed Umer is a big loss to his numerous colleagues and friends in the international community of palaeoenvironmental research. He was a dedicated and internationally recognized researcher and an ambassador for African Science and for PAGES (Past Global Changes), and a much-valued friend to his many students and colleagues.

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