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A multi-proxy approach to tracing a regressive event at Ferguson's Gulf, Lake Turkana, Kenya: Implications for modern analogues to assist in interpretations of the Plio-Pleistocene record

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Located in the East African Rift Valley, the Turkana Basin has long been central to our understanding of how early hominins evolved. In particular, there is great curiosity as to the relationship between the paleoenvironment/paleoclimate conditions and evolution. Historical records aid in the interpretation of Plio-Pleistocene sediments by creating the opportunity to ground truth assumptions through the use of modern analogues. This project uses high-resolution, multi-proxy records from a series of short cores spanning the Little Ice Age to the modern, to suggest one possible model for how regressive events are recorded in lacustrine sequences. Because Lake Turkana is hydrologically closed, changes in lake level affect the water chemistry and thereby the ecosystems that depend upon it. Ferguson's Gulf is a 13 km^2, shallow embayment located on the western shore of Lake Turkana. The gulf is connected to the rest of the lake by a narrow mouth on its northern end which is $\sim$1 m deep. Therefore, relatively minor drops in lake level have the potential to restrict flow from Lake Turkana into Ferguson's Gulf, creating localized evaporative water chemistry which effects the suitability of this area for sustaining various benthic populations. Six short cores collected in 2011 and 2012 were picked for ostracods at 1-5 cm intervals to study the changes in assemblages and total abundances through time. An age model, generated using radiocarbon dating of ostracods, demonstrated that the record extending into the Little Ice Age (1550-1850 AD), a period when wetter conditions prevailed within the Turkana Basin. The ostracod faunal results were compared with sedimentology/stratigraphy, XRF data, and stable isotope analysis on ostracod shells for a multiproxy approach to reconstructing hydrologic conditions during the past $\sim$500 years. The Ferguson's Gulf record can be subdivided into three bins based on the ostracod assemblages. The lowest third of the core shows high ostracod total abundance and high variability during the Little Ice Age. The middle third displays moderate total abundance but extremely little variability across the boundary out of the Little Ice Age. The upper third, post-Little Ice Age has very low total abundance and a dramatic decrease in assemblage diversity. Relative to the bottom two thirds of the core, it also has a higher concentration of tilapia fish teeth and Daphnia egg sacks. To summarize, a decrease both in overall ostracod abundance and in species diversity was observed moving up core and across the transition out of the Little Ice Age. This faunal shift is paralleled by an isotopic one, with values of δ^{18}O and δ^{13}C both decreasing up core. Ultimately, proxies' responses to the transition out of the Little Ice Age in the modern record will be a good analogue for Plio-Pleistocene lake regressions and will aid in the interpretation of paleoclimate and paleoenvironment during key intervals in hominin evolution.