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Lead isotope and geochemical analyses of copper-based artifacts from the Tanzanian Swahili Coast, 7th-15th centuries CE

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This paper presents analytical results characterizing and identifying potential provenances of 28 copper-based metal objects from five archaeological sites along the Tanzanian Swahili Coast in East Africa. The Swahili Coast is widely recognized for its historic involvement in extensive trade networks that spanned the Indian Ocean world between the 7^{th}-15^{th} centuries CE. Recent archaeological excavations in Tanzania have recovered a variety of copper and copper alloy metal objects alongside a wealth of other goods, such as ceramics and glass, which originated from Southwest, South, and Southeast Asia, and China, as well as from the African interior. However, the role of copper within these trade networks and local knowledge surrounding copper-working technology remains unclear. This project used a combination of solution-mode inductively coupled plasma mass spectrometry (ICP-MS) and multi-collector ICP-MS (MC-ICP-MS) to perform geochemical and lead isotopic analyses of these 28 copper-based artifacts. The results of the bulk elemental analysis reveal a variety of metal types, including pure coppers, brasses, bronzes, as well as ternary, quaternary, and highly leaded alloys, attesting to the prevalence of mixing and recycling practices surrounding the production of these copper-based metals. Trace element compositions were examined alongside lead isotope ratios in order to discern possible geological provenances of the copper and added lead, revealing likely connections with ore sources in Southwest Asia and India. The results of this research demonstrate the potential of combined isotopic and geochemical analyses to aid in understanding copper exchange in the medieval African and Indian Ocean worlds, and by proxy to help determine the Swahili Coast's role in these historic long-distance economic networks.