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Fishing in a fluctuating landscape: terminal Pleistocene and early Holocene subsistence strategies in the Lake Turkana Basin, Kenya

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ABSTRACT

During the African Humid Period (AHP; c. 15–5.5 ka), the rivers and lakes of much of the continent swelled due to changes in monsoonal rainfall driven by Earth's orbital precession. This period witnessed the growth of diverse fisher-forager communities, whose members adapted their settlement patterns and created new technologies in order to take advantage of aquatic resources. Around Lake Turkana in northern Kenya, numerous surface sites have been documented along former shorelines dating to the AHP. Relatively few have been excavated and dated however, and just three – all from the eastern basin – have published faunal analyses. Here, we present archaeofaunal assemblages from the Kalokol region of the western basin, where three sites with microlithic technology, bone harpoons, and radiocarbon dates falling within the AHP were excavated. We present a detailed taphonomic assessment of the fish assemblages and a comparison with both natural and anthropogenic, and ancient and modern, fish bone accumulations. Taxa identified at the Kalokol sites are discussed in terms of the occupants' possible fishing technologies and strategies, drawing on ethological and ethnographic data. Our analysis, combining our data with those published from the eastern basin, enables a broader discussion of how people may have responded to fluctuating AHP environments in the Turkana Basin.

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1. Introduction

Across much of the African continent, the transition from the terminal Pleistocene to early Holocene was marked by major environmental transformations, providing people with new economic opportunities and ultimately shaping social changes. The African Humid Period (AHP; c. 15–5.5 ka) led to the swelling of rivers and lakes across much of the northern half of the continent (DeMenocal et al., 2000). Perhaps the best-known effect of the AHP is the so-called “Green Sahara,” where aquatic and savanna fauna are beautifully captured in the rock art of today's deserts (Le Quellec, 1993). The AHP led to the expansion of lakes not only in the Sahara and Sahel, but also along the Rift Valley from Ethiopia to Tanzania (Street-Perrott et al., 1989; Tierney et al., 2011). Around many of these lakes, and along rivers such as the Niger and Nile, fishing-based communities emerged. Archaeological indicators of aquatic resource specialization across much of northern Africa – in

the form of fish remains, barbed bone points, and early pottery – were once interpreted as evidence of a widespread “cultural complex” termed the “Aqualithic” (Sutton, 1974, 1977). In this view, abundant aquatic resources drove early Holocene sedentism, technological specialization, culinary innovation, and social change, just as agriculture drove the same in the Near East.

While the “Aqualithic” hypothesis has been critiqued for imposing an inferred cultural homogeneity across a vast and archaeologically heterogeneous expanse, Sutton's ideas inspired new investigations and improved understandings of sites dating to the AHP. In the Turkana Basin of northern Kenya, excavations in the 1970s–80s produced new evidence for early Holocene occupations along former shorelines (Robbins, 1974, 1975; Phillipson, 1977; Angel et al., 1980; Robbins, 1984; Barthelme, 1985), and provided the basis for the first comprehensive study of prehistoric fishing in eastern Africa (Stewart, 1989). Since the publication of Stewart's (1989) zooarchaeological investigation of faunal assemblages from Turkana Basin sites, no further archaeological study has been made of Holocene-era fishing in the region. In this paper, we present an in-depth taphonomic and zooarchaeological analysis of faunal assemblages from three recently excavated sites in the Kalokol area of the western Turkana Basin. The sites are

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characterized by microlithic technology, barbed bone points, and in one case, pottery, and have produced radiocarbon dates falling within the AHP. They provide an excellent point of comparison to the eastern basin sites, and these samples are jointly considered alongside published data from modern fishing camps and both modern and ancient natural fish bone accumulations. Collectively these datasets enable an assessment of the taphonomic history of the Kalokol sites. The present analysis, while limited by small samples and insufficient chronological resolution, sheds light on fishing-foraging adaptations at the Pleistocene-Holocene transition. This period has come into the spotlight recently due to the discovery of remains of 28 human individuals at Nataruk, c. 90 km south of our study area, where an early Holocene “massacre” is attributed to possible inter-group competition over resources (Mirazón Lahr et al., 2016). This suggestion – made in the absence of subsistence data – makes it all the more imperative to clarify early Holocene fisher-foragers’ economic strategies during a time of climatic fluctuation.

2. Environmental and cultural changes during the African Humid Period

2.1. Orbital and environmental shifts

Increased humidity at the Pleistocene-Holocene transition was caused by shifts in Earth’s orbital cycles, specifically precession of the equinoxes (DeMenocal et al., 2000). This describes a wobble in the Earth’s axis that occurs in approximate 20,000-year cycles, effectively determining the annual timing of the Earth’s most proximal pass of the Sun. In the early Holocene, precession led to an increase in Northern Hemisphere summer insolation. Consequent heating of the landmass changed monsoonal wind and rainfall patterns, with one study suggesting that the estimated 7% increased summertime radiation could have increased rainfalls by 17%–50% (Kutzbach and Liu, 1997). Ultimately, this led to the characteristic traits of the AHP: swelling of rivers, and expansion and in some cases connection of lakes; these effects last until the mid-Holocene (c. 5000 BP), when Northern Hemisphere insolation decreased and conditions became drier. These shifts are well documented through a wide range of geological, micro- and macro-fossil, sedimentary, and isotopic proxies (e.g., Gasse, 2000; Gasse et al., 2008; DeMenocal and Tierney, 2012), and can be correlated with key events in African prehistory (Kuper and Kröpelin, 2006).

Despite the overall humid conditions of the AHP, there were important millennial- or even decadal-scale shifts in rainfall, and consequently in lake levels, during the early Holocene. These were caused by minor shifts in the Earth’s orbit and solar radiation, and at the decadal level, by the Indian Ocean dipole (Marchant et al., 2007). Some of the larger-scale fluctuations are documented in the Turkana Basin, where extensive geological work and other research has aimed to reconstruct lake-level history (e.g., Butzer et al., 1972; Owen et al., 1982; Garcin et al., 2012; Forman et al., 2014; Bloszies et al., 2015). Correlating these reconstructed lake levels with the archaeological evidence for human occupations along paleoshorelines is a priority of current research in the Turkana Basin (Ashley et al., 2011; Beyin, 2011; Mirazón Lahr et al., 2016; Wright et al., 2015), and demands a level of chronological resolution currently lacking at early Holocene sites (Beyin et al. in press).

2.2. Cultural innovations during the AHP

Some archaeological sites dating to the terminal Pleistocene and early Holocene across Saharan, Sahelian and Great Lakes Africa

appear to share certain traits in common (Fig. 1). Many of them are located near paleoshorelines of existing lakes (e.g., Chad, Turkana, and Victoria), within the catchments of paleolakes that no longer exist in the formerly “Green” Sahara, or within the catchments of major rivers (e.g., Niger, Nile). Many have archaeofaunal evidence for aquatic resource exploitation: abundant fish bones, as well as more limited samples of crocodile, hippopotamus, turtles, and/or water birds. Some of these animals, as well as those inhabiting savannas (e.g., giraffe, elephant), are depicted in Saharan rock art. Sites from a wide geographic range (Morocco to Botswana) and long chronological timespan have produced barbed bone points (Yellen, 1998). While these are usually interpreted as tips of fishing spears or harpoons, in one case (Daima, Chad Basin) a bone point was used as weapon (Connah, 1981), while in the recently reported “massacre” at Nataruk in the Turkana Basin, the use of bone points as possible weapons is suggested (Mirazón Lahr et al., 2016:399). Numerous sites dating to c. 9000–8000 BP in the Nile Valley and the Sahara-Sahel have early pottery, in addition to evidence for aquatic resource exploitation (Barich, 1987; Close, 1995; Mohammed-Ali and Khabir, 2003; Garcea, 2006; Barich, 2013). Some but not all of these assemblages share “wavy-line” décor, a trait which also appears on limited numbers of sherds in the Turkana Basin, possibly after c. 8000 BP (Robbins, 1972; Barthelme, 1985).

The apparent similarities among early Holocene sites led Sutton (1974, 1977) to boldly put forward a hypothesis that they might belong to a shared “cultural complex”, termed “Aqualithic,” which he saw as a viable and equally important alternative to agriculture in resource-rich environments. Fishing, in particular, was argued to have enabled a kind of semi-permanent settlement leading to the development of some of the same technologies – grinding stones, pottery – seen in agricultural societies. Sutton advanced that “Aqualithic” groups across the continent (possibly linked through migrations) might not only share ceramic and bone technologies and subsistence strategies, but might also have a common ethno-linguistic identity, a hypothesis which he argued remained to be tested.

Sutton’s broader intention was to stimulate research, and he made it clear that he was laying out a proposition for future work and debate. In this sense, the “Aqualithic” papers were successful. For example, Sutton inspired productive discussions on the role of aquatic resources in the development of pottery (the “fish stew revolution”) and on the social changes that may have accompanied this development (e.g., Haaland, 1992, 1993, 1997, 2007, 2009). However, the hypothesis also generated criticism. Increased field-work led to larger samples with which to examine the notion of a widespread cultural complex (Holl, 2005). These samples have shown substantial regional variation in ceramic and barbed bone point traditions (e.g., Barich, 1987; Krzyżaniak et al., 1993; Yellen, 1998; Dale, 2007). Lithic analyses suggest local continuity from late Pleistocene to early Holocene technological traditions (e.g., Phillipson, 2005; Seitsonen, 2010). Consumption of freshwater fish also has a long history throughout much of the continent (e.g., Van Neer, 1986; Stewart, 1994; Plug and Mitchell, 2008; Trapani, 2008; Braun et al., 2010; Linseele and Zerboni, this volume). The shift to a large number of aquatic-focused settlements during the AHP may thus be a question of scale, with sites not only more numerous but also more visible to archaeologists today, since they are located on exposed paleoshorelines. In many areas the joining of lakes during the AHP would have also led to species exchanges, creating greater biodiversity and, by extension, potentially greater opportunities for aquatic resource exploitation (Stewart, 1989).

Despite the importance of aquatic resources to AHP economic and social shifts, faunal analyses have been limited to a handful of well-researched areas, with the Nile River and its tributaries being

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