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Chapter · November 2022

DOI: 10.1007/978-3-031-18203-7_13

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Dark Side Archaeology: Climate Change and Mid-Holocene Saharan Pastoral Adaptation

Augustin F. C. Holl



Published online: 25 August 2020 © Springer Science+Business Media, LLC, part of Springer Nature 2020

Abstract High-resolution paleoenvironmental research allows us to pinpoint the tempo and amplitude of past climate changes. Abrupt climate events have axiomatically triggered cascades of adjustments, in vegetation, fauna, humans, and pathogens. This essay focuses on the abrupt end of the African Humid Episode (9000-6000 cal BP), ca. 5000 cal BP in the Sahara. Neolithic pastoralists, practicing transhumance between sandy lowlands and Saharan mountains, adopted new cultural practices: cattle burials and livestock bone deposits in built installations. Their ritual nature is indisputable. But ritual for what? If considered from the perspective of livestock zoonoses, such practices may point to the "dark side" of cultural adjustments-strategies to counter human and livestock diseases. Livestock zoonoses are constant sources of emerging infectious diseases (EID) in the present, as they were in the past. Sustained research on livestock and human health are of paramount importance given the accelerating rate of world urbanization.

Résumé La haute résolution des recherches paléoenvironnementales actuelles permet de préciser la chronologie et l'amplitude précises des changements climatiques passés. Axiomatiquement, de brusques changements climatiques ont déclenché des cascades d'ajustements, de la végétation, la faune, les humains et les agents pathogènes. Cet article porte sur la fin abrupte

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de l'Episode Humide Africain (9000-6000 Cal yr BP), autour de 5000 calBP dans le Sahara. Les pasteurs néolithiques, transhumant entre les basses terres sablonneuses et les montagnes sahariennes, ont adopté de nouvelles pratiques culturelles: enterrements de bétail et dépôts de leurs os dans des installations construites. Leur nature rituelle est incontestable. Mais rituel pour Quoi? Si elles sont prises en considération du point de vue des zoonoses du bétail, de telles pratiques peuvent indiquer le « côté obscur » des ajustements culturels, des stratégies de lutte contre les maladies humaines et du bétail. Les zoonoses sont des sources constantes de maladies infectieuses émergentes [EID] dans le présent, ainsi que dans le passé, en effet. En raison de l'urbanisation acceleree, les recherches soutenues sur la santé humaine et du bétail sont d'une importance capitale.

Keywords Mid-Holocene · Abrupt climate change · Biosphere adjustments · Pastoralism · Livestock zoonoses · Cultural adaptation

Introduction

Climate change is the ideal illustration of punctuated equilibria with different periodicities. High-resolution paleoenvironmental research on the Holocene has now allowed the detection of many abrupt climate change events in the past 10,000 years (Armitage et al. 2015; Phelps et al. 2019). These studies have demonstrated the selective pressures that climate change has exerted on long-term cultural adaptation. This short contribution

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focuses on the Mid-Holocene (ca. 5000 BP) abrupt climatic event and its consequences on Saharan Neolithic pastoralists of the Messak plateau in southwest Libya.

The ca. 5000 Cal BP Abrupt Climate Event

The Mid-Holocene abrupt climate event is documented worldwide. Shells from the Goz Kerki regressive 325-330-m shoreline in the northern Chad basin, dated and calibrated to between 5310 and 4190 BP, indicate mid-Holocene high lake levels. Soon after, "the lake level fell dramatically, and dunes of the Erg of Djourab within the northern Bodélé catchment became active" (Armitage et al. 2015, p. 8545). Data from Mega-Chad, partly summarized in Armitage et al. (2015), point to an abrupt end of the African Humid Period (AHP), a phenomenon that is also documented in East and North Africa. The data indicate rapid, centennial-scale dry conditions all over the large paleolake (Mega-Chad basin) after ca. 5000 BP. A study by Phelps et al. (2019, p. 9) shows that "the most obvious increase in the domestic animal climatic niche (ca. 4500 BP) occurred during the end of the AHP when both a strong reduction in the cover of tropical trees and Sahelian grassland cover and spatially extensive dust mobilization occurred."

Humans, Livestock, and Droughts

Increased aridity affects all components of the local biospheres. It impacts fodder and water, two critical variables of sustainable animal husbandry. Poor grazing and water shortage affect livestock and human health and increase susceptibility to diseases (e.g., contagious bovine pleuropneumonia and rift valley fever), death, and pastoralists' impoverishment. It also heightens inter-group conflicts triggered by the use of raiding and counterraiding as a replenishing strategy.

Climate change and global warming impacts are at the forefront of public, policy, and academic discussions today. Assembled data show that "climate change drives the emergence of diseases where arthropods vectors are sensitive to environmental changes" (Tomley and Shirley 2009, p. 2639; McDaniel et al. 2014). Zoonoses account for approximately 75% of the newly introduced diseases. Ungulates, according to McDaniel et al. (2014), "are the most important non-human host, both in terms of the number of zoonotic pathogens species supported as well as among emerging and re-emerging zoonotic species." Pathogens susceptible to affecting humans and cattle are dominated by bacterial (c. 42%), followed by parasites (29%) and viruses (22%), prions (infectious proteins 2%), and others (5%). Consequently, "both the CDC [Center of Disease Control] and the NIAID [National Institute of Allergy and Infectious Disease] have listed approximately half of all bovine zoonotic pathogens as both biological weapons (52%) and potentially-emerging pathogens (50%)" (McDaniel et al. 2014, p. 14). Disrupted environments have dire consequences on pastoral communities in the present, as they did in the past (Di Lernia 2006; Di Lernia et al. 2013; Holl 2013; Pantuliano and Pavanello 2009; Western and Finch 1986).

Neolithic Pastoralists and Their Cultural Adjustments

Neolithic pastoralists devised two main strategies to deal with the mid-Holocene environmental crises: (1) migration in search of new favorable lands (Holl 1998, 2013; Phelps et al. 2019) and (2) local cultural adjustments (Di Lernia 2006; Di Lernia et al. 2013) via "bad times" innovative livestock management strategies. Western and Finch's (1986) observational and experimental research on cattle husbandry in drought contexts provides good actualistic referentials. According to them, "the reduction in food maintenance requirements when nutritive conditions deteriorate, and the rapid weight increase when they improve" are adaptive livestock responses to drought (Western and Finch 1986, p. 87). Tight mating controls allow for cattle birth to take place in the rainy season to optimize the availability of milk for calves and human consumption.

In pastoralist societies, cattle were the ultimate social currency. The drive for large herds was geared towards storing surplus accumulated during good seasons as "meat on the hoof" and providing reserves to be used during bad ones (Western and Finch (1986). Meat from surplus cattle or sheep and goat is the only reliable food in "bad years" or dry seasons. Pastoral-nomadic groups with large herds can accordingly "take greater risks, and prudently...slaughter and consume animals in anticipation of their death from starvation" (Western and Finch 1986, p. 89) and, one may add, epizootics. Anthrax,

bovine spongiform encephalopathy, bovine cysticercosis, bovine tuberculosis, brucellosis, cryptosporidium, *Escherichia coli 0157:H7*, leptospirosis, methicillin *staphylococcus aureus*, Q fever, rift valley fever, and Salmonella are the predominant cattle zoonotic diseases. It is axiomatic that they affected livestock and humans' health in the past as they do in the present. Therefore, we have to expect patterned cultural and healing responses to these threats to pastoralists' livelihood and health. Curing techniques, medicinal plants, healing, and ritual practices were certainly relied upon to cope with such situations.

Livestock, Cattle in Ritual Performance

Archaeological evidence pertaining to special treatments of cattle remains are documented in different regions of northern Africa, from the Eastern Sahara (Egypt) to the Eghazzer basin (Niger), via the Messak plateau (Libya) and the Tenere (Di Lernia 2006; Di Lernia et al. 2013; Holl 1998, 2013). Consideration is given to a few case studies from Nabta Playa and the Messak plateau in this short essay.

Seven out of nine tumuli were excavated at Nabta Playa. Four of these contain cattle remains dated to the seventh millennium BP. Tumulus (T) E-94-1n contained the complete skeleton of a young cow, and T- E-94-1s had articulated and disarticulated bones of three individual cattle. Four individuals (two sub-adults and two young adults) were found in T-E-96-4, two individuals (one juvenile, one young adult) in T-97-6, and, finally, one or two sub-adult in T-E-97-16 (Di Lernia 2006, p. 53). Interestingly, all the represented specimens are young to very-young animals, not yet at reproductive age, and, as such, susceptible to culling without endangering the reproduction of the community herds.

Forty-two stone monuments were excavated along the Wadi Bedis meander in the Edeyen Murzuq Lake in southwest Libya, an area claimed to represent "locales of social importance and enduring value for Messak pastoral groups" (Di Lernia et al. 2013, p. 4). Twentyfour of these monuments dated to 7165-6745 cal BP (GX-28456) and 6186-5656 cal BP (GX-28446) and contain livestock remains (cattle, sheep/goats, and other ungulates). Eight monuments, dated to 6652-6449 cal BP (GX-28448 AMS) and 6172/5913 cal BP (UGAMS 3763), have cattle (large ungulates) remains only; six monuments of 7165-6745 cal BP and 6186-5656 cal BP dates have cattle and sheep/goat remains. And, four monuments, dated to 6194-5999 cal BP (UGAMS 5858), contain only sheep/goat remains, whereas one monument has the remains of equids and small ungulates (sheep/goat). Finally, five monuments dated to between 6304–6125 cal BP (UGAMS-2839) and 1816–1625 cal BP (UGAMS-5857) revealed the presence of undetermined faunal remains.

The practice of slaughtering animals as a sacrifice, sharing their meat or burying their bones-complete carcasses or fragments-in purposely built installations is evident in the cases under consideration. Identifying the goals of the performed rituals is, however, a more challenging issue. Whatever the case, the behavioral patterns represented in the performed rituals can hardly qualify as a "Cattle Cult" "to cope with drought and famine, using this precious resource as an offering to superhuman entities" (Di Lernia 2006, p. 60). There are multiple human-to-human reasons for performing rituals involving cattle, sheep, and goats. The assumed connection to divinities or "superhuman entities" is a cultural imposition (Schwartz 2017). Divine transcendence is not a universal cognitive category. The sacrifice and offering to honor the ancestors, for example, do not require the hypothesis of a divine entity; it deals exclusively with human affairs, the rationale adopted in this paper.

Archaeological tools are severely limited when it comes to addressing the palimpsest nature of archaeological sites. By necessity, our compressed timeframe— Binford's durational behavior—distorts the perception of how events actually happened in the past. A ritual performance is a specific space-time event. If the monument dated to 1816–1625 cal BP is removed from consideration, the ritual events represented in the Messak archaeological record took place from ca. 7165–6745 to 6186–5656 cal BP, a little more than 1000 years. Twenty ritual events over 1029–1075 years represent, on average, one ceremony every 46.77–48.86 years, once every two generations.

Concluding Remarks

Zoonoses and their related infectious diseases are partly defined by biological interconnectedness. Outbreaks are not rare. But the present one, triggered by the COVID-19 virus, is so far unique in human history due to its global impact. Limited infectious disease outbreaks have certainly affected the past pastoral-nomadic communities in the Sahara and elsewhere. The Messak plateau pastoral groups used the shores of Lake Edeyen Murzuq as a rainy season camping area and the higher ranges of the plateau during dry seasons. Some specific areas—along the Wadi Bedis meander, for example were consecrated and used for important ritual events.

Cattle, sheep/goats, and occasionally an equid were butchered, some buried entirely, and others cut, roasted, and eaten, and their bones collected for burial in monuments built for this purpose. Slaughtered sheep/goats tend to be younger, while the cattle remains indicate adult animals. Three specimens are > 18–24 months old. But most of the butchered cattle specimens are 4–10 years old, with 4–6-year-old animals sacrificed in six cases. Interestingly, when sex was determinable, the specimens were bulls (see Di Lernia et al. 2013, p. 15-16, table 4). Only surplus animals appear to have been selected.

Selective butchering, likely at the beginning of the rainy season, points to different kinds of crisis management. Health issues, concerning livestock, humans, or both, could have emerged infrequently during harsh dry seasons. The ritual performances, very likely exceptional and infrequent, were gatherings of families or larger social groups enabling new/renewed alliances between pastoral groups scattered all over the Messak plateau during the long dry seasons. Such gatherings could also be to perform exorcism. Animal epizootics could have happened. Some of cattle zoonoses could have affected humans. Calls to and support from successful ancestors were part of the needed social healings. In some cases, sick animals could have been butchered, burnt to dispel the "evil eye," and buried entirely without anyone eating their meat. In others, healthy but weak animals were butchered, their meat shared to celebrate the renewal of alliances with other pastoralists groups, and the animals' bones collected and sealed in a stone monument. In other cases, depending on the size of the attendance, cattle and sheep/goat and undetermined large/small bovids were culled, butchered, shared, and consumed in feasting episodes. And finally, to seal matrimonial alliances, healthy oxen could have been butchered, all or part of their bones buried in consecrated monuments to cement the alliance between two distinct pastoralist groups. In fact, one has to expect more than 1000 years of these ritual scripts to feature some diversity. The archaeology of that hard-to-perceive side of biological and cultural adaptations deserves to be investigated in the future.

Almost 75% of the recent major global disease outbreaks have a zoonotic origin (Asante et al. 2019). Human tuberculosis (TB), for example, can be contracted from infected cattle, and this is identifiable in the archaeological record (Galagan 2014; Kemunto et al. 2018; Muller et al. 2013). Bovine TB, prevalent in all major livestock-producing countries of the developing world and Africa, is strongly correlated to cattle density (Muller et al. 2013). TB, one of the most devastating human infectious diseases transmitted by Mycobacterium bovis, occurs through close contact with infected cattle or the consumption of contaminated animal products. About eight million new active cases that lead to nearly 1.5 million deaths are recorded annually (Galagan 2014, p. 307).

The accelerated urbanization of Africa and the increasing demand for animal protein, estimated to increase by 50% in the year 2030 (Salman and Steneroden 2015, p. 3), drive a profound change in the landscape of infectious diseases that affect humans and animals (Asante et al. 2019). Humans, particularly Africans, have to be prepared to face extraordinary health crises in the future. Unfortunately, there is a significant imbalance in the attention given to zoonotic diseases (Kemunto et al. 2018). Those posing global economic and health threats are, rightly so, focused on, and taken care of, at the expense of the endemic ones that affect populations with little political clout, such as the descendants of African Neolithic pastoral-nomadic communities.

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