Quaternary International xxx (2015) 1–9

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Facing climatic hazards: Paleolithic foragers and Neolithic farmers

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ARTICLE INFO

Article history:
Available online xxx

Keywords:
Pleistocene
Paleolithic
Holocene
Neolithic
Climatic impacts
Continuity

ABSTRACT

Food security intertwined with the need to maintain biological survival of a demographically viable population is the basic long-term policy for all societies. This paper compares selected cases of successful and failed Paleolithic groups of hunter-gatherers, as recorded archaeologically across Eurasia and Africa, in responding to the impacts of abrupt climatic changes. The complex prehistory of Pleistocene foragers is briefly compared to strategies adopted by Neolithic farmers. The major difference between forager and farmer economies is not their social organization as much as the access options to alternative territories and food resources. Open Pleistocene landscapes across Eurasia and Africa allowed for movements of Paleolithic groups over large distances with or without adopting new exploitation techniques. Successes and failures that we measure in a chronological macro-scale left archaeological evidence (lithic assemblages, faunal remains, occasional flimsy dwellings, etc.) in various regions, recorded by systematic and comprehensive surveys and excavations. However, we miss the chronological micro-scale of most of the Paleolithic period that could inform us about extinctions. We can identify only survival stories explained as successful adaptations. When farming communities were established during the course of the Holocene, variable modes of social and economic interactions and group resilience evolved in order to secure survival in years of bad harvests. Interactions with foragers and herders, competition, raids, village abandonment, migration into others' territories, were among the optional strategies. Due to the difference in chronological scales between 2.6 Ma of the Paleolithic period and the 12 Ka of the Holocene (or Anthropocene), we can more easily recognize the role of abrupt climatic changes among prehistoric societies during the Terminal Pleistocene and the Holocene and evaluate the success and failure of both, hunter-gatherers and farmers.

1. Opening remarks

Archaeologists and paleoanthropologists share a common positive view of continuity of human biological and cultural evolution. The history of these intertwined disciplines during the 19–20th centuries resulted in a view that, I believe, prevents us from ‘writing’ the history of different ‘people with no name’. The notion of seamless continuity emerged from ignoring the important differences between macro- and micro-chronological scales. In writing our anthropological interpretations of the deep past we take into account the modeled extinctions during the Pleistocene, but often fail to account for the archaeological examples. Therefore, before delving into the discussion concerning the role of climatic fluctuations in prehistory and how humans survived natural calamities, we need to briefly examine the contradiction between continuity that means endurance and discontinuity that could mean replacement or even extinction.

The basis for a supposed relationship between climate change and human culture emerged in the early 19th century, when European scholars first recognized prehistoric remains as evidence of ancient human behavior. These were closely tied with the generalized sequence of river terraces of the Somme in France and the Thames in England. Both artifacts and the remains of extinct mammal species were found in gravel quarries in the terraces. Understanding that topographically higher terraces were older than those below them allowed the creation of a bio-chronology, and an artifact sequence that could be dated by reference to the geo-chronology of glacial cycles established in the Alps (Zeuner, 1959). This relative chronology led to the association between climatic changes and human survival in Europe during the Pleistocene. This association was incorporated in the paradigms of archaeological research which expanded from Europe to eastern Eurasia (e.g., Bar-Yosef and Wang, 2012) as well as in other continents (e.g. Ziegler et al., 2013).

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http://dx.doi.org/10.1016/j.quaint.2015.11.037
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The concept of “continuity” in human evolution developed from the combined influence of Charles Lyell (1779–1875), the author of *Principles of Geology*, who adopted the concept of ‘uniformitarianism’ from the writings of James Hutton (1726–1797), and those of Darwin about biological evolution in the world of living organisms. More recently, with the development of genetic studies, we recognized the presence of ‘bottle necks’ in biological evolution marking population decrease (e.g., Cornuet and Luikart, 1996), the impacts of genetic drift (e.g., Nei, 1978), and the effects of interbreeding and of migrations during the Paleolithic.

Technical inventions and innovations supposedly improved the survival of prehistoric societies during the last 2.6 Ma. Testing ethnographically the importance of social circumstances that allowed for the acceptance of changes in material culture resulted in rather ambiguous results. On the one hand models demonstrate that larger populations increase the probability of adoption of innovations (e.g., Shennan, 2000; Premo and Kuhn, 2010). But, on the other hand, testing those models against the material culture of hunter-gatherers produced mixed results (e.g., Collard et al., 2013 and references therein). Biological survival does not fully depend on producing new stone tools. A population may loose a set of elaborate material culture as shown by Henrich (2004), who argues that Tasmanians underwent a loss in technological complexity some 3400 years ago when they were cut off from interacting with the Australian continent due to rising sea levels. Apparently they switched to a simpler set of tools that did not impair their survival until Europeans appeared on the island. In contrast, the Inuit, often living at extraordinarily low population densities, maintained the most complex of technologies among hunter-gatherers (Read, 2008). Therefore, the meaning of continuity in material culture or lack thereof is a challenge to the archaeological interpretations of Pleistocene cultural changes. Providing an explanation for ‘how’ and ‘why’ the change in the tool kits supports the notion of cultural continuity or replacement is essential for determining whether the observations mark the former or the latter phenomena. In claiming cultural continuity in face of climatic fluctuations it would be sufficient to demonstrate that the basic tool-kits did not change, whether those were used for hunting, butchering, or working hides. In case one claims for cultural continuity after a climatic crisis, the archaeologist should demonstrate why the new tools were better suited for survival in the same environment under the new circumstances. In this case we also demand to know why the major shift in the composition of the tool-kit does not indicates the presence of new people. A few illustrative examples are described below.

When compared to the Holocene records of western Asia where farming societies first emerged around 12/11,700 cal BP, every minor climatic fluctuation had an impact on settlement patterns and village survival. The first to suffer were agro-pastoral societies in the steppic belt and later villages on the banks of the rivers. The current information is based on large data sets of radiocarbon dates (e.g., Weninger et al., 2009; Perlès, 2013; Borrell et al., 2015). However, also concerning Levantine farmers we ask for the information that supports continuity rather than population replacement. Here I try to examine this issue from a broader viewpoint, looking back into the Pleistocene.

2. The Lower and Middle Pleistocene

The possible and sometimes probable interaction between climatic and cultural changes and natural selection became an inseparable part of telling the evolutionary history of humankind that was described by Spencer in his *Principles of Biology* (1864) and later adopted by Darwin in his *The Variation of Animals and Plants under Domestication* (1868) as the “survival of the fittest.” Movements across landscapes into new territories in search of food sources, proximity to water sources, inter and intra-group competitions, and migrations over long distances were a part of early hominins behavioral repertoire. In addition, social and brain research indicates a difference between perceptual and epistemic curiosity in human behavior. The first is aroused by novel, strange or ambiguous stimuli and relates to all biological beings (Jepma et al., 2012, p. 8). The second, epistemic curiosity, refers to the desire for knowledge or intellectual information and is considered an innate characteristic of humans (e.g., Berlyne, 1954, 1966; Litman, 2005; Jepma et al., 2012, and references therein). Exploratory behavior or the search for specific and diverse knowledge could be the biological background to the evolution of foresight that may explain the motivation for earlier hominin migrations.

Biological evidence documents the changes of the human body since the Plio-Pleistocene and in particular the growth of brain size and its complexity that resulted in morphological changes of the skull (e.g., Liberman, 2011). Current interpretations of hominin evolution stress the shrinking of the earlier Pleistocene forests in Africa and the expansion of savannah landscape as the main cause for the specific physical adaptation of *Homo habilis* and *Homo ergaster* to food acquisition in a new environment (e.g., Potts, 1998, Potts and Teague, 2010; Mirazón Lahr, 2010).

The overall success of early hominins led to the emergence of *Homo erectus* that until recently was considered to be the hominin who left Africa. The discovery of five skulls in Dmanisi in the Republic of Georgia demonstrated the first ‘out of Africa’ migration to Western Asia at 1.85–1.77 Ma (Ferring et al., 2011; Lordkipanidze et al., 2013). The taxonomic definition of these skulls as *Homo erectus* indicates that this population was not limited by their original adaptation to foraging and scavenging only to the African savanna (Bar-Yosef and Belmaker, 2011). Moreover, if their original homeland, mostly East Africa, was a “Garden of Eden”, why did members of the *Homo erectus* population move? We assume that a decline in the carrying capacity or in the predictability of animal and vegetal resources in the African savanna caused a portion of this meta-population to leave.

Several motivations, based on ecological conditions, are already suggested, such as the relatively limited size of habitable areas across the African continent and especially the diseases present in tropical and semi-tropical environments (Bar-Yosef and Belfer-Cohen, 2001, Fig. 1). Was it competition among groups of hunter-gatherers that forced the “losers” to move? Other suggested that the search for food by hominins as scavengers followed the territorial expansion of large carnivores (Turner, 1992), an argument that failed the test of evidence. Decreasing carrying capacity, whether of plant food or animals to hunt and scavenge, is another general explanation.

Although the fate of the Dmanisi hominins after 1.77 Ma is unknown, the success of the first pioneer groups supports the assumption that they were able to persist in different kinds of environments, due to their capacities for mobility, hunting, scavenging, feeding in new vegetation environments, and making simple stone tools (Oldowan types). Their tool kits fall within the category of ‘core and flake’ industry, a general term that would fit the majority of the Lower to early Upper Paleolithic assemblages in the Chinese mainland (Bar-Yosef, 2015).

The spread of hominins across Asia (Dennell, 2009) and through particular ecological zones where resources were available, predictable and accessible by their tools (made of stones or organic substances such as wood and bamboo) led through time to the establishment of different populations that sometimes became disconnected from each other. Stone tools bear only limited information and their cultural interpretations should be unassertive.