Quaternary International xxx (2016) 1–10

Contents lists available at ScienceDirect

Quaternary International

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

Did foragers adopt farming? A perspective from the margins of the Tibetan Plateau

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ARTICLE INFO

Article history:
Received 3 March 2016
Received in revised form
29 November 2016
Accepted 12 December 2016
Available online xxx

Keywords:
Tibet
Niche model
Forager
Karuo
Zongri

ABSTRACT

Farmer's ability to rapidly grow their populations has been seen as an advantage in allowing them to either engulf or simply do away with foragers. Research on agriculture's spread in East Asia has followed an underlying assumption: that farming produced equally reliable returns across the vast expanse of territories into which it spread. Farmers are thus always seen as being at a demographic advantage. However, in some parts of Asia, ecological barriers to growing crops may have meant that the opposite was true. In order to illuminate how foragers and farmers might have interacted in environments marginal to crop cultivation, I argue that we first need to outline where the barriers to farmer expansion in prehistory lay. Using ecological niche modeling combined with an analysis of recent archaeological data, this paper contrasts forager farmer interaction in two different areas of the Tibetan Plateau. It argues that the higher elevation reaches of the "third pole" constituted a barrier for early millet farmers expanding into the region. In these areas foragers may have maintained a competitive advantage.

1. Introduction

Across most of the globe, there is an expectation that rapid farmer demographic increases meant that foragers were engulfed before they had an opportunity to engage in agricultural activities, unless they found themselves in situations where they had demographic advantages over farmers, or where environmental factors prevented farmers from moving their crops (Bellwood, 2005). Research on agricultural origins has long taken into account the fact that humans were not able to grow crops successfully across the entire earth. For instance, Binford (1968) equilibrium model argued that humans who lived in optimal patches of food resources experienced increases in population growth. In these areas, growing population densities lead to demographic movement into patches with lower carrying capacity, disturbing the density equilibrium and leading to resource extensification: an idea that Flannery later used for his Broad Spectrum Revolution. The environment's patchiness has not been as thoroughly considered when trying to understand how, once domesticated, crops and animals were spread outside of their homelands of domestication.

While population pressure in agricultural centers is still seen as the primary driving force behind agriculturalist expansion (Richerson et al., 2001): farmer movement outside of these centers of domestication has too often been reduced as taking place as a homogenous and barrier-less "wave of advance" (e.g. Ammerman and Cavalli-Sforza, 1972; Cavalli-Sforza, 2002). Many of these models tend to assume that the ability to grow crops is distributed across the landscape in a homogenous fashion and that farmers were able to move into whichever areas their growing population densities pushed them into. Some alternatives exist such as "hopping" across the landscape to target particular environmental variables such as soils or water (Ammerman and Cavalli-Sforza, 1973).

What we have had difficulty in doing is in creating models that are able to outline where exactly barriers to farmer expansion might have located. Although some optimal foraging models do account for the patchiness of the environment (such as Patch Choice) (Charnov 1976), these have only been rarely employed in archaeological research. Rather the Diet Breadth model, which assumes a homogenous distribution of resources across the environment, has been applied to most archaeology case studies (e.g. Gremillion, 1996; Piperno and Pearsall, 1998).

Examples from around the world have, however, shown that the wave of advance model did not hold true everywhere. Rather, farmers were presented with ecological challenges as they tried to move crops (and animals) that were domesticated in one area to new environments (Alexander, 1977; Dennell, 1985; Davidson, 1989; Banks et al., 2013; d'Alpoim Guedes and Butler, 2014). But

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http://dx.doi.org/10.1016/j.quaint.2016.12.010
1040-6182/

where exactly did these physical barriers to farmer expansion lie? Although ecological barriers have been discussed as potential impediments to farmers spread (e.g. Bellwood, 2005; Davidson, 1989) only occasionally have these barriers been formally modeled at a scale that is detailed enough to inform us about forager farmer interaction (although see Banks et al., 2013; Silva et al., 2015).

In Tibet, a lack of understanding of where these limits lay in the past has meant that previous work in the region has largely assumed that farmers were able to move unfettered onto the Plateau. As a result, their potential interaction with existing foragers has been largely ignored. In addition, in East Asia, foraging and farming have often been seen as lifestyles at complete odds with each other. Foragers can and have, however, engaged in opportunistic cultivation when presented with the opportunity and prospecting pioneer farmers can themselves take on a foraging lifestyle to seek out trade opportunities or to prospect as they move the frontier. Davidson (1989) points out that we should consider four categories of people operating at agricultural frontiers: A.) Hunters; B.) Cultivating Hunters; C.) Hunting Agriculturalists; and D.) Agriculturalists/Pastoralists. In Tibet, little attention has been paid to identifying the groups that fall outside of categories A and C, yet they undoubtedly were present as agriculture spread into this region. If sites contain either pottery and/or the presence of a domesticated plant or animal they have been construed as belonging to farmers. I argue that particularly in Tibet, the presence of these two elements alone is not sufficient to demonstrate that it was farmers themselves were responsible for the transmission of crops and animals. Rather we must consider more complex scenarios for the peopling of this area.

Using ecological niche modeling, I demonstrate that prehistoric Eastern Tibet was one area where moving farmers experienced considerable constraints on their expansion. The unique geography of the Eastern Tibet meant that foragers in this area were able to engage with agricultural products and material culture produced by agriculturalists (and in some instances came into contact with them) without fully abandoning their forager lifestyle and while maintaining cultural autonomy.

2. The archaeological record of eastern tibet

The archaeology of early western Tibet is still in its infancy. My discussion will thus focus on remains from the better-known margins of Eastern Tibet, where increasing numbers of archaeological research over the past decade have begun to provide us with a picture of what early forager/farmer interactions might have looked like. Eastern Tibet is composed of the former provinces of Kham to the South and Amdo to the North. We call these the SETP (South Eastern Tibetan Plateau) and the NETP (North Eastern Tibetan Plateau) respectively. The NETP (Amdo) comprises parts of the current provinces of Qinghai, Gansu (and a small part of Sichuan), and the SETP (Kham) encompasses most of western Sichuan, northern Yunnan and Southern Qinghai (Fig. 1). The SETP is comprised of a series of deeply incised river valleys. Within the space of a single river valley, altitudes can vary from 2500 masl at the riverbed to over 5000 m at the top of the surrounding mountains. Heavy summer precipitation has lead to the SETP's Hengduan mountain chain becoming a hotspot of biodiversity. On the NETP, there is less dramatic vertical delineation. This area is characterized by a drier high altitude open grassland (3000–4000 masl) that extends from Hongyuan and Ruo'ergai in the south up until roughly Gannan in the East and Amye Machen mountain the West. Today this area constitutes some of the most productive pastoral land in Tibet. This plain is flanked by the lower lying Qinghai lake district to the north and a series of lower elevation East-West oriented mountains around Gannan (Fig. 1).

2.1. Mobile foragers on the Plateau

Microliths are an important feature of the cultural assemblage associated with the hunter-gatherers that occupied Northern China during the late Pleistocene and early Holocene (26,000-6000 BC) (Bettinger et al., 2007; Lu, 1998). This technology arose during the LGM, likely as a response to producing the cold adapted clothing and hunting technology that was necessary to survive during this cooler period of time (Yi et al., 2013). Microlithic technology was likely brought to the Plateau by game hunter/foragers who had technologically adapted to the high latitude northern steppes of Asia and followed the Paleoartic big game that once occupied this area into the highlands after the end of the LGM drove these animals out of lower elevation reaches of NW China (Rhode, 2016). Sites containing microliths are spread widely across the Plateau and are associated with small, ephemeral sites indicative of only short-term occupations (likely temporary hunting camps, where hunters processed animal carcasses) (Rhode, 2016).

The similarity of these assemblages of microliths to earlier material from Northern China and from high latitude Asia, led archaeologists working on the Tibetan Plateau to originally believe that these dated to either only the late Pleistocene or early Holocene. However in recent years, re-dating of a number of these sites has demonstrated that several of these are mid Holocene in date: for instance Xidatan on the Northern Tibetan Plateau was found to date to 9200-6400 cal. BP, despite the late Upper Paleolithic appearance of the assemblage (Brantingham et al., 2013). Recent evidence from the Jiaritang site found in the Qinghai–Tibet railway project shows that a hunter-gatherer lifestyle may have continued on the Tibetan Plateau well into the even later Holocene (c. 1200–900 BC) (Xizang et al., 2005): although it is possible that this site was also occupied by later pastoralists. In the lower lying altitude areas of the SETP, microliths have been discovered, but were initially always found in association with later agriculturalist material. The lack of systematic screening of sediments likely meant that many of these sites have simply been missed in early work in the region. For instance, in initial surveys of the Ruo'ergai grasslands archaeologists did not discover any microblade sites. However, following an introduction to microlithic technology and being familiarized with these tools size and appearance, recent surveys of the high altitude Ruo'ergai grasslands revealed substantial numbers of ephemeral hunting camps that contained large numbers of microliths and cores. Examples include the Qurujian site where large numbers of animal bones, microblades and cores as well as larger flaked tools were found on the surface (Gugong Bowuguan et al., 2014). No evidence for permanent structures was found at this site. At the nearby site of Xiemajian, microliths were found alongside painted pottery suggesting that at the users of microliths co-existed temporally with neighboring farmers and may have even engaged in exchange with them (Gugong Bowuguan et al., 2014). Sadly, no direct dating has been applied to these settlements and none have been excavated. However, they are key to our understanding of forager/farmer interactions in the region. One can hope that future archaeological investigations in this area will explicitly target these sites.

2.2. Expansion of farmers to the SETP

The earliest expansion of farmers into the Eastern Tibetan Plateau is better known and is closely linked to the expansion of the Majiayao culture of Northwestern China. The Majiayao culture is has its origins in the Yangshao culture of Central China (6800-6200 cal. BP) (Xi'an et al., 1988). During the Miaodigou phase (c. 6000-5500 cal. BP), the Yangshao culture (now known as Majiayao) begins an expansion throughout Northwestern China and