Quaternary International xxx (2017) 1–7

Contents lists available at ScienceDirect

Quaternary International

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

Radiocarbon dating and dietary reconstruction of the Early Neolithic Houtaomuga and Shuangta sites in the Song-Nen Plain, Northeast China

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ARTICLE INFO

Article history:
Received 2 May 2016
Received in revised form
12 January 2017
Accepted 25 January 2017
Available online xxx

Keywords:
Radiocarbon dating
Northeast China
Early Neolithic
Charred residues on pottery

ABSTRACT

Our objective in this study was to date and reconstruct the diets of humans at the Houtaomuga and Shuangta sites in Northeast China. Both sites have recently been surveyed and are important for understanding the emergence of pottery. Ours is the first study to provide age estimates for the Houtaomuga site. Phase Houtaomuga I (H-I) was dated to 10,820–9770 BP (13,000–11,000 calBP); Phase Shuangta I (S-I) was dated to 9400–7125 BP (11,000–7800 calBP); Phase Houtaomuga II (H-II) was dated to 7085–6755 BP (8000–7500 calBP); Phase Houtaomuga III (H-III) was dated to 5380–4920 BP (6300–5500 calBP); and Phase Houtaomuga IV (H-IV) was dated to 4420 BP (5000 calBP). This is the first site in Northeast China to be dated to the Early Neolithic period; future studies will focus on the relationship between this area, North China, and the Amur River Basin in Russia. Dietary reconstruction on the basis of carbon and nitrogen isotope composition and C/N ratios of charred residues on pottery indicated that freshwater fish was likely a major component of the diet in this region. These data are important for understanding the use of pottery in Northeast Asia.

1. Introduction

Researchers are starting to develop a more concrete understanding of the period that saw the emergence of pottery in East Asia, thanks to the publication of the results of numerous excavations and the accumulation of data. Pottery dating as far back as the Pleistocene has been found across a wide area spanning East and Central China, North China, Eastern Siberia, the Central and Lower Amur River Basin, and the Japanese archipelago. In East and Central China, Xianrendong Cave has been dated to approximately 20,000 calBP (Wu et al., 2012), while Yuchanyan Cave has been dated to approximately 18,000 calBP (Boaretto et al., 2009). The next-oldest sites are located in the region surrounding the Sea of Japan, with three locations in Japan, the Lower Amur River, and North China being dated to 10,000 BP. The Odai Yamamoto 1 (Nakamura et al., 2001) and Taisho 3 (Yamahara, 2008) sites in Japan and the Goncharka 1 site (Shewkomud and Yanshina, 2012) in the Amur River Basin are well known and have been dated to between 13,780 BP and 9890 BP (Fig. 1). The Nanzhuangtou and Yujiagou sites are located in North China where pottery is believed to have appeared during the Younger Dryas stage of the Late Glacial Period (Li et al., 2016; Sun et al., 2014). Given that the oldest examples of pottery from this initial period have been found in East China, it has been suggested that the pottery was transmitted from south to north (Cohen, 2013; Cohen et al., 2016). However, archeological sites distributed between East and North China do not follow an orderly progression from older to newer. Instead, they represent a patchwork of independent sites. Most importantly, there is a large time gap between sites in East and North China, and many aspects of the relationship between these sites remain unclear. The process whereby pottery emerged in North China is also unknown. To clarify these issues, in this study, we discuss the ages of the recently excavated Houtaomuga and Shuangta sites in Northeast China. It is necessary to determine the ages of these sites and to clarify the chronological relationship between these sites and those in the Amur River Basin and North China.

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http://dx.doi.org/10.1016/j.quaint.2017.01.031
1040-6182/

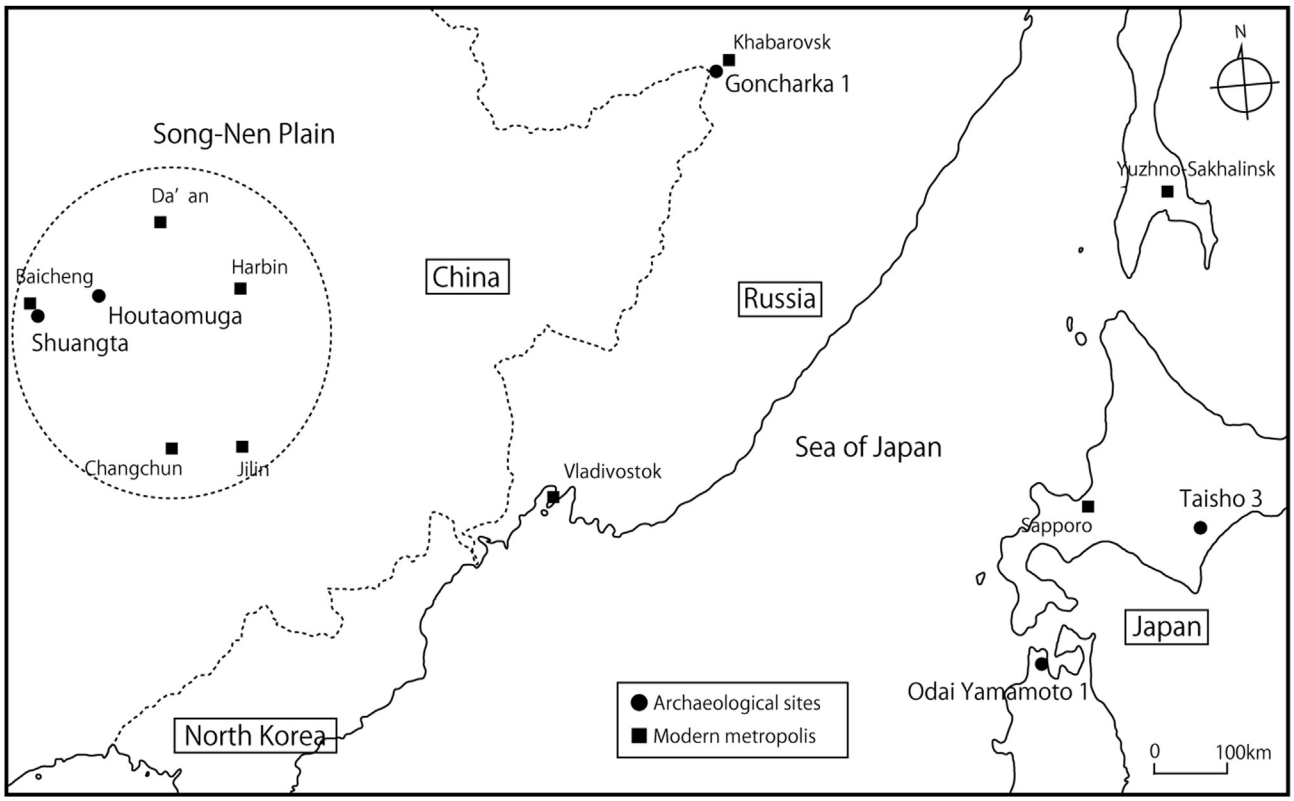

Fig. 1. Distribution of sites mentioned in this paper.

The objective of this study was to carry out radiocarbon dating and use charred residues on pottery to reconstruct human dietary habits. Carbon and nitrogen isotopic compositions of charred residues adhering to pottery excavated from archeological sites have recently been used to study prehistoric diets. Analysis of the carbon and nitrogen isotopic composition and fatty acids in charred residue samples from the Taisho 3 site indicates the presence of marine aquatic organisms (Craig et al., 2013). The authors also analyzed residues from the Taisho 3 site and the Osipovka culture. The former consisted mainly of marine organisms, whereas the latter did not indicate the presence of marine resources, but rather, suggested a greater role for freshwater fish and other terrestrial organisms in the diet (Kunikita et al., 2013). Our findings led to the conclusion that the cultural transitions in the East Asian region that took place during the Neolithic period should be understood as broad-based changes. The similarities between the prehistoric cultures surrounding the Sea of Japan are based on their shared natural environment, and partial ecological differences such as vegetation may have had a major influence on the transitions of different cultural groups. For example, given the correspondence between the duration of the sophisticated blade technology and the global climatic fluctuation, it is likely that an 8.2 ka climatic event was responsible for the sudden change in blade technology (Morisaki et al., 2016). Identifying the age and subsistence activities of regional cultural groups is thus important for discussing the process of cultural formation.

Recent studies have discussed neolithization (including the emergence of pottery) and agriculture (Kuzmin, 2013) as well as the transformation pottery and stone tools in East Asia in the greater chronological context and in relation to climate change (Morisaki and Sato, 2015). In terms of climate change, much of the focus has been on the warm Bølling and Allerød oscillations (15,000–13,000 calBP) and the cold Younger Dryas (13,000–11,500 calBP). The emergence of pottery is believed to have been spurred by changes in the ecological environment associated with climate change that occurred from the end of the Pleistocene to the Holocene. The emergence of pottery was an epochal event in prehistoric Northeast Asia, and elucidating this process is significant for understanding the cultural transitions in the subsequent Neolithic period.

2. Material and methods

The samples analyzed were collected by the authors in 2014 and 2015 in Northeast China (the Song-Nen Plain) at the Houtaomuga and Shuangta sites. The Houtaomuga site is located on the gently sloping foothills along the southeast shore of Lake Xinhuangpao in Da'an City, Jilin Province (45°39′27.5″N, 123°47′15.1″E). The site was discovered in 1957 and was excavated from 2011 to 2012 by a team from Jilin University and the Jilin Provincial Institute of Cultural Relics and Archaeology. The survey covered an area of 2355 m^2 and so far has yielded a rich harvest of remains and artifacts, including 100 burials, 312 pits, and 12 dwelling sites (Wang et al., 2013). Numerous freshwater shells, fish bones, human bones, and animal remains have been excavated and are currently being analyzed (e.g. Merrett et al., 2015). Six cultural strata have been identified, with Phase I being the oldest. Pottery from Phase I is characterized by having been fired at low temperature and featuring decoration consisting of a stamped or rolled-tool, pressed-comb pattern. No similar pottery has been found anywhere else in northeast Asia: these are regarded as the first Early Neolithic artifacts from this region. In the neighboring northern region of North China, the distribution of Early Neolithic artifacts was restricted to the area around Beijing before suddenly expanding at around 9000–8000 BP. The Houtaomuga site is extremely significant for understanding the transition in the

Please cite this article in press as: Kunikita, D., et al., Radiocarbon dating and dietary reconstruction of the Early Neolithic Houtaomuga and Shuangta sites in the Song-Nen Plain, Northeast China, Quaternary International (2017), http://dx.doi.org/10.1016/j.quaint.2017.01.031