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CHRONOLOGY OF THE BEGINNING OF POTTERY MANUFACTURE IN EAST ASIA

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ABSTRACT. This paper presents an updated radiocarbon chronology of the earliest pottery sites in the Old World. Ceramic production originated in the Late Glacial period in several regions of East Asia—the Japanese Islands, the Russian Far East, and southern China—at approximately the same time, about 13,700–13,300 BP (about 17,200–14,900 cal BP).

INTRODUCTION

The emergence of pottery had a significant impact on prehistoric people's lifestyle and subsistence, increasing the usable food resources and leading to a sedentary life. By the mid-1960s, the Japanese already had dates of 12,700–12,200 BP for the beginning of pottery manufacture there, despite the limited number of radiocarbon dates available at that time (Watanabe 1966). Since then, the number of dates associated with the earliest pottery in Japan and neighboring East Asia, including the Russian Far East and China, has increased dramatically, but this information is not well known to Anglophone scholars because the original sources are written mostly in Japanese, Russian, and Chinese. Some of the ^{14}C dates associated with the earliest pottery from East Asia have been summarized before (Morlan 1967; Kuzmin and Keally 2001), and here we present the most complete corpus of data available as of mid-2003.

MATERIALS AND METHODS

^{14}C dates for Japanese and Russian sites (Figure 1) were collected from published reports and the authors' own research materials (Keally and Muto 1982; Kuzmin 1998, 2001, 2002; Kuzmin and Keally 2001; Kuzmin and Orlova 2000; Nakamura et al. 2001; Taniguchi 2002); these were critically evaluated. For Japan, the 97 most reliable age measurements from 30 sites clarify the ^{14}C ages of the 4 oldest phases of pottery development there (Keally et al. 2003). For the present study, we included only the 28 earliest pottery-associated dates, those belonging to Phases 1 and 2 (Table 1). For the Russian Far East, the ^{14}C dates of the Osipovka and Gromatukha cultural complexes in the Amur River basin were included (Table 1). To evaluate the reliability of the age of the earliest Russian pottery, both ^{14}C dating of pottery temper (sedge grass, *Carex* sp.) and thermoluminescent (TL) dating of potsherds were performed. For the Chinese sites (Figure 1), the most recent summaries were used (Zhang 1999, 2002; Zhao and Wu 2000; Wu and Zhao 2003). Data from the Xianrendong, Miaoyan, Yuchanyan, and Diaotonghuan sites were incorporated and critically evaluated. These sites are all located south of the Yangtze River. Due to uncertainty about the direct association of ^{14}C values and earliest pottery in southern China (see below), only the most reliable ^{14}C pottery-associated dates are given (Table 1), and problematic dates are discussed separately. For consistency, original Chinese dates were re-calculated for the Libby ^{14}C half-life value, 5568 yr, whenever necessary.

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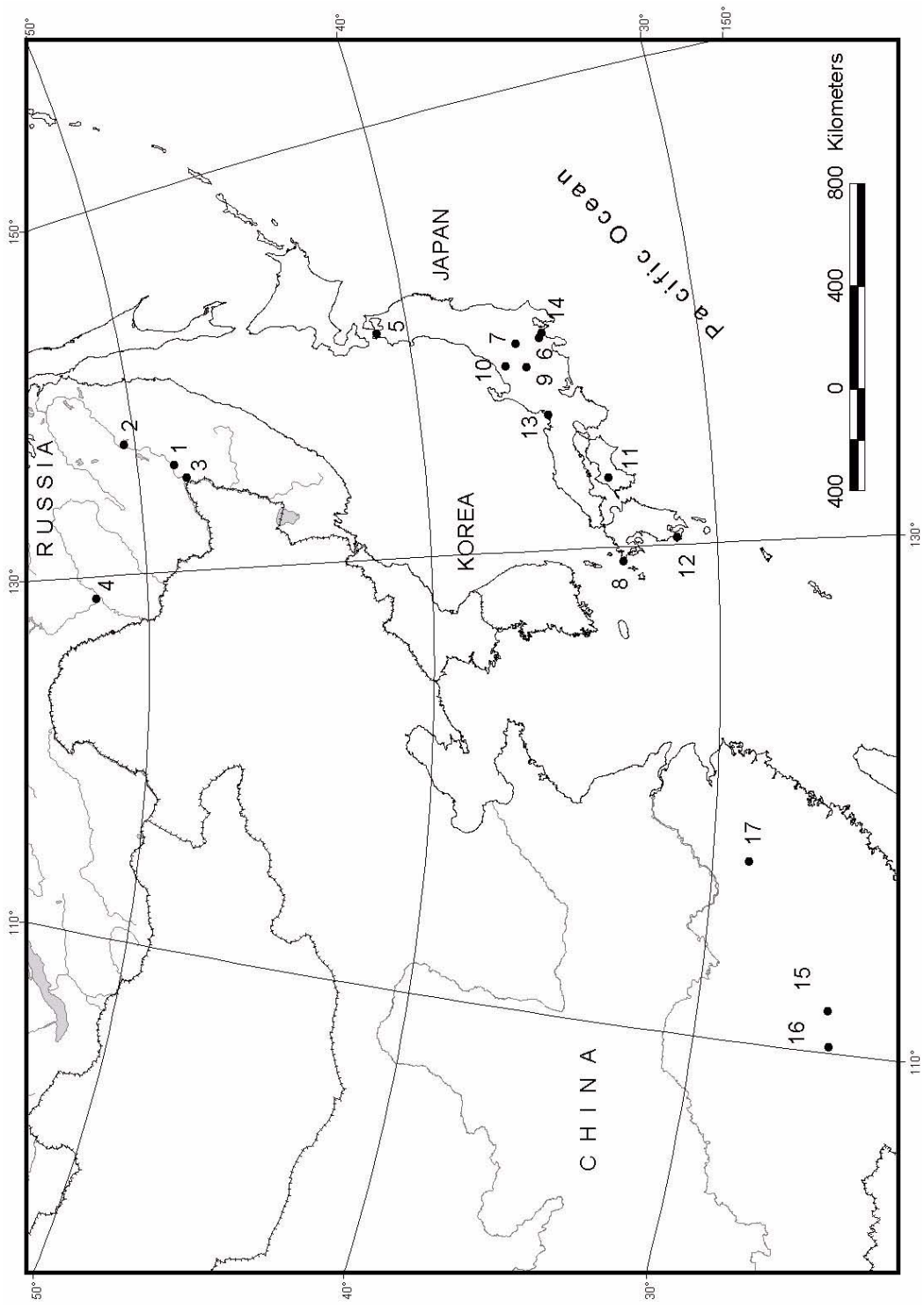

Figure 1 Location of the earliest sites with pottery in East Asia: 1–Gasya; 2–Khummi; 3–Goncharka 1; 4–Gromatukha; 5–Odai Yamamoto 1; 6–Kitahara; 7–Tokumaru Nakata; 8–Fukui Cave; 9–Nakajima B; 10–Seiko Sansou B; 11–Kamikuroiwa; 12–Sikazegashira; 13–Torihama; 14–Keio SFC; 15–Yuachanyan; 16–Miaoyan; 17–Xianrendong.

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Table 1 ^{14}C dates associated with the earliest pottery in East Asia (after Kuzmin and Jull 1997; Jull et al. 2001; Taniguchi 2002).

Nr	Site	Phase	Lab code & nr	Material dated	^{14}C age, BP (±1 σ)	cal BP (±2 σ)[a]
	JAPAN					
1	Odai Yamamoto 1	1	NUTA-6510	adhesion	13,780 ± 170	17,160–15,950
2	Odai Yamamoto 1	1	Beta-125550	charred wood	13,480 ± 70	16,680–15,730
3	Odai Yamamoto 1	1	NUTA-6515	adhesion	13,210 ± 160	16,470–14,750
4	Odai Yamamoto 1	1	NUTA-6507	adhesion	13,030 ± 170	16,270–14,470
5	Odai Yamamoto 1	1	NUTA-6509	adhesion	12,720 ± 160	15,880–14,240
6	Odai Yamamoto 1	1	NUTA-6506	adhesion	12,680 ± 140	15,800–14,220
7	Kitahara	1	Beta-105398	charred wood	13,060 ± 80	16,190–14,640
8	Kitahara	1	Beta-105401	charred wood	13,060 ± 100	16,210–14,620
9	Kitahara	1	Beta-105400	charred wood	13,050 ± 80	16,180–14,620
10	Kitahara	1	Beta-105403	charred wood	13,050 ± 80	16,180–14,620
11	Kitahara	1	Beta-105402	charred wood	13,020 ± 80	16,140–14,590
12	Tokumaru Nakata	2	PAL-381	wood	13,700 ± 560	17,830–14,420
13	Tokumaru Nakata	2	PAL-383	wood	12,770 ± 225	16,050–14,170
14	Tokumaru Nakata	2	PAL-384	wood	12,420 ± 205	15,600–13,850
15	Tokumaru Nakata	2	PAL-380	wood	12,410 ± 225	15,620–13,840
16	Tokumaru Nakata	2	PAL-379	wood	11,810 ± 240	15,290–13,180
17	Tokumaru Nakata	2	PAL-382	wood	11,550 ± 235	15,060–13,020
18	Fukui Cave, layer 3	2	Gak-950	charred wood	12,700 ± 500	16,530–13,550
19	Nakajima B	2	I-13767	charred wood	12,460 ± 310	15,850–13,820
20	Seiko Sanso B	2	Beta-133847	adhesion	12,340 ± 50	15,480–14,110
21	Seiko Sanso B	2	Beta-133849	adhesion	12,160 ± 40	15,390–13,840
22	Seiko Sanso B	2	Beta-133848	adhesion	12,000 ± 40	15,310–13,660
23	Kamikuroiwa, layer 9	2	I-944	charred wood	12,165 ± 600	16,130–12,980
24	Sikazegashira	2	Beta-118963	adhesion	11,860 ± 50	15,230–13,620
25	Sikazegashira	2	Beta-118964	adhesion	11,780 ± 50	15,170–13,470
26	Torihama	2	KSU-1028	wood	11,830 ± 55	15,210–13,550
27	Torihama	2	KSU-1029	wood	11,800 ± 55	15,190–13,480
28	Keio SFC	2	Gak-15904	charred wood	11,350 ± 160	13,810–13,000
	RUSSIAN FAR EAST					
29	Gasya	—	LE-1781	charcoal	12,960 ± 120	16,110–14,480
30	Gasya	—	GEO-1413	charcoal	11,340 ± 60	13,780–13,030
31	Gasya	—	AA-13393	charcoal	10,875 ± 90	13,140–12,640
32	Khummi	—	AA-13392	charcoal	13,260 ± 100	16,450–14,900
33	Khummi	—	SOAN-3583	charcoal	12,425 ± 850	16,990–12,690
34	Khummi	—	AA-13391	charcoal	10,345 ± 110	12,830–11,690
35	Goncharka 1	—	LLNL-102169	charcoal	12,500 ± 60	15,550–14,160
36	Goncharka 1	—	AA-25437	charcoal	12,055 ± 75	15,350–13,670
37	Goncharka 1	—	LLNL-102168	charcoal	10,590 ± 60	12,940–12,190
38	Goncharka 1	—	AA-25438	charcoal	10,280 ± 70	12,750–11,700
39	Goncharka 1	—	AA-25439	charcoal	10,280 ± 70	12,750–11,700
40	Goncharka 1	—	Gak-18981	charcoal	9890 ± 230	12,330–10,600
41	Gromatukha	—	AA-36079	charcoal	12,340 ± 60	15,480–14,110
42	Gromatukha	—	AA-36447	charcoal	9895 ± 50	11,550–11,200
	SOUTHERN CHINA					
43	Yuachanyan, layer 3E	—	BA95058	charcoal	13,680 ± 270	17,210–15,660
44	Miaoyan, layer 4M	—	BA92034	charcoal	13,320 ± 270	16,780–14,720
45	Xianrendong, zone 3B1	—	UCR-3561	charcoal	12,430 ± 80	15,530–14,130

[a]CALIB rev. 4.3 software (Stuiver et al. 1998; http://depts.washington.edu/qil/calib/) was used for date calibration.

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RESULTS AND DISCUSSION

Approximate dates of the earliest phases of Japanese Jomon culture have been known for a long time (Watanabe 1966; Keally and Muto 1982). These sources give the Phase 1 dates as about 13,000 BP, and for Phase 2, about 12,500–12,000 BP. The large number of additional ^{14}C dates collected during the past 20 yr, especially the AMS dates, have greatly improved the earliest pottery chronology in Japan (Taniguchi 2002). The most reliable measurements indicate the ages of the 2 earliest phases of pottery in Japan to be about 13,500–12,700 BP for Phase 1, and about 12,700–11,400 BP for Phase 2. The calibrated ^{14}C ages for the beginnings and endings of these phases are listed below:

- Phase 1, beginning at about 16,750–15,700 cal BP (approximately 14,800–13,750 cal BC);
- Phase 1/2 boundary, about 15,750–14,350 cal BP (approximately 13,800–12,400 cal BC);
- Phase 2, ending at about 13,500–13,150 cal BP (Keally et al. 2003).

In the Amur River basin in the Russian Far East, ^{14}C dates on charcoal indicate that the Osipovka culture comprises such sites as Gasya, Khummi, and Goncharka 1, and existed about 13,300–10,000 BP (approximately 16,100–11,700 cal BP or 14,150–9750 cal BC) (Table 1). The pottery temper ^{14}C dates for the Gasya and Khummi sites are about 12,000–9000 BP (O'Malley et al. 1999), which are generally close to the charcoal dates. The TL dates of the Gasya site pottery are 13,460 ± 1460, 10,430 ± 1160, and 8580 ± 1490 yr ago (Kuzmin et al. 2001). They are very close to the calibrated dates of the charcoal ^{14}C dates they correspond to in Table 1. The charcoal ^{14}C dates of the Gromatukha site are of about 12,340–9900 BP (approximately 15,500–11,200 cal BP or 13,550–9250 cal BC) (Table 1). The pottery temper ^{14}C dates are in the range from about 13,300 to about 7300 BP (O'Malley et al. 1999; Jull et al. 2001).

There are several age determinations for the earliest pottery-bearing sites in southern China (Zhao and Wu 2000; Wu and Zhao 2003). Some of them—such as Bailiandong and Dushizai, dated to about 21,000–14,000 BP (An 1989; Wu and Zhao 2003: 17)—were considered as problematic and later were not associated with the Neolithic. The best studied sites associated with the earliest pottery in China are Yuchanyan, Miaoyan, and Xianrendong.

^{14}C dates from the Yuchanyan site are 13,680 ± 270 BP (BA95058) for charcoal from a layer with pottery and rice grains, and 14,390 ± 230 BP (BA95057b) and 11,970 ± 120 BP (BA95057a) for pottery organics (Zhao and Wu 2000). ^{14}C ages of 15,220 ± 260 BP (BA94137b) and 15,120 ± 500 BP (BA94137a) were obtained for organic matter in the pottery from layer 5 of the Miaoyan site. Earlier, a ^{14}C age of 13,320 ± 270 BP (BA92034-1) was obtained for charcoal from layer 4M of this site (Yuan et al. 1995; Wu and Zhao 2003). The underlying layer 5 was without pottery and dated to about 17,600 BP (Wu and Zhao 2003); this is consistent with the age of pottery-containing layers and potsherd organics. Organics in pottery for the Yuchanyan and Miaoyan sites might represent the time of clay formation, but not pottery manufacture, because pottery from both sites is not organic-tempered (Zhao 2002). Thus, dates range from about 15,200 BP to about 14,400 BP for these sites are less reliable, rather than charcoal dates, about 13,700–13,300 BP (Table 1). For the Diaotonghuan site, the newly released bone ^{14}C date from layer D is 15,090 ± 210 BP (BA00014) (Wu and Zhao 2003). No details about the degree of association of the dated sample and the pottery were provided, so this age determination must be considered a provisional one.

For the Xianrendong site, charcoal associated with pottery from zone 3B1 was dated to 12,430 ± 80 BP (UCR-3561) (MacNeish and Taylor 1995). There are also earlier ^{14}C dates reported for the Xianrendong site—14,185 ± 290 BP (BA93181) for zone 3B1, and 15,180 ± 90 BP (UCR-3300) for zone 3 (MacNeish and Taylor 1995)—but these should be excluded from consideration

because there is a possibility that the cultural materials are mixed. For example, ^{14}C dates of 17,420 ± 130 BP (AA-15008) (MacNeish and Taylor 1995:83–84) and 16,440 ± 190 BP (BA00009) (Wu and Zhao 2003) were obtained from a stratigraphically higher layer in zone 3C1B, showing clearly that there is disturbance of the layers in the Xianrendong site. A new bone date from zone 3C1a is 15,210 ± 190 BP (BA00006) (Wu and Zhao 2003). Thus, the youngest ^{14}C age measurement from zone 3B1, about 12,430 BP (UCR-3561), is probably the most reliable age estimate for the earliest pottery-bearing component from this site. Lu (1999:95) estimates the age of the earliest pottery layers in the Xianrendong site as about 13,000 BP.

The origins of pottery technology in East Asia remains one of the main questions yet to be answered. Our present interpretation of the dates and materials available is that a) the oldest pottery in Japan, the Russian Far East, and southern China represents 3 independent origins, and b) none of these regions was influenced from any other outside source. We base this interpretation on 2 factors: 1) the oldest pottery in all 3 regions is typological very different, and 2) the dates are very similar, while the regions are quite distant.

The oldest pottery in Japan (Phase 1) is mostly plain ware; a few vessels with impressed or incised marks are also known, and some vessels have fiber tempering. The forms are not clear; however, some vessels had flat bases. Linear-relief and bean-relief wares mark phase 2 of Incipient Jomon. Vessel shapes are somewhat varied and both pointed bases and flat bases occur. In the Amur River basin, the Osipovka complex pottery from the Gasya and Khummi sites has flat bottoms, thick walls (up to 1.7 cm), and a clay matrix tempered with grass. The design is represented by vertical grooves on the external surface (Derevianko and Medvedev 1993). At the Goncharka site, there is no plant-fiber tempering in the potsherds, and the design is more elaborate compared with Gasya and Khummi, with cord and comb impressions and vertical zigzags. The Gromatukha pottery is flat-based with grooves on both sides and plant-fiber temper (Okladnikov and Derevianko 1977). In southern China, the earliest pottery from the Xianrendong site has round bottoms and stripe-marked designs and it is tempered with course quartzite grains. Other early pottery types from the Xianrendong site have cord-marked designs and woven patterns; plain pottery also was discovered there (Zhang 2002). The Yuchanyan site pottery also has round bottoms and cord-marked designs and it is tempered with quartzite grains. The Miaoyan site pottery does not have a definite design, but it is tempered with coarse quartzite grains (Zhang 2002).

CONCLUSION

In Japan, the earliest pottery can be dated to about 13,500 BP (about 16,750–15,700 cal BP). The beginning of pottery manufacture in the Amur River basin can be now dated to about 13,300 BP (about 16,500–14,900 cal BP). The most reliable ^{14}C age determinations for the earliest pottery complexes in southern China are in the range from approximately 13,700 to about 13,300 BP (about 17,200–14,700 cal BP). The oldest pottery in East Asia and in the whole Old World is now reliably dated to about 13,700–13,300 BP (about 17,200–14,700 cal BP) in 3 regions: 1) Japan, 2) lower and middle parts of the Amur River basin in the Russian Far East, and 3) southern China (Figure 2). Due to very different pottery types in these regions, it is probable that pottery-making originated in several places within East Asia independently, rather than being the result of migration or technological exchange.

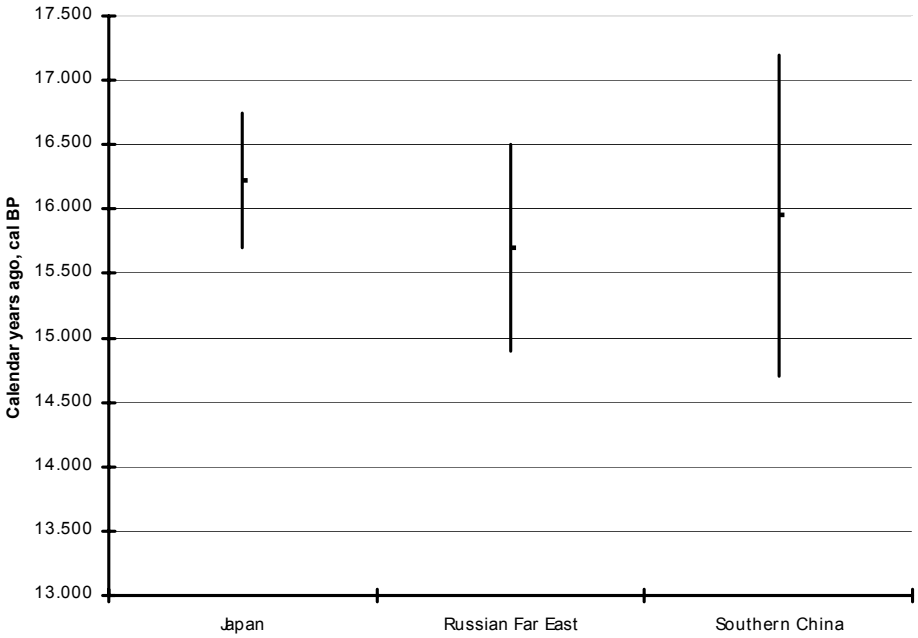

Figure 2 The calibrated ages for the beginning of pottery manufacture in East Asia

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