DOI: 10.17746/1563-0110.2017.45.4.003-012

A.P. Derevianko[1], E.I. Derevianko[1], S.P. Nesterov[1], A.V. Tabarev[1], Kazunori Uchida[2], Dai Kunikita[3], Kazuki Morisaki[4], and Hiroyuki Matsuzaki[5]

[1]Institute of Archaeology and Ethnography, Siberian Branch, Russian Academy of Sciences, Pr. Akademika Lavrentieva 17, Novosibirsk, 630090, Russia
E-mail: derev@archaeology.nsc.ru; nesterov@archaeology.nsc.ru; olmec@yandex.ru
[2]Hokkaido Government Board of Education, Kita 3-jo, Nishi 6-chome, Chuo-ku, Sapporo, 060-8588, Hokkaido, Japan
E-mail: wtn_uchida@yahoo.co.jp
[3]Graduate School of Humanities and Sociology, University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, 113-0033, Tokyo, Japan
E-mail: dkunikita@yahoo.co.jp
[4]Agency for Cultural Affairs, Government of Japan, 3-2-2, Kasumigaseki, chiyoda-ku, 100-8959, Tokyo, Japan
E-mail: mediocritas@icloud.com
[5]University Museum, University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, 113-0033, Tokyo, Japan
E-mail: hmatsu@um.u-tokyo.ac.jp

New Data on the Chronology of the Initial Neolithic Gromatukha Culture, Western Amur Region

Since its discovery in the early 1960s, the chronology of the Neolithic Gromatukha culture in the Western Amur region has undergone radical changes. After the appearance of a series of carbon dates based on charcoal and organic remains in clay texture, its initial attribution to the Early and Middle Neolithic (second half of the 5th to 4th millennia BC) was replaced by a much earlier estimate (from 16–15 to 8 cal ka BP). As a result, Gromatukha became not only one of the most ancient Early Neolithic cultures in the Amur Region, but also one with the earliest pottery among forest and riverine hunter-gatherer cultures. To date, its absolute chronology is based on 34 dates, comprising 9 derived from charcoal, 8 from organic remains in clay texture, and 17 from samples of charred remains on pottery. The latter are analyzed in this article. Comparison of the chronological limits of Gromatukha culture demonstrates that the widest of them concern dates based on organic remains in clay texture (16,260–8010 cal BP); narrower limits relate to estimates based on charred remains on pottery (15,010–9550 cal BP); and the narrowest limits to those based on charcoal (14,820–11,200 cal BP). A new series of dates based on charred remains on pottery indicates a span of 5460 years, which is 2790 years less than that based on organic remains in clay texture, and 1840 years more than what the charcoal-derived estimates suggest.

Keywords: *Gromatukha culture, Initial Neolithic, AMS carbon dating.*

Introduction

The Gromatukha culture was distinguished by A.P. Okladnikov in 1961 by the finds from a multilayered site in the mouth of the Gromatukha River, in the Zeya River basin. For the first time, these materials were presented to the scientific community at the Third Far Eastern Conference in Komsomolsk-on-Amur in 1962 (Okladnikov, 1962). In 1963, stone artifacts and ceramics close to Gromatukha were discovered near the village of Sergeyevka, in the upper Amur basin (Okladnikov, 1966). In various years at the turn of the 20th–21st centuries, in the Zeya and Amur basins, archaeologists found artifacts that could have been assigned to the Gromatukha culture. The Gromatukha culture sites studied via excavations in the Western Amur region are rare. In 1963–1965, studies were conducted at the Sergeyevka settlement; in 1965–1966 and 2004 at the eponymous site of Gromatukha; in 2006 and 2010 at the Chernigovka-on-Zeya settlement; and since 2004 they have been continued at the Kalinovka rock art site in the upper Amur area (Fig. 1) (Okladnikov, Derevianko, 1977: 8–9; Derevianko, Kang Chan Hwa, Ban Mun Be et al., 2004; Nesterov, Zaitsev, Volkov, 2006; Nesterov, 2008; Zabiyako, Kobyzov, 2011). On the basis of materials from excavations at the Gromatukha site, in 1960s, a detailed typology of stone tools and ceramics belonging to the Gromatukha culture has been developed. A.P. Okladnikov and A.P. Derevianko noted that the artifacts from "three cultural layers of the settlement compose a single well-matured complex", while the percentage ratio of tools and differently ornamented ceramics represents development of the Gromatukha culture in time (1977: 79–98). Owing to the absence of radiocarbon dates, the Gromatukha culture was preliminarily dated by the analogs and typology of artifacts to the 5th to the early 4th millennia BC, or to the second half of the 5th to the 4th millennia BC (Ibid.: 161, 173). However, as early as the outset of the study of this culture, assumptions were made regarding its older age, which were taken skeptically by many scientists. For instance, in 1965, one of the authors of this article had occasion to discuss the degree dissertation of a historical sciences candidate in the Paleolithic Department of the Leningrad Branch of the Institute of Archeology of the USSR Academy of Sciences. The disputants rejected the dates of the Early Neolithic cultures of the Middle Amur region, proposed by the defender of thesis: the late 7th to early 6th millennia BC for the Novopetrovka culture, and the late 6th to early 5th millennia BC for Gromatukha. The opponents pointed out that no Neolithic cultures with ceramics of such an ancient age are known either in the Near East or in Europe. Because of the absence of absolute dates and because of this criticism, the author of study was forced to reduce the age of these cultures by two thousand years (Derevianko, 1965).

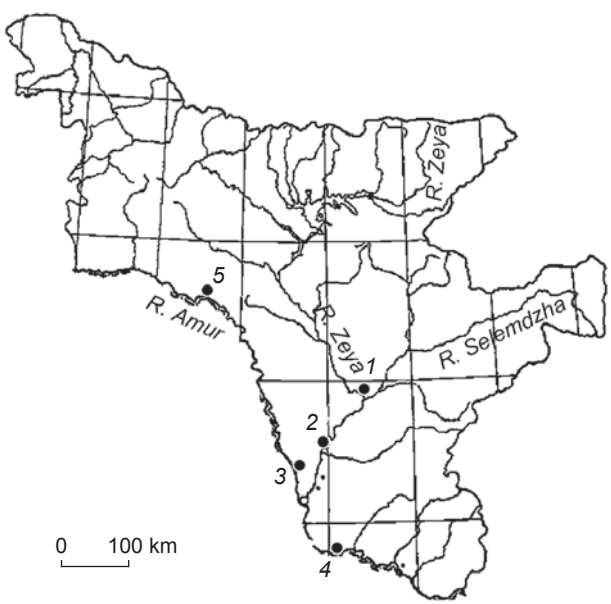

Fig. 1. Neolithic sites of the Initial Neolithic in the Amur Region.
1 – Gromatukha; *2* – Chernigovka-on-Zeya; *3* – Sergeyevka; *4* – Novopetrovka II; *5* – Kalinovka.

Radiocarbon dates obtained from charcoal and organic admixture in ceramics

The first data on radiocarbon dating based on charcoal and organic plant admixture in the Gromatukha ceramics were obtained in 1996–2002 (Derevianko, Kuzmin, Burr et al., 2004). The studies at the Gromatukha site in 2004 resulted in the discovery of numerous stone and pottery artifacts, along with 22 samples of charcoal, 11 of which were subjected to radiocarbon dating in laboratories in Russia, Japan, and the USA (Nesterov et al., 2006). Five radiocarbon determinations obtained from these samples correspond to the initial stage of the Gromatukha culture (Table 1, No. 1, 2, 4, 6, 23) (Nesterov et al., 2005: 170). One date belonging to the Initial Neolithic is available for the Chernigovka-on-Zeya settlement (Table 1, No. 32) (Kuzmin, Nesterov, 2010).

A series of 17 radiocarbon dates for the Gromatukha and Chernigovka-on-Zeya sites obtained in 2010* supplemented the relative chronology of sites, which was based on stratigraphic observations and typological analysis of material, with absolute indicators.

*For reference: by 2010, five radiocarbon dates were available for the Early Neolithic Novopetrovka culture of the Western Amur region, and six dates for the Late Neolithic Osinovoye Ozero culture. The archaeological culture of the Middle Neolithic has not been distinguished in this area so far.

Table 1. **Radiocarbon dates of the Gromatukha culture, obtained in 1996–2002**

No.	Site, layer	Material	Laboratory code	^{14}C-date, BP	Calendar date, BP, ±2σ	Source
1	Gromatukha, layer 3	Charcoal	MTS-05937	12,380 ± 70	14,820–14,090	(Nesterov et al., 2006)
2	" "	"	MTS-05936	12,340 ± 70	14,740–14,030	(Ibid.)
3	" "	"	AA-36079	12,340 ± 60	14,700–14,040	(Ibid.)
4	" "	"	MTS-05936	12,300 ± 70	14,560–13,980	(Ibid.)
5	" "	"	AA-60765	12,120 ± 40	14,090–13,840	(Ibid.)
6	" "	"	SOAN-5762	11,580 ± 190	13,810–13,100	(Ibid.)
7	" "	"	AA-36447	9895 ± 50	11,600–11,200	(Jull et al., 2001)
8	" "	Organic admixture (grass)	AA-20940	13,310 ± 110	16,260–15,350	(Derevianko et al., 2004)
9	" "	Ditto	AA-20939	13,240 ± 85	16,120–15,300	(Ibid.)
10	" "	"	SNU02-002	11,320 ± 150	13,360–13,050	(Ibid.)
11	" "	"	AA-38108	10,450 ± 60	12,650–12,120	(Ibid.)
12	" "	"	AA-38102	8660 ± 90	10,200–9630	(Ibid.)
13	" "	"	AA-38107	7310 ± 45	8200–8010	(Ibid.)
14	" "	Charred remains	MTS-17798	12,400 ± 100	15,010–14,050	This study
15	" "	"	Tka-15189	12,170 ± 50	14,190–13,840	Ditto
16	" "	"	MTS-17808	11,440 ± 80	13,450–13,140	"
17	" "	"	MTS-17799	9680 ± 80	11,230–10,770	"
18	" "	"	MTS-17800	9620 ± 80	11,200–10,730	"
19	" "	"	MTS-17797	9360 ± 80	10,780–10,280	"
20	" "	"	MTS-17802	9460 ± 80	11,090–10,510	"
21	" "	"	MTS-17796	9150 ± 80	10,520–10,190	"
22	" "	"	MTS-17801	9280 ± 90	10,680–10,250	"
23	" layer 2.2	Charcoal	Beta-205394	10,660 ± 40	12,820–12,650	(Nesterov et al., 2006)
24	" layer 2	Charred remains	MTS-17805	12,530 ± 90	15,120–14,190	This study
25	" "	"	MTS-17794	10,060 ± 90	11,970–11,270	Ditto
26	" "	"	MTS-17793	9960 ± 80	11,750–11,730	"
27	" layer 2.2	"	MTS-17806	9910 ± 70	11,680–11,200	"
28	" layer 2	"	MTS-17795	9900 ± 80	11,700–11,190	"
29	" "	"	MTS-17807	9360 ± 70	10,760–10,300	"
30	" layer 1	"	MTS-17803	9670 ± 80	11,220–10,770	"
31	Novopetrovka II	Organic admixture (grass)	AA-38103	12,720 ± 130	15,430–14,320	(Derevianko et al., 2004)
32	Chernigovka-on-Zeya, layer 2	Charcoal	AA-78935	9885 ± 55	11,600–11,200	(Kuzmin, 2006)
33		Charred remains	MTS-17811	9080 ± 230	11,060–9550	This study
34	Sergeyevka	Organic admixture (grass)	AA-38104	7940 ± 45	8980–8640	(Derevianko et al., 2004)

Stratigraphic analysis of strata on the area where the Gromatukha site is situated has shown that three Neolithic cultural layers (Fig. 2, *1*) lie under the layer associated with the Russian settlement that emerged during intense development of the territory in the 20th century.

Layer 1 is composed of tawny light loam. Its thickness varies from 10 to 40 cm. In the eastern part of the area unearthed by excavation in 2004, traces of a ground dwelling belonging to the Osinovoye Ozero culture were recorded (Volkov, Nesterov, 2008). Charcoal from layer 1 produced one date: 3600 ± 45 BP (SOAN-5759), the calendar value of which corresponds to (±2σ) 3730–4080 BP. This is in good agreement with three determinations based on samples from the dwelling, which could have existed in the interval from 3410 to 3690 BP (3290 ± 40 BP (MTS-05940), 3340 ± 40 BP (MTS-05939), and 3350 ± 40 BP (MTS-05941)) (Kuzmin, Nesterov, 2010: 105). Only one charcoal sample from this dwelling has shown the date of 2600 ± ± 95 BP (SOAN-5760), which corresponds to the time of the Uril culture of the Early Iron Age ((±2σ), 920–410 BP)), whose separate pottery fragments are found in redeposited form at this site.

Layer 2 is composed of dark humic sandy loam. In the majority of sections made in 2004, it was possible to identify a division of this layer into two horizons. In certain sections, a thin (5–7 mm) sandy interlayer was established between the horizons. The thickness of layer 2 is from 20 to 70 cm, or 40–50 cm on average. The calibrated dates based on two charcoal samples from this layer (6175 ± 125 BP (SOAN-5761), 10660 ± ± 40 BP (Beta-205394)) and on one collagen sample from a roe-deer bone (5140 ± 140 BP (AA-36085)) indicate a calendar calibrated age of the layer in the interval (±2σ) from 5600 to 12,820 BP (Ibid.: 104–105).

Layer 3 is composed of gray sandy loam represented discretely by lenses in all sections. In the places where layer 3 is absent, layer 2 lies directly on crushed-stony/clay layer 4, containing no archaeological artifacts. For layer 3, 13 radiocarbon dates have been obtained from charcoal and organic remains (grass) in clay texture (Table 1, No. 1–13), according to which the calendar calibrated age of the layer (±2σ) is approximately 8010–16,260 BP (Derevianko, Kuzmin, Burr et al., 2004; Kuzmin, Nesterov, 2010: 104–105).

Stratigraphic studies at the Chernigovka-on-Zeya site have determined that the top layer of the terrace is a weakly sodded arable field exposed to severe water and wind erosion (Fig. 2, *2*). In fact, this is the upper horizon of archaeological layer 1. As a result of its destruction, some artifacts proved to be redeposited. Apart from the Gromatukha finds, rare potsherds belonging to the Uril culture of the Early Iron Age and the Early Middle Ages (Mohe) were encountered here. The part of layer 1 (red sandy loam) undisturbed by tillage wedges out towards the south in the meridional sections, while its underlying layer 2 (black sandy loam) and, occasionally, sterile layer 3 near the southern wall of the excavation area, lie immediately under the arable field. The thickness of the layers increases towards the north by 30–40 cm for

Fig. 2. Stratigraphy of Gromatukha (*1*) and Chernigovka-on-Zeya (*2*) sites.

layer 1, and by 40–50 cm for layer 2. At the same time, it reduces eastwards. A blade-based arrowhead, discovered in the arable land layer, is similar to the arrowheads from Novopetrovka III (Western Amur region), where for layer 1 a radiocarbon calibrated date of (±2σ) 8610–9240 BP (8040 ± 90 BP (MTS-05943)) is available (Nesterov et al., 2005: 170). The radiocarbon date obtained from the charcoal sample found in layer 2 (9885 ± 55 BP (AA-78935)) has shown an interval of 11,200–11,600 BP (Kuzmin, Nesterov, 2010: 104).

Radiocarbon dates from charred remains on pottery

In 2015, for the first time for the Gromatukha culture, our Japanese colleagues conducted radiocarbon (AMS) dating of charred remains (deposited during cooking) on ceramicware fragments from the Gromatukha (20 samples) and Chernigovka-on-Zeya sites (1)*. Potsherds for analysis were taken from collections of the Gromatukha (excavations by A.P. Okladnikov, A.P. Derevianko, E.I. Derevianko in 1966 (14 samples), and S.P. Nesterov in 2004 (6)) and Chernigovka-on-Zeya sites (excavations by Nesterov in 2006 (1 sample)) (Table 2; Fig. 3, 4). Samples of charred remains on pottery were dated in the University of Tokyo, Japan (laboratory codes MTS and Tka).

Radiocarbon dating of charred remains on Neolithic pottery from the Western Amur region resulted in 21 dates, 17 of which were attributed to the Gromatukha culture. For the Gromatukha site, nine dates were established based on samples from layer 3, six dates from layer 2, and one date from layer 1. One date (9070 ± 240 BP) (MTS-17811)) was derived from charred remains on pottery from layer 2 of the Chernigovka-on-Zeya site**.

*Also, two charcoal samples from the medieval sites were dated: Ozero Dolgoye, pit No. 17 – 1760 ± 40 BP (MTS-17572), (±2σ) 139–385 AD, and Osinovoye Ozero, dwelling 3 – 1535 ± ± 40 BP, (±2σ) 427–604 AD.

**Charred remains on pottery (which has no cultural attribution so far) from layers 2 and 1 of the Gromatukha site produced two new radiocarbon dates: 5680 ± 60 BP (MTS-17792) (±2σ), 6634–6318 BP, and 5430 ± 50 BP (MTS-17810) (±2σ) 6313–6020 BP, respectively. Two samples, one of which pertains to layer 1 (3380 ± 45 BP (MTS-17809) (±2σ), 3811–3479 BP), and another one represents the dwelling (3460 ± 50 BP (MTS-17804) (±2σ) 3852–3587 BP), were assigned to the period of the Late Neolithic Osinovoye Ozero culture. In the latter case, the date relates, most probably, to the soot that appeared on one of the conjoining vessel fragments as a result of a fire, in which the dwelling was burnt down (Volkov, Nesterov, 2008: 109). On the mating sherd, there are neither charred remains nor traces of fire (Fig. 4, *6*; see Tab. 2).

Discussion of results

The dates of the Gromatukha sites were derived from charcoal, organic remains (grass) in clay texture, and charred remains on vessels.

Dating of charred remains on pottery is performed using the standard procedure; however, its interpretation should take into account some special features. The matter is that the cooking of food is often accompanied by absorption of carbon dissolved in water, which can have a greater (up to several hundreds of years) radiocarbon age than plant or animal food cooked in a ceramic vessel. In such a case, the date determined from the charred remains will be more ancient than that established from contemporaneous charcoal from a hearth or a layer (Fischer, Heinemeier, 2003; Kuzmin, Nesterov, 2010: 103, 106).

As for radiocarbon dating of an organic admixture (usually, chopped grass) in clay texture of ceramics, it is based on carbon (approx. 1.0–0.1 %) released as a result of heating the milled ceramics (preliminarily cleared from carbonates and humic acids) under oxygen atmosphere at a temperature of 400 ºC. However, even at 400 ºC, there remains a probability of the organic admixture's being polluted with more ancient carbon from clay. Radiocarbon dates from organic material in pottery, as compared with ^{14}C-dates from charcoal and charred remains at the same sites, give a greater chronological range, but show the similarity of age for all other types of carbon-containing materials. This makes the dates obtained from organic remains in clay texture sufficiently reliable as well (Kuzmin, Nesterov, 2010: 106).

The largest number of charcoal and pottery samples for radiocarbon analysis was obtained from layer 3 at the Gromatukha site. Comparison of dates from charcoal and organic admixture has revealed a somewhat older age (approximately by 1 thousand years) of pottery samples with grass in clay texture (see Table 1). In general, the dates of artifacts from Gromatukha layer 3 are in the range of (hereinafter ± 2σ) 14,820–11,200 calendar years ago for charcoal, and 16,260–8010 BP for organic admixture. A charcoal sample from interlayer 2.2 of layer 2, taken at the boundary with layer 3, has also demonstrated a considerably ancient age of 12,820–12,650 BP. The dates of finds from layer 2 of the Chernigovka-on-Zeya are comparable with the dates of samples from layer 3 of the Gromatukha site. Dates corresponding to the period of the Gromatukha culture have also been derived from ceramics containing grass in clay texture at the Novopetrovka II and Sergeyevka sites. Pottery from Novopetrovka II represents the period up to 15,430 BP, while the Sergeyevka sample (8980–8640 BP), obviously represents the final stage of Gromatukha development in the Western Amur region, contemporaneous with the Novopetrovka culture.

Table 2. **New radiocarbon dates for the Gromatukha and Chernigovka-on-Zeya sites**

Sample No.	Year of excavations, No. of pottery fragment according to the list, archaeological culture	Location of charred remains on a vessel	No. of figure in this article	Laboratory code	^{14}C-date, BP	Calendar date, BP, ±2σ	Carbon content, C%	Nitrogen content, N%	Carbon-to-nitrogen ratio, C/N
1	2	3	4	5	6	7	8	9	10
Gromatukha									
Gro-1	1966, layer 3, Gromatukha culture	On the inside of the body	3, *1*	Tka-15189	12,170 ± 50	13,843–14,185 (100 %)	39.3	4.9	9.3
2015Gro-1	1966, layer 2, No. 12598, culture not identified	On the inside of the rim	3, *2*	MTS-17792	5680 ± 60	6318–6375 (10 %) 6387–6574 (80 %) 6577–6634 (10 %)	48.0	3.7	15.3
2015Gro-2	1966, layer 2, No. 8256, Gromatukha culture	Ditto	3, *3*	MTS-17793	9960 ± 80	11,228–11,728 (99 %) 11,731–11,751 (1 %)	44.3	4.5	11.5
2015Gro-3	1966, layer 2, Gromatukha culture	"	3, *4*	MTS-17794	10,060 ± 90	11,272–11,844 (89 %) 11,858–11,973 (11 %)	54.7	5.8	10.9
2015Gro-4	1966, layer 2, No. 3457, Gromatukha culture	On the inside of the body	3, *7*	MTS-17795	9900 ± 80	11,187–11,629 (98 %) 11,672–11,699 (2 %)	30.1	4.0	8.8
2015Gro-5	Layer 3, Gromatukha culture	On the inside of the rim	3, *6*	MTS-17796	9150 ± 80	10,189–10,519 (100 %)	8.7	0.9	10.7
2015Gro-6	Layer 3, No. 2494, Gromatukha culture	On the inside of the body	3, *5*	MTS-17797	9360 ± 80	10,275–10,775 (100 %)	4.3	0.4	12.1
2015Gro-7	1966, layer 3, No. 9285, the Gromatukha culture	Ditto	3, *9*	MTS-17798	12,400 ± 100	14,048–15,009 (100 %)	42.2	6.4	7.7
2015Gro-8	1966, layer 3, Gromatukha culture	"	3, *10*	MTS-17799	9680 ± 80	10,773–11,229 (100 %)	52.5	5.4	11.4
2015Gro-9	1966, layer 3, No. 895, Gromatukha culture	"	3, *8*	MTS-17800	9620 ± 80	10,733–11,197 (100 %)	54.8	5.7	11.3
2015Gro-10	1966, layer 3, No. 2657, Gromatukha culture	On the inside of the rim	3, *11*	MTS-17801	9280 ± 90	10,247–10,679 (100 %)	–	–	–
2015Gro-11	1966, layer 3, No. 8921, Gromatukha culture	On the inside of the body	3, *12*	MTS-17802	9460 ± 80	10,508–10,898 (77 %) 10,917–11,088 (23 %)	8.6	1.1	9.0
2015Gro-12	2004, layer 1, No. 347, Gromatukha culture	On the inside of the rim	4, *3*	MTS-17803	9670 ± 80	10,766–11,223 (100 %)	27.0	3.1	10.2
2015Gro-13	2004, Osinovoye Ozero culture dwelling, No. 1001	Ditto	4, *6*	MTS-17804	3460 ± 50	3587–3602 (2 %) 3610–3852 (98 %)	37.9	4.5	9.8
2015Gro-14	1966, layer 2, Gromatukha culture	On the inside of the body	4, *1*	MTS-17805	12,530 ± 90	14,191–15,117 (100 %)	16.5	2.5	7.6

Table 2 (end)

1	2	3	4	5	6	7	8	9	10
2015Gro-15	2004, layer 2.2, No. 7935, Gromatukha culture	On the outside of the rim	4, *2*	MTS-17806	9910 ± 70	11,202–11,619 (99.9 %) 11,680–11,681 (0.1 %)	38.9	1.8	25.6
2015Gro-16	2004, layer 2.2, No. 8030, Gromatukha culture	Ditto	4, *7*	MTS-17807	9360 ± 70	10,299–10,325 (1 %) 10,341–10,353 (1 %) 10,373–10,756 (98 %)	14.6	1.5	11.4
2015Gro-17	1966, layer 3, No. 9397, Gromatukha culture	"	4, *4*	MTS-17808	11,440 ± 80	13,136–13,450 (100 %)	–	–	–
2015Gro-18	2004, layer 1, No. 1003, Osinovoye Ozero culture	On the inside of the rim	4, *8*	MTS-17809	3380 ± 45	3479–3721 (99 %) 3800–3811 (1 %)	–	–	–
2015Gro-19	2004, layer 1, No. 301–302, culture not identified	On the inside of the body	4, *9*	MTS-17810	5430 ± 50	6020–6052 (3 %) 6061–6079 (1 %) 6111–6154 (7 %) 6174–6313 (89 %)	23.4	3.4	8.0
				Chernigovka-on-Zeya					
Cher-P1	2006, layer 2, No. 1714, Gromatukha culture	Ditto	4, *5*	MTS-17811	9080 ± 230	9545–10,785 (99.5 %) 10,979–10,988 (0.1 %) 11,036–11,059 (0.4 %)	–	–	–

Note. Gro-1 and 2015Gro-1…-19 are indices of pottery samples from the Gromatukha site for ^{14}C-analysis, Cher-P1 is from the Chernigovka-on-Zeya site.

Radiocarbon dates were calibrated using the Calib radiocarbon calibration program (Calib 611) (Stuiver, Reimer, 1993).

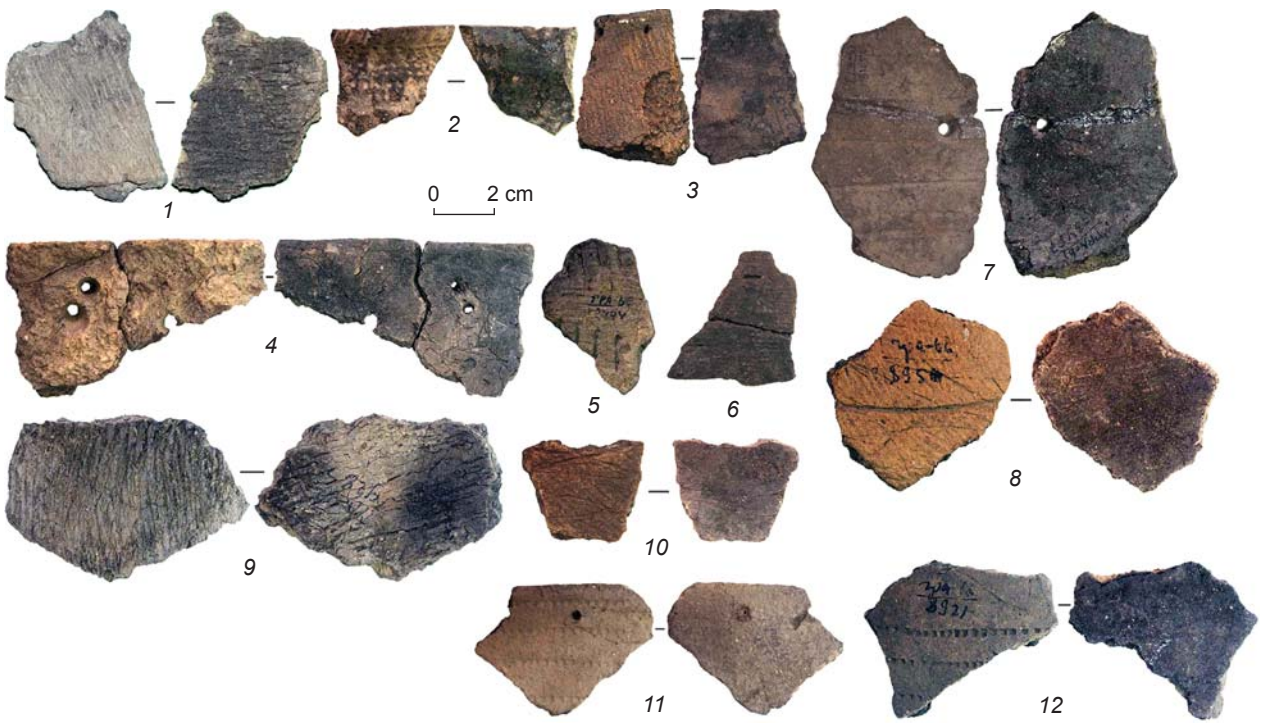

Fig. 3. Pottery-fragments with charred remains on the surface, from the Gromatukha site.

Fig. 4. Pottery-fragments with charred remains on the surface, from the Gromatukha site (*1–4*, *6–9*) and Chernigovka-on-Zeya site (*5*).

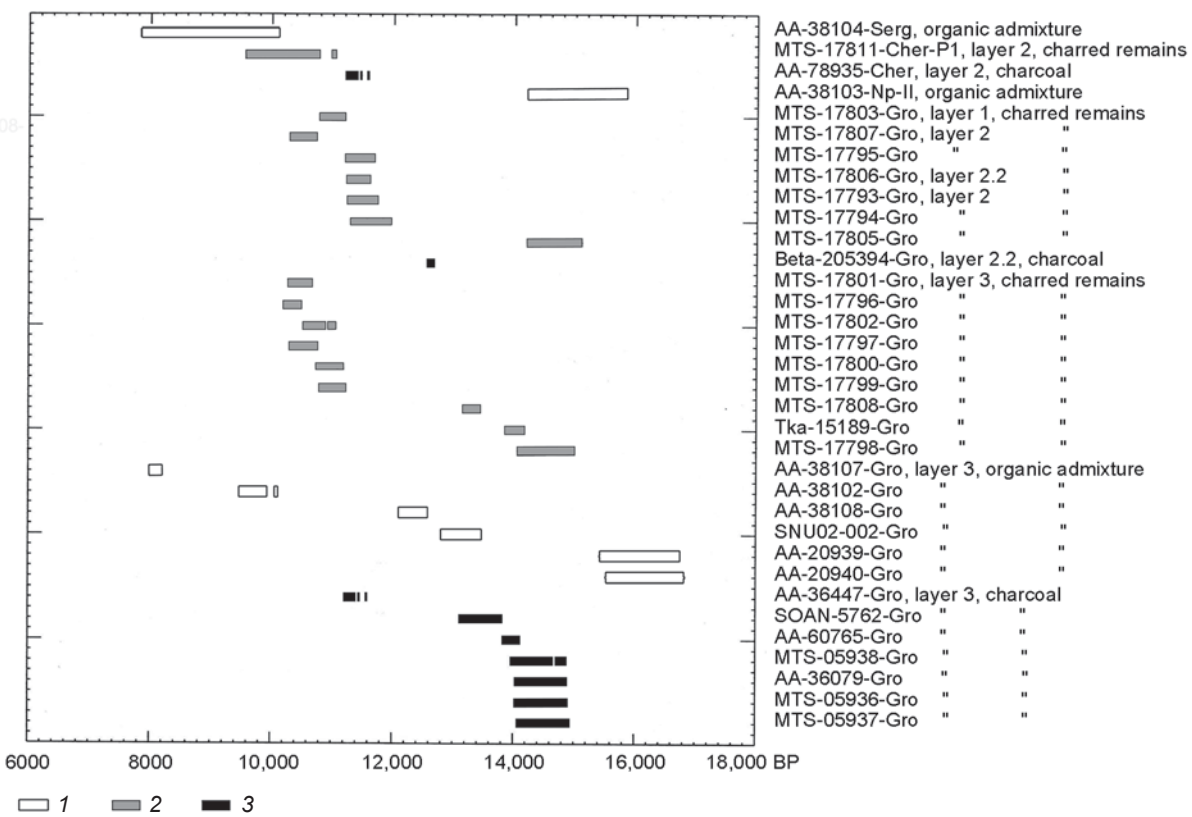

Fig. 5. Ranges of radiocarbon dates for the Gromatukha culture of Western Amur region. Gro – Gromatukha, Cher-P1, Cher – Chernigovka-on-Zeya, NP-II – Novopetrovka-II, Serg – Sergeyevka.
1 – by organic admixture; *2* – by charred remains; *3* – by charcoal.

The Gromatukha culture dates derived from charred remains on pottery from layer 3 of the Gromatukha site pertain to its initial period, which falls between the calendar calibrated dates (±2σ) from 15,010 (MTS-17798) to 10,250 BP (MTS-17801). Determinations from charred remains on pottery from layer 2 of the same site also correspond to the Initial Neolithic, from 15,120 (MTS-17805) to 10,300 BP (MTS-17807). Another early date (11,220–10,770 BP (MTS-17803)) was determined from charred remains on the Gromatukha pottery (Fig. 4, *3*) that were discovered in layer 1. The date for Chernigovka-on-Zeya obtained from charred remains on pottery from layer 2 (Fig. 4, *5*) (11,060–9550 BP) (MTS-17811) is close to this. The latter dates have a greater standard deviation (or a standard error) of ±230 as compared to that for other radiocarbon dates (from ±70 to 90 years (see Table 1)).

Several explanations for a resemblance between the dates for layers 3 and 2 of the Gromatukha site can be proposed. The first is a discrete distribution of layer 3 over a terrace, whereby layer 2 (interlayer 2.2) in some places is located directly on crushed-stony/clay layer 4. The second is the presence of Gromatukha lithic industry and ceramics in layer 2, similar to artifacts from layer 3; i.e. continuous deposition of material. And the third is the displacement of early material from layer 3 during digging by the Gromatukha people themselves, and by later inhabitants that left deposits in layers 2 and 1. Trampling and subsidence of subjects into the underlying layers cannot be ruled out. For instance, during excavations in 2004, a fragment of Osinovoye Ozero pottery-rim with appliquéd segmented fillets was found lying 7 cm below layer 1. A piece of ocher and an adjacent cluster of Osinovoye Ozero pottery can be assigned to the boundary between layers 1 and 2. Chalcedonic flakes were found near the cluster. All these objects could have been trampled in by inhabitants of the Osinovoye Ozero dwelling.

The presence of a more ancient pottery sample (Fig. 4, *3*) in layer 1 of the Gromatukha site is explained by its redeposition as a result of the activities of inhabitants of the site at the mouth of the Gromatukha River, which could have taken place at any stage after the Gromatukha culture, from the Late Neolithic to the period of the site's occupation in the first half of the 20th century.

Conclusions

According to the data from radiocarbon analysis of charcoal and organics from pottery, the chronological framework of the Gromatukha culture is 16,260–8010 BP, i.e. this culture existed for about 8250 years. Actually, this time-range corresponds to the dates derived from organic admixture in ceramics; the charcoal-based dates fall within the said chronological limits. However, if we rely on the dates established from charcoal only (14,820–11,200 BP), this period is reduced to 3620 years (see Table 1) (Kuzmin, Nesterov, 2010).

New radiocarbon dates determined from charred remains on the Gromatukha pottery give a chronological range of 15,010–9550 BP (for Gromatukha layers 3 and 2, and Chernigovka-on-Zeya layer 2); in other words, the duration of existence of ceramics within the Gromatukha culture of the Initial Neolithic in the Western Amur region was 5460 years. This is 2790 years less than the period of existence of the tradition of manufacture of the said ceramicware, established by organic remains in clay texture, and 1840 years more than the Gromatukha culture period determined from charcoal found in the cultural layers of the sites (Fig. 5). Comparative studies of the lithic industry and ceramics of the Gromatukha sites will demonstrate to what extent such existence periods of the Gromatukha culture, determined from charcoal, organic remains in pottery, and charred remains on pottery, are realistic, and which of them represents actual events.

Acknowledgement

This study was supported by the Russian Science Foundation (Project No. 14-50-00036).

References

Derevianko A.P. 1965
Drevniye kultury Srednego Amura (kamennyi vek). Cand. Sc. (History) Dissertation. Leningrad.

Derevianko A.P., Kang Chan Hwa, Ban Mun Be, Ko Chje Von, Nesterov S.P., Kan Sun Siok, Kim Chon Chan, Kan Si Ne, Volkov P.V., Komarova N.A., Savelova A.V., Kudrich O.S., Min Chji Hion. 2004
Poleviye issledovaniya pamyatnika Gromatukha na reke Zeye v 2004 godu. In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territoriy*, vol. X (I). Novosibirsk: Izd. IAE SO RAN, pp. 82–86.

Derevianko A.P., Kuzmin Y.V., Burr G.S., Jull A.J.T., Kim J.C. 2004
AMS ^{14}C age of the earliest pottery from the Russian Far East: 1996–2002 results. *Nuclear Instruments and Methods in Physics Research*. Section B: Beam Interactions with Materials and Atoms, vol. 223/224: 735–739.

Fischer A., Heinemeier J. 2003
Freshwater reservoir effect in ^{14}C dates of food residue on pottery. *Radiocarbon*, vol. 45 (3): 449–466.

Jull A.J.T., Derevianko A.P., Kuzmin Y.V., Orlova L.A., Bolotin D.P., Sapunov B.S., Tabarev A.V., Zaitsev N.N. 2001
Noviye radiouglerodniye daty arkheologicheskikh pamyatnikov Srednego Priamurya. *Vestnik Amurskogo gosudarstvennogo universiteta*. Ser.: Gumanitarniye nauki, iss. 12: 47–48.

Kuzmin Y.V. 2006

Palaeoenvironment and chronology. In *Archaeology of the Russian Far East: Essays in Stone Age Prehistory*. Oxford: Archaeopress, pp. 13–40. (BAR Intern. Ser.; No. 1540).

Kuzmin Y.V., Nesterov S.P. 2010

Khronologiya neoliticheskikh kultur Zapadnogo Priamurya. In *Traditsionnaya kultura vostoka Azii*, iss. 6. Blagoveshchensk: Izd. Amur. Gos. Univ., pp. 103–110.

Nesterov S.P. 2008

Chernigovka-na-Zeye – poseleniye gromatukhinskoy kultury v Zapadnom Priamurye. In *Neolit i neolitizatsiya basseyna Yaponskogo morya: Chelovek i istoricheskiy landshaft: Materialy Mezhdunar. arkheol. konf., posvyashch. 100-letiyu co dnya rozhd. A.P. Okladnikova*. Vladivostok: pp. 170–181.

Nesterov S.P., Alkin S.V., Petrov V.G., Kang Chan Hwa, Orlova L.A., Kuzmin Y.V., Imamura M., Sakamoto M. 2005

Rezultaty radiouglerodnogo datirovaniya eponimnykh pamyatnikov gromatukhinskoy i novopetrovskoy kultur Zapadnogo Priamurya. In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territoriy*, vol. XI (1). Novosibirsk: Izd. IAE SO RAN, pp. 168–172.

Nesterov S.P., Sakamoto Minoru, Imamura Mineo, Kuzmin Y.V. 2006

The Late-Glacial Neolithic complex of the Gromatukha site, Russian Far East: New results and interpretations. *Current Research in the Pleistocene*, vol. 23: 46–49.

Nesterov S.P., Zaitsev N.N., Volkov D.P. 2006

Ranneneoliticheskiy pamyatnik gromatukhinskoy kultury Chernigovka na reke Zeye. In *Problemy arkheologii, etnografii, antropologii Sibiri i sopredelnykh territoriy*, vol. XII (1). Novosibirsk: Izd. IAE SO RAN, pp. 201–205.

Okladnikov A.P. 1962

Osnovniye problemy drevney istorii Dalnego Vostoka. In *Tezisy dokladov i soobshcheniy Tretiey dalnevostochnoy konferentsii po istorii, arkheologii i etnografii*. Vol. 1: Sektsiya "Sotsialisticheskiye novostroyki Sibiri i Dalnego Vostoka". Komsomolsk-na-Amure: pp. 3–11.

Okladnikov A.P. 1966

Arkheologiya doliny reki Zei i Srednego Amura. *Sovetskaya arkheologiya*, No. 1: 32–41.

Okladnikov A.P., Derevianko A.P. 1977

Gromatukhinskaya kultura. Novosibirsk: Nauka.

Stuiver M., Reimer P.J. 1993

Extended ^{14}C data base and revised CALIB 3.0 ^{14}C age calibration program. *Radiocarbon*, No. 35: 215–230.

Volkov P.V., Nesterov S.P. 2008

Osinoozerskoye zhilishche na poselenii Gromatukha. In *Traditsionnaya kultura vostoka Azii*, iss. 5. Blagoveshchensk: Izd. Amur. Gos. Univ., pp. 98–110.

Zabiyako A.P., Kobyzov R.A. 2011

Artefakty gromatukhinskoy kultury pamyatnika Kalinovka, pisanitsa-1 i problema datirovki naskalnykh risunkov. In *Aktualniye problemy arkheologii Sibiri i Dalnego Vostoka*. Ussuriysk: Izd. Ussur. Gos. Ped. Inst., pp. 167–173.

Received March 31, 2017.
Received in revised form June 20, 2017.