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A STONE AGE STRAINER FROM THE NORTHERN BOREAL ZONE: A FIND FROM PEGREMA I (KARELIAN REPUBLIC)

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The settlement site Pegrema I is located on a sandy pine heath by the fjord-like bay of Unitskaya Guba, on Lake Onega, on the Zaonezhe Peninsula in the Karelian Republic (Russian Federation) (Fig. 1). The area is one of the major prehistoric settlement areas known in Karelia, with tens of individual locations or areas of activity dating from the Mesolithic to the Early Metal Period. The site of Pegrema I is among the best-studied of these: found in 1966, c 1000 m^2 were excavated in 1970–73 (Zhuravlev 1987; 1991) (Fig. 2). It is also one of the most intensively studied Rhomb-Pit Ware sites in Karelia, and has held an important position in the study of this pottery type, as well as its dating (see Vitenkova 1996: 152, 160–1; Khoroshun 2013: 11, 116; Nordqvist & Mökkönen in press).

While re-examining the find material from Pegrema I in February 2015, a peculiar artefact was encountered: a ceramic vessel with holes pierced through its walls, a strainer. This item had not previously aroused much interest and is only mentioned once in passing in earlier publications (Zhuravlev 1991: 82). In this contribution, the find and its find context will be described, and the results of radiocarbon dating and lipid analysis of the specimen are presented.

THE ARTEFACT

The strainer from Pegrema I consists of numerous pieces (e.g. 784/1681, 1682, 1685, 1688, 1689, 1690, 1692, 1693, 1694; collections stored at the Institute of Linguistics, Literature

Fig. 1. The location of Pegrema (upper left) and an overview of the Pegrema I site, photographed from the northern end of the excavated area. Photo & illustration: K. Nordqvist.

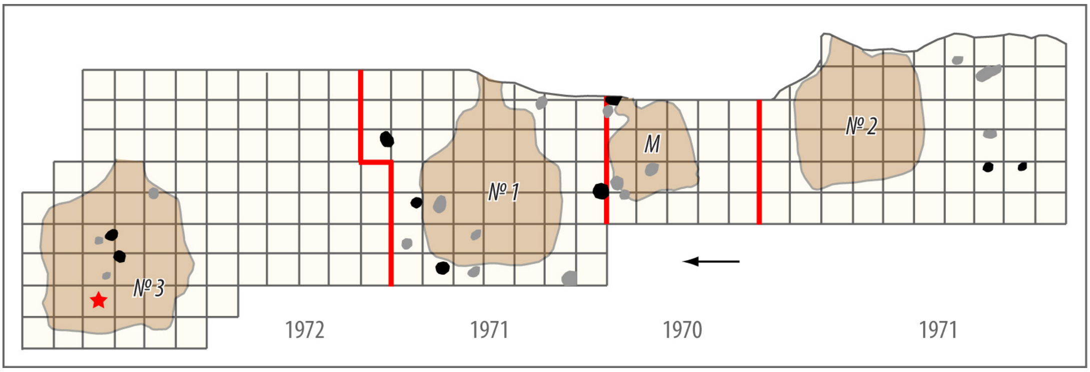

Fig. 2. General map of the excavations in 1970–72, trenches excavated in 1973 are not visible on the map. №1–3 – excavated dwellings; M – workshop; black areas – fireplaces; dark grey areas – other features of cultural soil; the grid unit is 2 x 2 metres. The find location of the strainer shards in square 77 is marked with a star. Illustration: K. Nordqvist (after Zhuravlev 1991: Ris. 7).

and History of the Karelian Research Centre, Petrozavodsk), many of which have been glued together. Its shape resembles the lower part of fairly flat, round-bottomed vessel, but no pieces of the rim have been identified (Fig. 3). The artefact is light brown or brown in colour, tempered with coarse sand and its thickness varies between 8 and 11 mm. The outer surface is weakly smoothed, whereas the inner surface is uneven in places. The vessel is undecorated, but studded with round holes, distributed seemingly randomly across the surface. The holes have been pierced from the inner surface with a hollow, tubular instrument (straw? bone?): their rims have a slight 'collar' on the outer surface, and in one case (784/1688) the hole has not been punctured through and just the impression of the hollow implement is visible on the inner surface (Fig. 3C). The diameter of the holes is fairly large, c 8 mm.

Many of the shards have weak charred organic residues on their outer surfaces (Fig. 3A). Combining the material from four shards (784/1682, 1690, 1692, 1693), an AMS dating made in the Groeningen laboratory (the Netherlands) indicated an age of 4695±35 BP (GrA-63734), i.e. 3630–3370 calBC (calibrated using the software OxCal 4.2 and given a 2-sigma confidence level; see Table 1). The date obtained from the strainer is very close to two other dates of birch bark tar on Rhomb-Pit Ware pottery from Pegrema I: 4730±35 BP (GrA-63686), and 4720±35 BP (GrA-63733), in addition to which yet another, slightly older date was obtained from the site, 4825±35 BP (GrA-63684).

The new datings place the use of the strainer – and the excavated part of the site – between c 3700–3400 calBC. In the literature, other datings with a much wider time range have also been presented for Pegrema I (Zhuravlev 1987; 1991: 127; Vitenkova 2002: 141, Tablitsa 6; see Table 1). However, these are conventional dates obtained from charcoal collected from features, or from the cultural layer, and consequently their connection with the find material is uncertain. As an example, the youngest date from the site (TA-493), which most likely derives from the cultural layer of the same house structure in which the strainer was found (see below), is dated c 500 radiocarbon years younger than the date obtained for the strainer. It may reasonably be assumed that the extreme values reflect other human activities or natural events in the area, though not Rhomb-Pit Ware habitation (Nordqvist & Mökkönen in press). There are also some older and later find materials at the site. Further, the discrepancy could be explained by a (freshwater) reservoir effect, although there is no clear evidence for this: the remaining charcoal datings, assuming they derive from the same habitation episode, are contemporary or older than the AMS dates. The δ13C values for the AMS dates, between -27.00‰ and -28.91‰, hint at a terrestrial or freshwater component, but in the absence of comparative isotopic data from the area the question remains unanswered. In general, the magnitude of the freshwater effect in north-eastern Europe has been considered fairly small (Pesonen et al. 2012: 665), even though no individual studies on the topic have been made.

Lipid analysis was carried out using combined gas chromatography-mass spectrometry (GC-MS) to see if there were any absorbed organic residues in the clay mass which could reveal the purpose of use of the artefact. The analysis was made at the University of Bradford (UK) from two samples prepared from both surfaces of the vessel (sampled shard 784/1694)[1]. In both samples common lipids were identified: glycerol and $C_{16:0}$ (palmitic) and $C_{18:0}$ (stearic) fatty acids, as well as low levels of unsaturated fatty acid $C_{18:1}$ (oleic) in the interior sample. The contents were so low that no further analysis or identification of compound-specific markers was possible. As the results were very similar to the ones obtained for the control sample, the lipids were estimated to be contaminants and not related to the original use of the vessel (Stern 2016).

THE CONTEXT

At least nine dwelling depressions were originally visible at Pegrema I. During the fieldwork, three dwellings were completely excavated, each one being understood as a semi-subterranean log-based building (Zhuravlev 1987; 1991: 16, 72) (Fig. 2). In addition, a structure interpreted as a workshop for working metal was found (Zhuravlev 1974; 1991: 21–4), although this interpretation has been later challenged (see Zhulnikov 1999: 66). Still, Pegrema I is an extraordinary place in terms of early metal use: there are over 60 published pieces of native copper at the site. This is by far the largest amount discovered at any Rhomb-Pit/Comb-Pit Ware site, or in fact, from any Stone Age site in north-eastern Europe in general (Nordqvist et al. 2012: 11; Nordqvist & Herva 2013: Table 1).

The strainer was found in the excavations of 1972 (Zhuravlev 1973), which were 344 m^2 in extent, and took place in the northern part of the settlement area, covering dwelling 3 and its surroundings (Fig. 2). This dwelling was described to be 10 x 9.3 x 0.5 m in size and rectangular in shape. A fireplace was found in its central part, whereas the entrance was directed towards the east, i.e. towards the shore. Finds were concentrated around the fireplace and by the walls, and the thickness of cultural layer varied in the overall excavated area from 32 to 47 cm (Zhuravlev 1987: 144–5; 1991: 20). According to the find catalogue, all identified strainer pieces originated from inside the house from one 2 x 2 m unit in the north-western part or the dwelling. Thus, the strainer seems to be one of the several pottery vessels broken and recovered *in situ* within dwelling 3. All in all, the find assemblage consists of fairly regular material encountered in Stone Age settlement sites: of the c 5500 finds recovered in 1972, the majority, c 5000 pieces, are pottery, the remaining part consisting of c 100

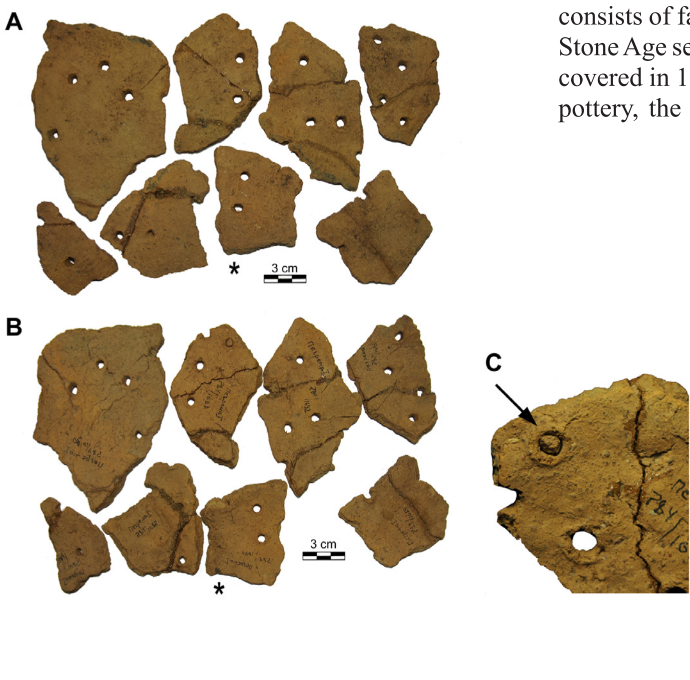

Fig. 3. Pieces of the strainer found in Pegrema I: a – outer and b – inner surface (784/1682, 1685, 1688, 1689 1690, 1692, 1693, 1694), the shard sampled for lipids (784/1694) is marked with an asterisk; and c – a shard with a non-punctured hole (784/1688). Photos: T. Mökkönen.

Lab-index	BP	±	Max (2σ)	Min (2σ)	Median	δ ^{13}C	Material	Sample	Reference
GrA-63684	4825	35	3694	3523	3580	-27.21	Birch bark tar	№ 784/1074	This study
GrA-63686	4730	35	3635	3377	3528	-28.91	Birch bark tar	№ 784/855	This study
GrA-63733	4720	35	3634	3375	3512	-27.00	Birch bark tar	№ 721/1090	This study
GrA-63734	4695	35	3630	3370	3453	-27.75	Charred residue	№ 784/1682, 1690, 1692, 1693	This study
TA-541	5145	110	4236	3705	3950	-	Charcoal	-	Zhuravlev 1987
LE-1029	4980	60	3943	3653	3767	-	Charcoal	-	Zhuravlev 1987
TA-492	4780	50	3655	3378	3565	-	Charcoal	-	Zhuravlev 1987
TA-493	4200	50	2904	2631	2777	-	Charcoal	-	Zhuravlev 1987

Calibrated using the software OxCal 4.2.

Table 1. Radiocarbon dates from Pegrema I.

pieces of stone artefacts (polished slate tools, polishing stones, scrapers, retouched tools, etc.), c 300 flakes (mainly slate and quartz), as well as four pieces of native copper (also found inside the dwelling). The pottery was classified as Rhomb-Pit Ware (Zhuravlev 1973; also Zhuravlev 1991: 77–83), but also includes the oval-pitted variant, as well as pieces that could be classified to represent contemporary Comb-Pit Ware (see also Khoroshun 2013: 118).

As far as we know, the strainer from Pegrema has no analogies in north-eastern Europe, or northern Russia. In the previous archaeological literature, the only remark on the object can be found in a monograph presenting the results of excavations undertaken in the Unitskaya Guba region, where it is very briefly commented on: ‘One vessel has through-holes applied all over its surface. This was, apparently, used as a colander.’ (Zhuravlev 1991: 82; authors’ translation).

Neolithic strainers have been reported from more southern areas and especially the Linear Pottery culture -related artefacts of the 5th millennium calBC from the northern central Europe have recently received attention. Analyses of lipids and individual biomolecular markers have proven the presence of dairy fats, thus indicating their use as cheese strainers (Salque et al. 2012: 58; 2013: 525). Externally, the Linear Pottery culture’s strainers share some features in common with the specimen from Pegrema, but there are also differences, for example in the shape, as well as in the number, density and size of the holes (in the strainers illustrated, e.g. in Salque et al. 2012: Fig. 4; 2013: Fig. 1, the holes occurred more densely and are smaller in size). Of course, it is not evident that all strainers would have been used for making cheese. Not all analysed specimens found in the Linear Pottery culture contexts have been found to contain dairy lipids, and other uses suggested for strainers include charcoal carriers/covers, honey strainers or artefacts used in making beer or straining pieces of meat from stock (Salque et al. 2012: 58; 2013: 522).

Unfortunately, there is not much evidence that could further hint as to what purpose the specimen from Pegrema was used for. The preservation of organic materials is very poor in the acidic sandy soils prevalent in the area, as shown by the lipid analysis. In addition, several decades of storage and handling, as well as the reconstruction of the vessels with various glues and plaster have probably contaminated and destroyed any surviving traces of their use. No osteological material exists from the site due to the rough excavation and documentation methods and the selective find recovery. This is a common problem with many Karelian assemblages, although the existing material points clearly towards hunter-gatherer subsistence. All in all, in north-eastern Europe the first indications of animal husbandry are known only later and far away from Pegrema, by the Baltic Sea in Finland: the first dairy lipids are recognised among the Corded Ware of the 3rd millennium calBC (Cramp et al. 2014: 3–4) and the oldest certain bones of domesticated animals date only to the very end of the 3rd millennium calBC (sheep/goat) or to the 2nd millennium calBC (cattle)

(Bläuer & Kantanen 2013: 1652–3, Tables 5–6; Mannermaa & Deckwirth 2010: 56; but see Lõugas et al. 2007 for the Baltic States).

The use of the artefact from Pegrema for some other purpose, such as making beer, has none the more supporting evidence. Still, in this connection it is interesting to note the results of a pollen analysis from the Unitskaya Guba Bay, with two sediment cores taken from the lake c 1.5 and 2.5 km south-east of the Pegrema I site. Based on the age-depth curve, the analysis showed pollen of Cerealia (*Triticum*) c 5000 BP and other anthropocores, like flax (*Linum usilatissimum*) and Cannabaceae (*Humulus* type), during the habitation of Pegrema I site (Vuorela et al. 2001: 129, 134–5). Unfortunately, there are no corroborating macrofossil finds, which could provide evidence more accurately of the plant utilisation or even of possible incipient cultivation in the area (cf. Kriiska 2009; Mökkönen 2010; Alenius et al. 2013), but this alternative cannot be ruled out offhand.

The strainer from Pegrema I is currently a special, solitary specimen among the hunter-gatherers of north-eastern Europe. Being commonly connected with agricultural communities, the artefact seems at a first glance to be out of context in its present find location. Therefore, regardless of its actual use, it challenges archaeologists to explore alternative scenarios and explanation models of the Neolithic period in this area. It is also a reminder of the importance of studying old materials, long forgotten in cellars and storage.

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REFERENCES

Archival and upublished sources

Stern, B. 2016. Analysis of possible ceramic sieve, Neolithic, Russian Karelia, for organic residues by Gas Chromatography-Mass Spectrometry. Research report, University of Bradford.

Zhuravlev, A.P. 1973. Otchet o rabote Kondopozhskogo otryada Karelskoy arkheologicheskoy ekspeditsii za 1972 god. Research report, Karelskiy nauchnyi tsentr, Petrozavodsk.

Literature

Alenius, T., Mökkönen, T. & Lahelma, A. 2013. Early farming in the northern boreal zone: reassessing the history of land use in southeastern Finland through high-resolution pollen analysis. *Geoarchaeology* 28 (1): 1–24.

Bläuer, A. & Kantanen, J. 2013. Transition from hunting to animal husbandry in southern, western and eastern Finland: new dated osteological evidence. *Journal of Archaeological Science* 40 (4): 1646–66.

Cramp, L.J.E., Evershed, R.P., Lavento, M., Halinen, P., Mannermaa, K., Oinonen, M., Kettunen, J., Perola, M., Onkamo, P. & Heyd, V. 2014. Neolithic dairy farming at the extreme of agriculture in northern Europe. *Proc. R. Soc. B.* 281: 20140819.

Khoroshun, T.A. 2013. *Pamyatniki s yamochno-grebenchatoy i rombo-yamochnoy keramikoy na zapadnom poberezhe Onezhskogo ozera (konets V – nachalo III tys. do h.e.)*. Petrozavodsk: Karelskiy nauchnyi tsentr.

Kriiska, A. 2009. The beginning of farming in the Eastern Baltic. In P.M. Dolukhanov, G.R. Sarson & A. Shukurov (eds.) *The East European Plain on the Eve of Agriculture*: 159–79. British Archaeological Reports 1964.

Lõugas, L., Kriiska, A. & Maldre, L. 2007. New dates for the Late Neolithic Corded Ware culture burials and early husbandry in the East Baltic region. *Archaeofauna* 16: 21–31.

Mannermaa, K. & Deckwirth, V. 2010. Suomen varhaisin karjatalous: tutkimuksen nykytila ja ongelmat. In J. Hirvilammi (ed.), *Varhainen viljely Suomessa*: 54–81. Loimaa: Sarka.

Mökkönen, T. 2010. Kivikautinen maanviljely Suomessa. *Suomen Museo* 116 (2009): 5–38.

Nordqvist, K., Herva, V.-P., Ikäheimo, J. & Lahelma, A. 2012. Early copper use in Neolithic north-eastern Europe: an overview. *Estonian Journal of Archaeology* 16 (1): 3–25.

Nordqvist, K. & Herva, V.-P. 2013. Copper use, cultural change and Neolithization in north-eastern Europe (c. 5500–1800 BC). *European Journal of Archaeology* 16 (3): 401–32.

Nordqvist, K. & Mökkönen, T. in press. Novye dannye po arkheologicheskoy khronologii Severo-Zapada Rossii: AMS-datirovki neolita–eneolita Karelii. Will be published in *Tverskoy arkheologicheskiy sbornik* 11 (2017).

Pesonen, P., Oinonen, M., Carpelan, C. & Onkamo, P. 2012. Early Subneolithic ceramic sequences in eastern Fennoscandia – a Bayesian approach. *Radiocarbon* 54 (3–4): 661–76.

Salque, M., Radi, G., Tagliacozzo, A., Pino Uria, B., Wolframd, S., Hohle, I., Stäuble, H., Hofmann, D., Whittle, A., Pechtl, J., Schade-Lindig, S., Eisenhauer, U. & Evershed, R.P. 2012. New insights into the Early Neolithic economy and management of animals in southern and central Europe revealed using lipid residue analyses of pottery vessels. *Anthropozoologica* 47 (2): 45–62.

Salque, M., Bogucki, P.I., Pyzel, J., Sobkowiak-Tabaka, I., Grygiel, R., Szmyt, M. & Evershed, R.P. 2013. Earliest evidence for cheese making in the sixth millennium BC in northern Europe. *Nature* 493 (7433): 522–5.

Vitenkova, I.F. 1996. Ranniy period: Kultura rombo-yamochnoy keramiki. In M.G. Kosmenko & S.I. Kochkurkina (eds.) *Arkheologiya Karelii*: 151–61. Petrozavodsk: Karelskiy nauchnyi tsentr.

Vitenkova, I.F. 2002. *Pamyatniki pozdnego neolita na territorii Karelii*. Petrozavodsk: Karelskiy nauchnyi tsentr.

Vuorela, I., Saarinisto, M., Lempiäinen, T. & Taavitsainen, J.-P. 2001. Stone Age to recent land-use history at Pegrema, northern Lake Onega, Russian Karelia. *Veget Hist Archaeobot* 10 (3): 121–38.

Zhulnikov, A.M. 1999. *Eneolit Karelii*. Petrozavodsk: Karelskiy nauchnyi tsentr.

Zhuravlev, A.P. 1974. Drevneyshaya masterskaya po metalloobrabothe medi v Karelii. *Sovetskaya arkheologiya* 1974 (3): 242–6.

Zhuravlev, A.P. 1987. Poselenie Pegrema I. *Sovetskaya arkheologiya* 1987 (4): 140–50.

Zhuravlev, A.P. 1991. *Pegrema (poseleniya epokhi eneolita)*. Petrozavodsk: Karelskiy nauchnyi tsentr.

NOTES

[1] The method of analysis is described in the report (Stern 2016) as follows: 'Sample preparation: One sherd sample was sub-sampled for analysis: The interior and exterior surfaces were separately scraped with a metal spatula to yield ceramic powder. The resultant powders were extracted with ~1 ml DCM:MeOH (dichloromethane:methanol 2:1, v/v), with ultrasonication for 5 min. followed by centrifugation (5 min 2000 rpm, ~650 relative centrifugal force (g)). Excess BSTFA (N,O-bis(trimethylsilyl) trifluoroacetamide) with 1% TMCS (trimethylchlorosilane) was added to derivatise the sample which was heated at 70°C for one hour. Excess derivatising agent was removed under a stream of nitrogen. The samples were diluted in DCM for analysis by GC-MS. A method blank was prepared and analysed alongside the ceramic samples.; Instrumental (GC-MS): Analysis was carried out by combined gas chromatography-mass spectrometry (GC-MS) using an Agilent 7890A Series GC connected to an 5975C Inert XL mass selective detector. The splitless injector and interface were maintained at 300°C and 340°C respectively. Helium was the carrier gas at constant flow. The temperature of the oven was programmed from 50°C (2 min) to 350°C (10 min) at 10°C/min. The GC was fitted with a 30 m X 0.25 mm, 0.25 μm film thickness HP-5MS 5% Phenyl Methyl Siloxane phase fused silica column (Agilent J&W). The column was directly inserted into the ion source where electron impact (EI) spectra were obtained at 70 eV with full scan from m/z 50 to 800.'