ARCHAEOLOGICAL FIELDWORK IN ESTONIA

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ARCHAEOLOGICAL INVESTIGATIONS OF LIME AND TAR PRODUCTION FACILITIES IN KURSI AND RANNU PARISHES

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INTRODUCTION
Two early and important advancements in the history of chemical technology are tar and lime. To address the production and use of these two substances, the research project ‘Tar and Lime Production in Estonia during the prehistoric, medieval and modern times’ is being carried out by Andres Tvauri and financed by the Estonian Science Foundation (grant no. 6690). The purpose of this project is to study tar and lime production sites. The secondary aim of the project is to serve as a basis for a further advancement in the research of production and industry as a whole. This topic has scarcely been dealt with in Estonian archaeology.

The project started in 2006. Fieldwork carried out that year is presented in an article by Tvauri and Saimre (2007). In 2007 and 2008 the work continued. Lime production sites were investigated in Kursi parish and tar production sites in the south of Rannu parish (Fig. 1).

FIELDWORK IN THE LIME PRODUCTION REGION IN KURSI PARISH
Lime has had a number of uses in plasters, mortars, lime wash, paints and agricultural soil additives. It was probably introduced in Estonia during the 13th century by German and Danish crusaders. The raw material for lime is limestone. Limestone bedrock outcrops occur naturally only in the northern, western and central regions of Estonia. Kursi parish is the southernmost area where abundant limestone can be found. Therefore it was an important source of lime for all of South-Estonia. During the 17th–18th centuries, the predominant force behind organising the production and usage of lime in Kursi parish was the town of Tartu (Kruus 1933).

Fieldwork during 2007–2008 included surveying the forested areas on the banks of the Kaave River and the Pedja River. A lot of limestone quarries and the remains of one limekiln remains were discovered. That brings the total count of limekiln discovered in 2006–2008 up to three.

The discovered limekiln remains (Fig. 2) are located on the eastern bank of the Kaave River, in a Soomaa property in Tammiku village. A detailed elevation map of the site was made using a total station (Fig. 3).
Further excavations were carried out on a limekiln in Saduküla (Fig. 4), which was discovered and investigated already in 2006 (Tvauri & Saimre 2007). Previous excavations in 2006 did not reveal any charcoal, so the main objective was to find charcoal for dating purposes. Unfortunately, the search was unsuccessful again. A detailed elevation map of the kiln and surrounding limestone quarry was made of this site using a total station.

An elevation map was also made of the site of the previously known limekiln in Jõune village on the lands of the former Tolli farmstead (Figs. 5–6).
FIELDWORK ON THE TAR PRODUCTION SITES IN RANNU

Tar is probably the oldest man-made synthetic material. It has been produced and used extensively since the Stone Age as a gluing and waterproofing agent, for wood preservation, inflammable substance, lubricant, medicine, etc. There is no reason to believe that the situation was any different in Estonia. According to written sources there was an abundance of seaworthy ships in Estonia at the beginning of the Middle Ages, so the quantities of tar consumed here had to be significant. This tar was most probably produced locally as Estonia...
has good premises for tar production. From the Middle Ages onwards, historical sources reveal a lot of information about tar production—in some cases it was an extremely important source of income for peasants and local lords. Until now, however, no tar production site had been investigated archaeologically.

This project selected the southern part of the historical Rannu parish as the research site. There are several references to tar production in this region. The area is much forested. During 2008 many inspections were carried out in the local pine forests, systematic inspections were carried out in higher sandy areas around Vallapalu, Vehen-di and Rannaküla. The purpose was to find man-made depressions in the terrain, which could be remains of tar pits or charring pits. All depressions found were examined with a drill to look for charcoal, ashes or burn marks.

In spite of extensive areas studied, relatively few depressions were found. Only 8 pits in 4 different locations around Vehendi were discovered. These were 5–10 m in diameter, round or elliptical, up to 1.2 m deep pits that exhibit a layer of charcoal at the bottom, under moss and 25–80 cm thick caved in sand. The natural sand under the charcoal had become hard and red from fire. The pits were surrounded by the sand excavated from
the pit. The charcoal taken from the pits was dated on four occasions. Three of them were from the 19th century or even a later period.

One pit that contained charcoal, located in a forested area east of Vehendi village (Fig. 7), provided a sample that was dated to 166±45 BP. After calibration this turned out to be slightly older than the others: 1650–1960 AD. This pit certainly cannot originate in the 20th century because the local pine forest was cut only a few years ago and was on average 120 years old according to the tree-rings on the stumps. Further investigations have to show what this pit was and what period it dates to.

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In addition to the large pits with burn marks there were many pits about 2 m in diameter, which were usually located in rows on old sand dunes and coastal dunes. The pits were completely covered by turf, surrounded by sand excavated from the pits and were up to 0.5 m deep. Originally they must have been at least 1.5 m deep, which is indicated by the fact that the underlying natural sand layer was not reached by a 1 m long drill.

The largest of such group of pits was found in Vehendi, on the same dune as the previously mentioned tar pits or charring pits (Figs. 8–9). The pits are too far from inhabited areas to be 19th century potato storage pits. Further investigations should reveal their actual purpose.

**SMALL PITS IN RANNU PARISH FORESTS**

The terrain reliefs at selected tar and lime production sites were recorded with a total station by taking hundreds of elevation readings across the site. The reasons for employing such a method are following.

First, the tar pits and limekilns both consist mostly of soil. They are in fact just soil (and stones) shaped in a certain manner. There are practically no finds, no human or animal remains, no cultural layer. Therefore, documenting these types of sites means documenting terrain relief. Second, photography is not clear enough for recording the three dimensional shape of such objects. This is because of photography’s inherent inability to record depth, and also because the kilns and pits are often covered by thick vegetation, bushes, trash and other obstructions which make visual recognition of the terrain underneath impossible.
To illustrate this point we can compare photos and elevation plans presented in this paper (see for example Figs. 2–3). Third, a digital total station presents a cheap and effective way of recording terrain elevations of a site very precisely. Once the total station is set up, it takes about four hours to record approximately 500 points, which should be enough to cover a site of medium complexity and about 50 m by 50 m in size.
The process of recording the terrain was the following. First, hundreds of elevation readings were taken all over the site. This data is in the form of three numbers: x-coordinate (northing), y-coordinate (easting) and z-coordinate (elevation). The points do not need to be spaced regularly. In fact, it is better to take more readings in areas of higher variability and fewer readings in large flat areas. This data was then processed by a computer to interpolate elevations between the measured points. Several methods of interpolation are available for this task, and choosing the best one is subject to the researcher’s judgment. This topic is complex enough for at least another separate article.

A similar method has already been used in Estonia at least once. The fossil fields of Saha-Loo were mapped using a surveyor’s level, taking measurements according to a regular rectangular grid of 1 m steps. These measurements were then processed in MapInfo to produce a contour line map of the site. The procedure and results are published in an article by V. Lang, H. Kaldre and M. Laneman (2005). Unfortunately the interpolation procedure is not described.

There are a number of other software suites, besides MapInfo, that could be used to achieve the same results, including free open source software like GRASS. We used Surfer 8 for its wide range of interpolation abilities and greater user-friendliness. It is important to note, that the elevation plans generated by a computer on the basis of the interpolation data are not precise. It does not constitute tachymetric measurement data itself but it is already an interpretation of that data. Therefore the original measurement data file must always be preserved.
CONCLUSION

In Kursi parish the remains of one limekiln were discovered, along with several limestone quarries. Three limekiln sites were mapped with a total station. In Rannu parish several possible tar pits, charring pits and other small pits were located. One group of pits was mapped with a total station.

First steps towards establishing the tradition of archaeology related to industry and production activities have been made. In the future, the recording of terrain reliefs of limekiln and tar pit sites must continue. Different interpolation methods and possibly sampling patterns should be experimented with in order to find the best method of recording terrain relief data.

References

Millega täpsemalt on tegemist ja mis ajast lohud pärvinead, peavad näitama edasised uuringud.

Lisaks eelpoolkirjeldatud suurtele lohkudele leiiti metsadest hulgised väike- ja väikeväised süvendeid. Need on umbes 2 m läbibimõõduga lohud, mis reegliga paiknevad ridamis vaandel rannavallidel ja liivaulide. Lohud on täiesti kamardunud, nende ümber on madal väljaakavatud liivast ning nende sügavus on kuni 0,5 m. Algset on need lohud olnud vähemalt 1,5 m sügavused, mida näitab asjaolu, et 1 m pikkuse mullapuuriga pinnast sondeerides ei jõua loodusliku pinnaseni. Suurim avastatud seliste lohkode rühm paikneb Vehendi külas samal lülitel koos ülemainitud tõrva- või viilualukudega (jn 8–9). Lohud on sedavõrd vanad ja asustusest kaugel, et 19. saj kartulisäilistuukudeks neid pida ei saa. Millega on tegemist, peaksid näitama edasised uuringud.


Edaspidi ongi plaanis jätkata muististe reljeefide talletamist, eksperimenteerides uued erinevate mõõtepunktitiheuste ja paigutusmustritega ning erinevate interpalatsioonimeetoditega. Samas tuleb kindlasti jätkata uuringut ka traditionaalseni arheoloogilisi meetodei (st väljaakavamise ja inspektsooni) kasutades.