

**ARHEOLOOGILISED
VÄLITÖÖD
EESTIS**

**ARCHAEOLOGICAL
FIELDWORK
IN ESTONIA**

2003

Koostanud ja toimetanud
Ülle Tamla

Muinsuskaitseamet
Tallinn 2004

© 2004 Muinsuskaitseamet
Uus 18, Tallinn 10111, Eesti
National Heritage Board
Uus 18, Tallinn 10111, Estonia

Esikaas: 13.–14. saj. Liivimaal löödud brakteaat.

Tagakaas: Tinaraamis klaas (fragment vitraažist?) Piritalt.

Cover: Bracteate of the 13th–14th century, minted in Livonia.

Back cover: Glass in lead frame (fragment of a stained glass window?) from Pirita.

Toimetuskolleegium:

Ants Kraut

Erki Russow

Toomas Tamla

Ülle Tamla

Agne Trummal

Heiki Valk

Uus 18, Tallinn 10111, Eesti
e-mail: info@muinas.ee

Kujundus ja makett:

Jaana Kool

**TARTU ÜLIKOOI
RAAMATUKOGU**

ISSN 1406-3972

Trükitud AS Pakett trükikojas
Laki 17, Tallinn

ARCHAEOLOGICAL INVESTIGATION AT THE SETTLEMENT AND BURIAL SITE OF KIVISAARE

**Aivar KRIISKA, Raili ALLMÄE,
Mari LÕHMUS and Kristiina JOHANSON**

Tartu Ülikool (University of Tartu), Lossi 3, 51003 Tartu, Eesti (Estonia)

aivar.kriiska@ut.ee

Ajaloo Instituut (Institute of History), Rüütli 6, 10130 Tallinn, Eesti (Estonia)

raili.allmae@tllapt.ee

In July and August of 2003 the fieldwork started previously (Kriiska *et al.* 2003) continued at the settlement and burial site of Kivisaare in Central Estonia. The research was financed by the Estonian Science Foundation (Grant No. 4558 and 5328).

Two small excavation plots were opened in the central part of the drumlin (a total area of 24 m²) and additional test pits were dug in order to determine the extent of the settlement sites of different periods and the preservation of the cultural layer (Figs. 1; 2). The latter indicate that the habitation traces from the Mesolithic cover an area more than a hundred meters long, extending to the central part of the Kivisaare drumlin, while the centre of the Corded Ware Culture settlement is only a few tens of meters in diameter and situated on the southern end of the drumlin.

The cultural layer was relatively thick (even more than over half a meter) and rich in finds at both excavation plots. While the upper part of the layer has been disturbed by ploughing over a long period, the lower part was intact. The southern part of the excavation consisted mostly of numerous big granite stones, probably amassed by agricultural activity. No apparent artifacts could be identified; still, an assemblage of human bones was found that could be a grave or a part of a grave. The investigation of the latter will continue in the summer of 2004.

THE FINDS

Altogether 1236 artifacts were gathered from the excavations and the test pits. Most of these belong to the Stone Age but 53 items or fragments (sherds of glazed earthenware, faience and porcelain, pieces of glass *etc.*) relate to human activity on the Kivisaare drumlin during the last centuries. The prevalent part of the finds is made up of stone finds – altogether 1168, 1134 of these are of flint (97.1% of

¹Including one quartzite flake

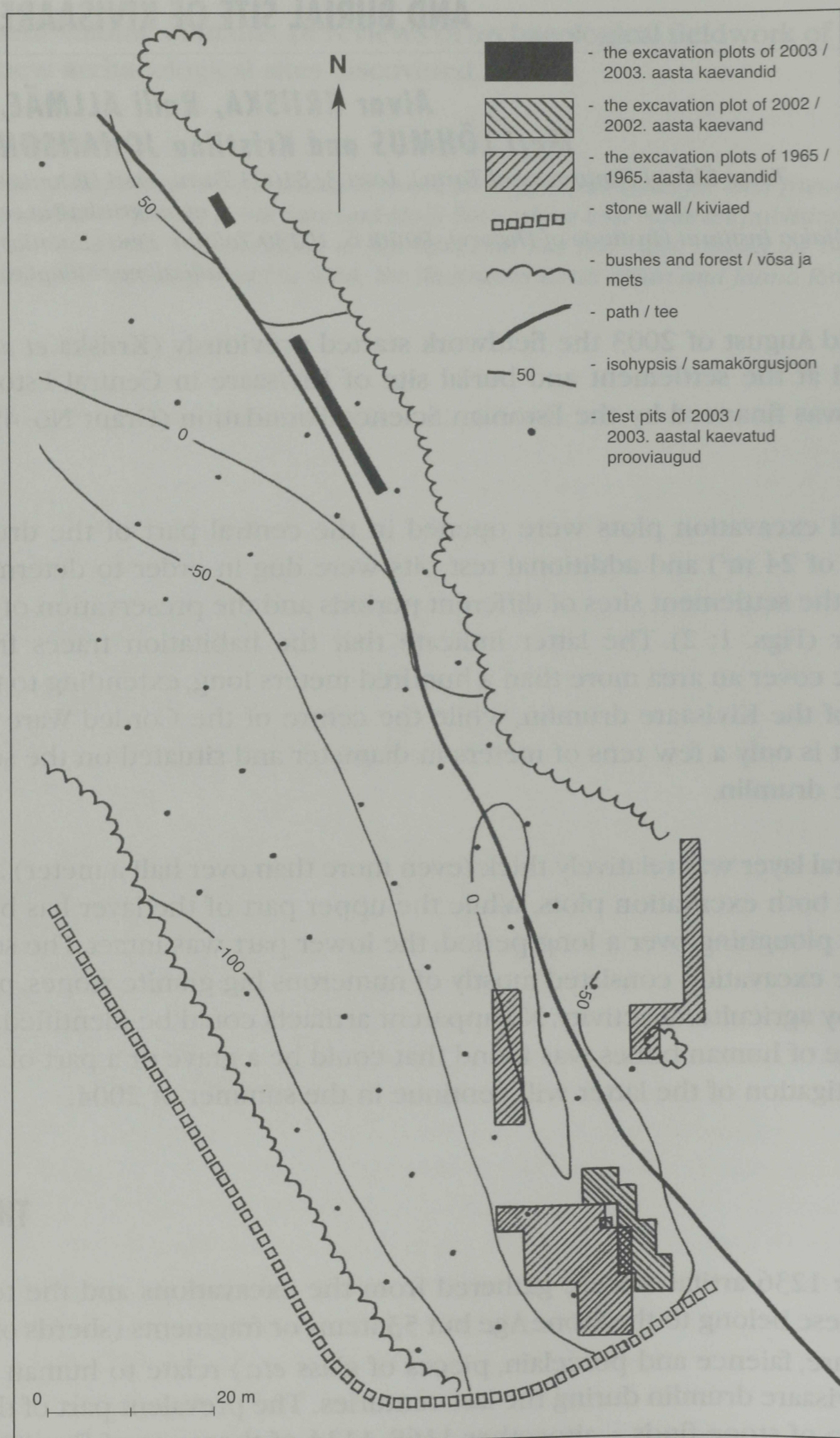


Fig. 1. The general map of Kivisaare.
Joon. 1. Kivisaare üldplaan.



Fig. 2. One of the excavations of 2003 on the Kivisaare drumlin.
 Joon. 2. Üks 2003. aastal rajatud kahest kaevandist Kivisaare voorel.

stone finds), 19 of quartz¹ (1.6% of stone finds) and 13 of other rock (1.1% of stone finds). The flint is of variable (generally of low) quality and of local origin. At least a part of the local flint has been quarried from limestone and brought to the area from outside the settlement site. This is indicated by unworn coarse limestone crust on the surfaces of several flakes (TÜ 1113: 1580, 1585, 1592 *etc.*) and a bigger flint lump (TÜ 1113: 1580). The latter had structural damage on one end which could have been created when the lump broke off from the limestone formation. In contrast, the natural flint lumps, numerous in the soil of Kivisaare, are severely worn and with smooth surfaces. One flake (TÜ 1113: 1628) and a fragment of a blade core (TÜ 1113: 1813) are of high quality blackish-grey flint which may originate from Southern Lithuania or Northern Belarus (for the distribution of this kind of flint in Estonia see: Kriiska 2001a and references there).

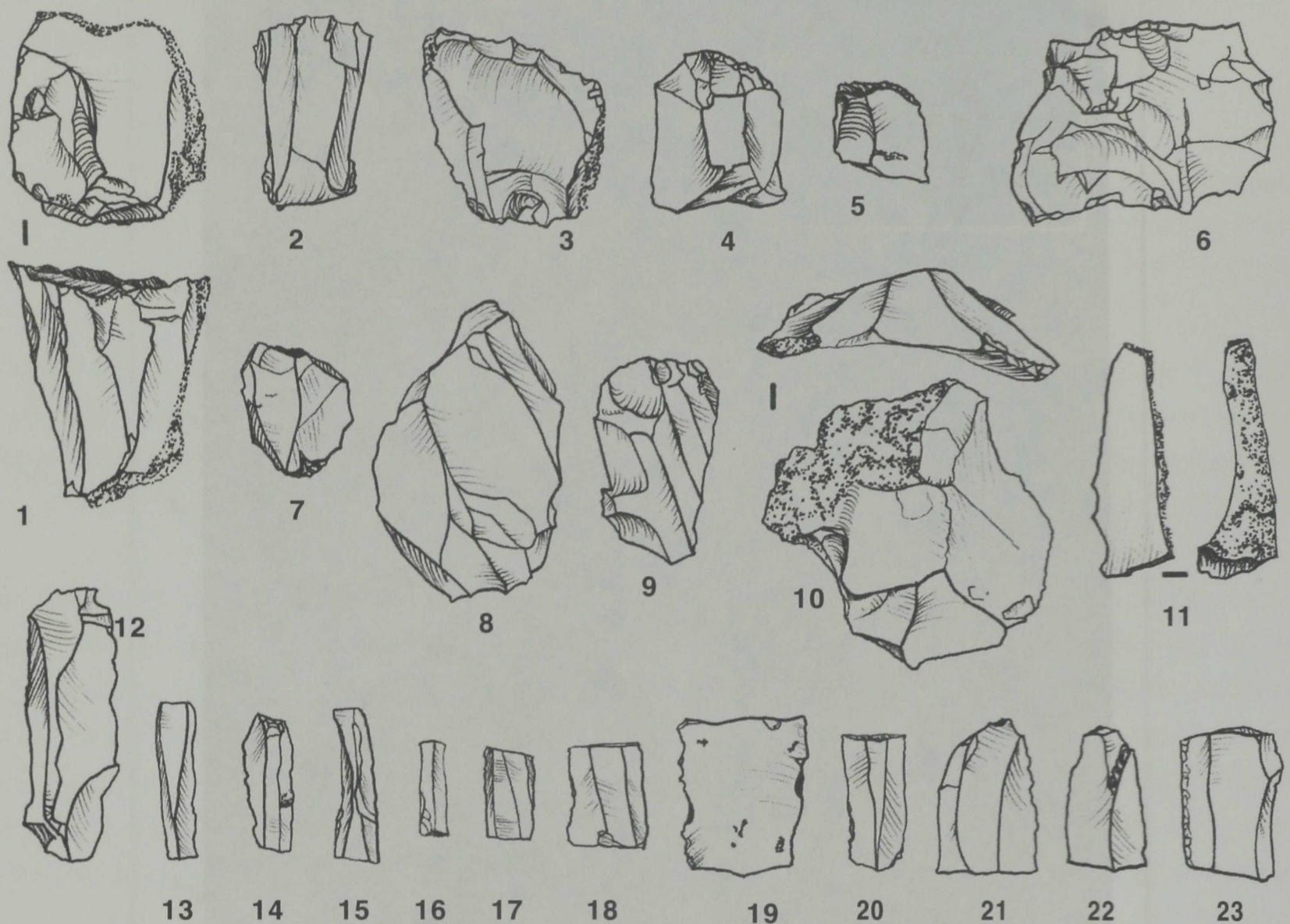


Fig. 3. Finds from Kivisaare.

1 - single-platformed blade core of flint, the edges of the platform are rounded, half of the core is covered with limestone crust (TÜ 1113: 1575), 2 - single-platformed blade core of flint (TÜ 1113: 1677), 3, 4 - flint flakes (TÜ 1113: 1621, 1814), 5 - flint end and side scraper on a blade fragment, the blade end has steep retouch, the blade side has light retouch (TÜ 1113: 1582), 6 - double-platformed irregularly shaped flake core of flint, the edges of both platforms are rounded (TÜ 1113: 1575), 7 - bipolar biconic flint core with structural damage on both ends (TÜ 1113: 1574), 8 - bipolar biconic flint core with structural damage on both ends (TÜ 1113: 1646), 9 - fragment of a blade core of flint (TÜ 1113: 1813), 10 - core platform rejuvenation or preparation flake (TÜ 1113: 1567), 11 - single-ridged flint blade partially covered with crust, a part of the distal end of the core was removed by the blade (TÜ 1113: 1627), 12 - double-ridged flint blade (TÜ 1113: 1609), 13-22 - fragments of flint blades (TÜ 1113: 1565, 1605, 1615, 1582, 1627, 1613, 1591, 1604, 1578, 1582), 23 - flint knife (TÜ 1113: 1590.)

Joon. 3. Leide Kivisaarelt.

1 - üheplatvormiline tulekivist laastnukleus, platvormi servad täksitud, poolt nukleust katab lubjakivikoarik, 2 - üheplatvormiline tulekivist laastnukleus, 3, 4 - tulekivikillud, 5 - laastukatkest otskülgteraga tulekivikõõvits, tera järsu retušiga, külgtera lauge retušiga, 6 - kaheplatvormiline tulekivist ebakorrapärase kujuga kildnukleus, mõlemad platvormid täksitud servaga, 7 - bipolaarne kaksikkoonilise kujuga tulekivist nukleus, mõlemas otsas struktuuririkked, 8 - bipolaarne kaksikkoonilise kujuga tulekivist nukleus, mõlemas otsas struktuuririkked, 9 - tulekivist laastnukleuse katke, 10 - tulekivikild, mis on löödud pronukleuse otsast löögiplatvormi tekitamiseks, 11 - üheharjaline osaliselt koorikuga kaetud tulekivilaast, löögil kaasa tulnud osa nukleuse distaalotsast 12 - kaheharjaline tulekivilaast, 13-22 - tulekivilaastude katked, 23 - tulekivist nuga.

The predominant part of the finds consists of flakes: 825 flint flakes (72.6 % of flint finds², Fig. 3: 3, 4, 10), 17 quartz flakes (89.4% of quartz finds) and 10 flakes of other stone materials. Some of the flakes have traces of being in fire. Of the many blades (32, Fig. 3: 11, 12) and their fragments (197, Fig. 3: 13–22) found, only one was of quartz, all the other were flint (20.6% of flint finds). One hundred and one of the blades and their fragments are single-ridged³, 100 double-ridged, 18 with three, 2 with four ridges and 7 without a ridge. The blade fragments originate from both the distal and proximal ends as well as mid-sections of the blades. Several blades are partly covered with crust. Judging by the proximal ends, the width of the blades, the striking nipple and the ripples on their ventral surfaces the blades have been produced by pressure flaking as well as by soft and hard hammer percussion. Just as some of the flakes, several blades have been in contact with fire as well.

Altogether 25 cores and 4 core fragments were collected, 28 of flint (2.5% of flint finds) and only one of quartz. Among the 1.4 to 4.1 cm high flint cores mainly bipolar (Fig. 3: 7, 8) biconic examples dominate, but flake cores of irregular shape with two or more striking platforms (Fig. 3: 6), conical single-platformed blade (Fig. 3: 1, 2) and flake cores as well as biconic flake-blade cores with several platforms are also present.

Of the 4 flint core fragments, two are from blade cores (Fig. 3: 9; one of them a piece of the distal end) and two flake-blade cores (one of them had initially been a single-platform blade core with flakes detached only in the last phase of its use).

Fifty-three artifacts with secondary processing were obtained, all of them of flint (4.5% of flint finds). The largest group among them is comprised of scrapers – 30 specimens (including 3 fragments; 56.6% of the artifacts with secondary processing). Nineteen of them are made on a flake and 8 on a blade fragment (Fig. 3: 5). The scrapers, 0.8 to 4.7 cm long and 0.7 to 2.7 cm wide, are rectangular (10), oval (6), polygonal (2), triangular (1), trapezoidal (1) or irregular (3) in shape. Twelve of them are end scrapers, 9 end and side scrapers, 4 side scrapers and on three examples the working edge covers the whole perimeter. In most cases the working edge has a steep retouch; cases with only a light retouch are less frequent. The working edge is most often convex, but can also be straight or even undulating.

The finds included 2 flint knives (3.8% of the flint finds, measuring 4.3 x 3.0 and

²18 lumps have been excluded from the whole number of the flint finds, as these are clearly natural and have reached the settlement site probably by geological processes and not as a result of human activity.

³Including the quartz blade.

1.8 x 1.3 cm; Fig. 3: 23): the smaller one is a double-ridged blade fragment with one edge covered entirely by a light retouch; the other, a flake, has a short, very lightly retouched working edge that is convex.

Secondary processing⁴ also occurs to a great extent on blades, including blade fragments and flakes, in 12 (22.6% of flint finds) and 8 (15.1 %) cases, respectively. Of blades and blade fragments 8 have light retouch on one edge, 3 have steep retouch on one edge and 1 example has either steep retouch or intensive use-chipping on both edges. Several of them have probably been used as flint inserts and can be classified as microliths. In addition to the specimens mentioned, there was a microlith with an oblique retouched working edge. This 2.1 x 0.8 cm artifact has been worked on the proximal end of a single-ridged blade. The microlith has traces of having been in fire.

Again a relatively small number of chopping tools were obtained from Kivisaare – altogether only three fragments of ground and polished stone wedges or axes (0.2% of finds). There are eight animal bones with traces of apparent processing ground and polished, including a fragment of a lance or a harpoon with the incision of the first barb clearly visible. Five potsherds dated to the prehistoric period were collected. Only three of them can be identified more precisely: one corded ware sherd with organic temper, smoothed on both surfaces, found from the excavation; one corded ware sherd with organic and sand temper smoothed on both surfaces; and one grit-tempered sherd of a hand-moulded vessel with a striated surface (that cannot be identified more exactly).

The ecofacts have not been identified so far, but in general numerous animal bones were gathered, including both burnt and unburnt fragments. A hazelnut shell was also found from the excavation.

The flaked tools and debitage have greatest similarity to the Mesolithic material of Central and Southwestern Estonia, most significantly the artifacts and debitage obtained in 2002 from the southern end of the Kivisaare drumlin. The share of blades, blade fragments and items processed from them 21.5% is noteworthy as it is the third biggest percentage after Pulli, exceeding that for the material of other Central Estonian settlement sites by 3–12% (for a comparison see: Jaanits & Ilumets 1988, 45; Kriiska 2001b; Kriiska *et al.* 2003, 36).

All the stone material gathered in Kivisaare in 2003 can be dated, both typologically and technologically, to the Mesolithic. Nevertheless its more exact dating is

⁴Some of it may be from wear.

difficult without radiocarbon analyses. The finds from Kivisaare are quite comparable to those excavated from other Central Estonian Mesolithic settlement sites, but unfortunately those lack C¹⁴ dating as well.

Since at the retreat of the Suur-Võrtsjärv stage of the lake Põltsamaa River or its tributary bypassed the Kivisaare drumlin, the site was suitable for habitation throughout the Stone Age. The materials found have several features that suggest the beginning of the settlement there already during the Early Mesolithic.

First of all, there is a big share of blades, blade fragments and artifacts processed on them. Although it has been suggested that their variation at different settlement sites is incidental depending on the need for maximal exploitation of the raw material or, quite the opposite, on the abundance of the rock (Jaanits & Ilomets 1988, 55), the trend towards a decreasing share of the blade technology is clearly discernible in the Estonian material towards the end of the Mesolithic. Thus the share of blades-flakes-artifacts on blades among the Kivisaare finds of 2003 is more similar to the material of the Early Mesolithic layer of the settlement sites of Kunda Lammasmägi in Northeastern Estonia and Zvejnieki II in Northern Latvia than to that of the Central Estonian settlements that have later dates (Jaanits & Ilomets 1988, 55). Both of the abovementioned sites were first inhabited already during the Preboreal, in Kunda, according to the radiocarbon dates, approximately 8700 years cal. BC (for the basis of the dates see Åkerlund *et al.* 1996, Table V). Flint inserts with a steep retouch are also more characteristic of the earlier part of the Mesolithic (Jaanits & Ilomets 1988, 58–59), as are the fragment of a supposedly Pulli-type arrowhead and the triangular microlith found in 2002 (Kriiska & Johanson 2003, Fig. 7).

HUMAN BONES FOUND AT THE EXCAVATION OF 2002

Human bones were gathered from the excavation plot as well as the test pits dug in the settlement area. The bone material consisted of extremely fragmentary parts of the skeleton. According to the distribution of the human bones (Fig. 4), two bigger concentration areas are evident in the excavation at the southern and northern parts of the excavation, while only single scattered bones were found between them. The southeastern corner of the excavation and a 2 meter long depression extending almost a meter into the natural moraine were conspicuous within the southern part. The latter could be interpreted as the reburial of human bones found while destroying the Stone Age cemetery in the 20th century (Kriiska *et al.* 2003, 34). The bones from the northern part of the excavation can also be

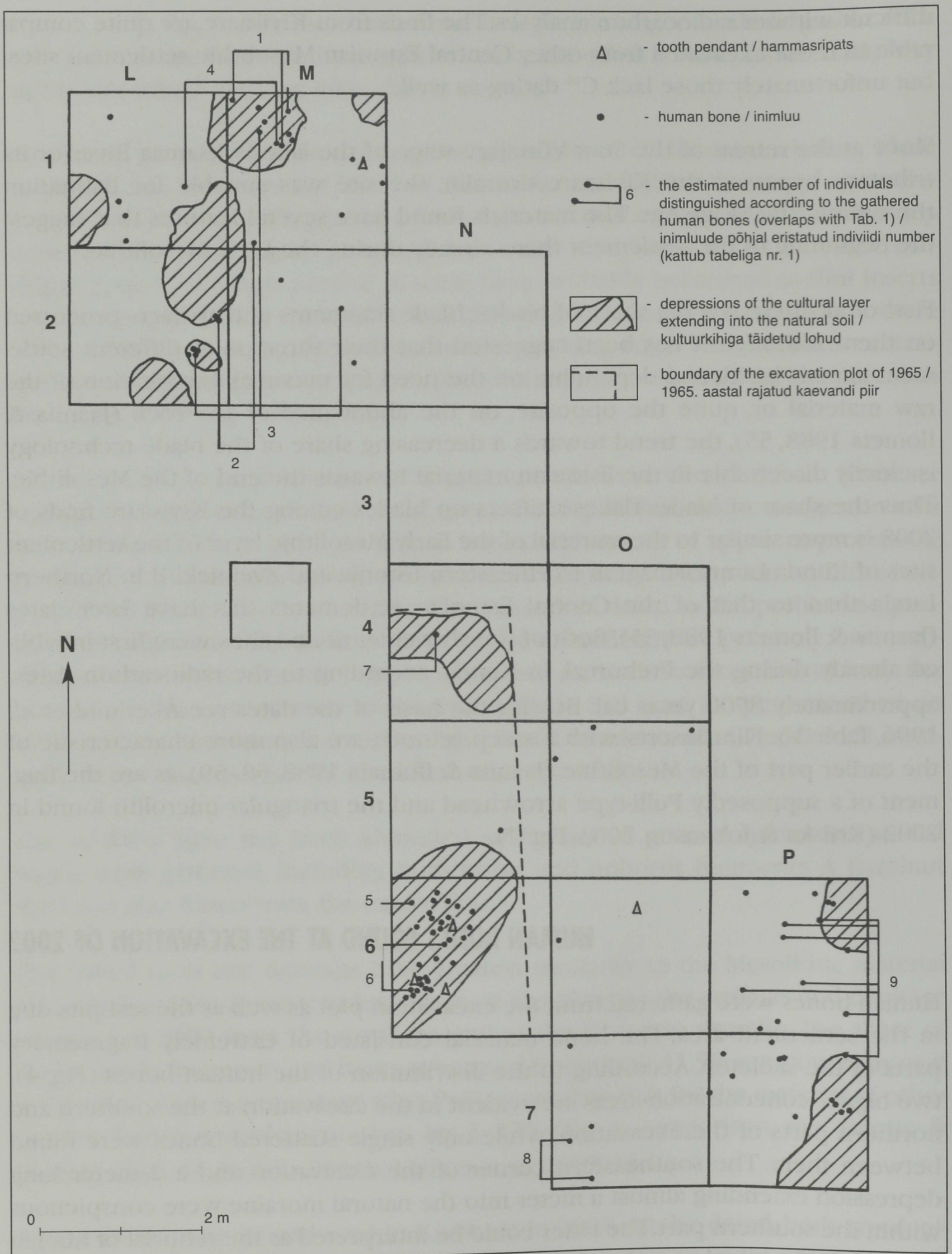


Fig. 4 The distribution of human bones and tooth pendants in the excavation of 2002.
Joon. 4. Inimluude ja hammasripatsite levik 2002. aasta kaevandis.

divided in two: the fragments found from the partly excavated depression at the northern end and the scattered single bones. The depression mentioned was regularly oval, conspicuous by its darker layer. It could be interpreted as the bottom of a destroyed or partly disturbed grave (Kriiska *et al.* 2003, 34).

Since none of the skeletons found were intact, the distinguishing of individuals has to be based on other principles, for example using the methodology applied in the research of stone graves where bones occur primarily as fragments. Still, using this methodology is hampered by the fact that only a part of the settlement and burial site has been excavated. For the present context the hypothesis is offered that if the identification of a bone fragment or a tooth obtained from a limited area falls into the same age category these should be stemming from a single individual.

The methodology based on this hypothesis allows to distinguish the remains of at least six persons in the excavation of 2002 (Tab. 1): 2–3 year old child (1, 8), 6–8 year old child (2, 7) and two adults. One of the adults was aged under 30 (4), the other over 30 (3, 9); from the measurement of the tubular bones it is likely that one of the adults was male and the other female (5, 6).

Considering that only a part of the settlement and burial site has been excavated and considering the distances between the areas with the bone finds, it can be assumed that the remains discovered belong to nine different individuals: (1) a 2–3 year old child⁵ in the presumably destroyed grave in the northern part of the excavation, (2) a 7–8 year old child among the scattered bones of the northern part of the excavation, (3) an adult aged over 30 among the scattered bones of the northern part of the excavation, (4) an adult aged under 30 in the presumably destroyed grave in the northern part of the excavation and among the scattered bones of the surrounding area, (5) a female in the depression of the reburial in the southwestern part of the excavation⁶, (6) male or female in the depression of the reburial in the southwestern part of the excavation, (7) a 5–8 year old child in the corner of the excavation of 1965 in the central part of the excavation of 2002, (8) a child under age 6 in the southern part of the excavation and (9) an adult over 30 in the southern part of the excavation.

Additional human bones were gathered from four test pits in the southern part of the drumlin. Considering the distance of the test pits from each other (approximately 10 or more meters), the bones probably belong to four different individuals.

⁵References used to determine age and sex: Ubelaker 1978; Miles 1963; Garmus & Jankauskas 1993.

⁶The parts of lower limbs, fewer fragments of upper limbs and skull were gathered from the depression. According to the lower limbs, these belong to at least two adult individuals. Still only three fragments can be classified more exactly.

Table 1. Probable individuals distinguished by the human bone finds of the excavation of 2002.

Tabel. 1 2002. a. kaevandist leitud inimluude määrangud.

No	Sex	Estimated age	Bones and age estimated	Pathologies and other observations	Distribution of the bones
1	child	2-3	upper right bicuspid (No 2211) pars petrosa ossis temporalis sinistra infans I (No 2098)		L-M/1-2 probable grave
2	child	7-8	proximal epiphysis of tibia (No 2107) - 8-12 years old lumbar vertebra of spine (No 2107) - older than 6 years		M/1 ja L/2 scattered bones
3	adult	over 30	upper left canine C (No 2275) - 7-8 years old		
			fragments of parietal bone (No 1007) - over 30/35 years		M/2 scattered bone
			lower right molar M1/M2 (No 2203) - over 30 years	ends of root are thickened	L-M/1-2 supposed grave
4	adult	under 30	IV cervical vertebra (No 1256)	processus articularis anterior with traces of inflammation, bone tissue is porous and with polished surface	L/2 small depression extending into natural soil
			upper right incisor C (No 2098) - under 25 years		L-M/1-2 assumed grave
			lower incisor I1 and upper canine C (No 1481) - under 25 years		L/2 scattered bones
5	female		distal end of left tibia (No 1638)	width 78 mm	N/5-6 reburial depression
6	male		fragment of diaphysis of left tibia fragment from foramen nutricium (No 1930)	perimeter 103 mm	N/5-6 reburial depression
			proximal end of right tibia (No 1966)	width 79 mm	

⁷Bones were gathered from their exact finding place, numbered and indicated on plans.

7	child	5-8	premolar	not emerged	N/4 scattered bone from the excavation of 1965
8	child	under 6	phalange (No 1816) - ca. 6 years metatarsal (No 2055) - under 6 years		O/7 scattered bones
9	adult ⁸	over 30	fragment of skull (No 1900) - over 30 years	sagittal suture of interior surface of skull is ossifying	P/6 scattered bone
			fragment of skull (No 1183) - over 30 years	sagittal suture of interior surface of skull is ossifying	P/6 scattered bone
			lower molar M1-M3 (No 2013) - over 35 years		P/6 scattered bone
			upper molar M1/2 (No 2076) - over 35 years		P/7 scattered bone
			upper right premolar P1/2 (No 2006) - over 35 years		P/7 scattered bone
			lower molar M3 (No 2147) - over 35 years		P/7 scattered bone
			enamel of lower molar (No 2158) - under 35 years		P/6 scattered bone
10	adult	over 35	upper mandible with roots of teeth (No 2378) - over 35/40 years	ends of tooth roots are severely thickened, degeneration of alveolar arch, traces of inflammation peri-radical tissue in left upper premolar P1 and in upper right second premolar P2	test-pit 21
11	?	?	fragment of lower mandible (No 2369)		test-pit 4
12	adult	over 30	lower incisor (No 2372) - over 30 years	1/3 of crown is frayed	test-pit 10
13	?	?	fragment of skull (No 2371)		test-pit 9, the excavation area of 1965

⁸If a fragment of mandible originates from the same skeleton, it could be male.

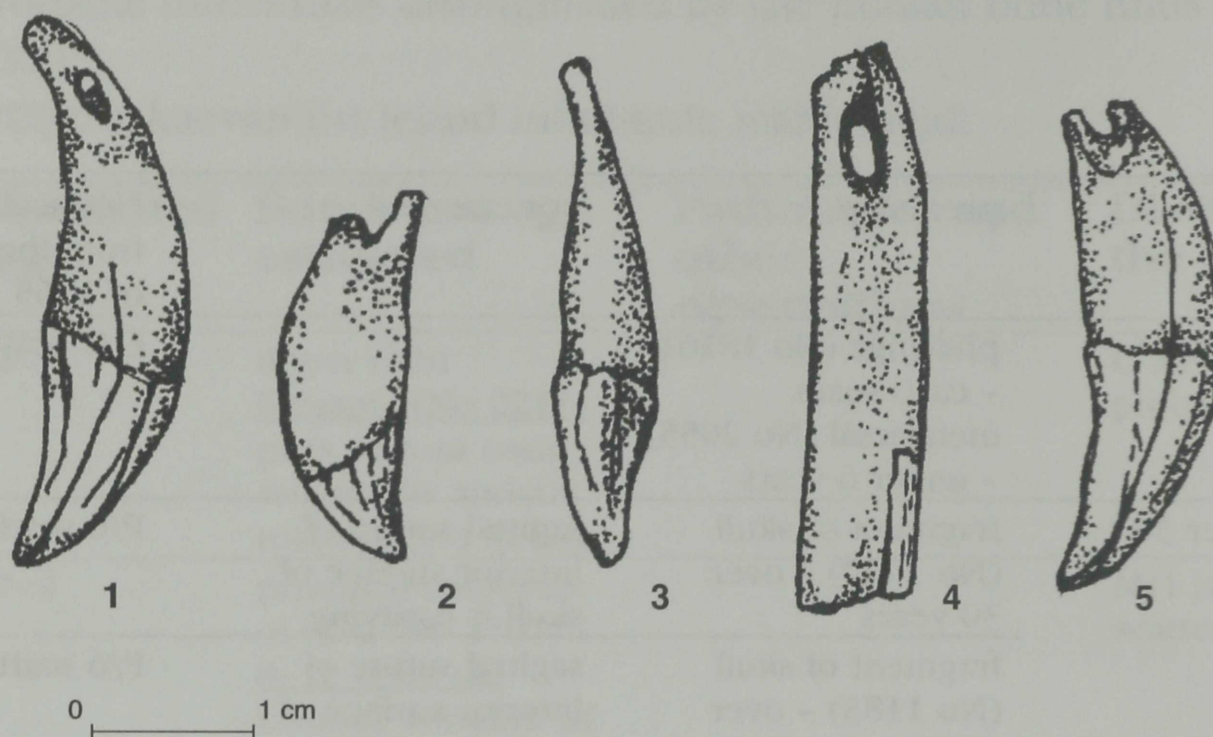


Fig. 5. Tooth pendants found from Kivisaare in 2002. 1, 3 and 5 - dog fang, 2 - seal fang, 4 - incisor of wild boar (TÜ 1113: 552, 353, 174, 1284, 1216.)

Joon. 5. 2002. aastal Kivisaarest leitud hammasripatsid. 1, 3 ja 5 - koera kihv, 2 - hülge kihv, 4 - metssea lõikehammas.

Since the dead were buried at the settlement site, the distinguishing of the grave goods related to mixed burials with certainty is impossible. Nevertheless, altogether 5 tooth pendants were obtained from the excavation of 2002, one of the most common items in the graves investigated previously at Kivisaare (Bolz 1914; Kriiska & Johanson 2003, Fig. 2). At least the three tooth pendants found with the reburial were probably grave goods. Three of the pendants are made of a dog fang, one of a wild boar incisor and one of a seal fang (Fig. 5). It is noteworthy that a pendant of a seal fang has been found from Kivisaare already previously (Bolz 1914, 32).

The dating of the cemetery is difficult. The previously excavated burials (Kriiska & Johanson 2003, 40–42) lack artifacts characteristic of the graves of the Corded Ware and the Combed Ware cultures. Therefore, one is led to believe that the burials are older and belong to the Mesolithic or the Early Neolithic. According to Lembi Lõugas the latter is indicated by the similarity of the dog fang pendants found from Kivisaare with those from the Zvejnieki Stone Age cemetery (Kriiska *et al.* 2003, 36).

Acknowledgements

The authors are grateful to all members of the Kivisaare fieldwork team, the paleozoologist Lembi Lõugas for identifying the tooth pendants and the artists Kristel Külljastinen, Jaana Ratas and Ene Tapfer for preparing the drawings for the article.

References

Bolz, M. 1914. Das neolitische Gräberfeld von Kiwisaare in Livland. – Baltische Studien zur Archäologie und Geschichte. Arbeiten des Baltischen Vorbereitenden Komitees für den XVI. Archäologischen Kongress in Pleskau 1914 herausgegeben von der Gesellschaft für Geschichte und Altertumskunde der Ostseeprovinzen Russlands. Riga, 15–32.

Garmus A. & Jankauskas R. 1993. Methods of Person's Identification From The Skeleton in Lithuania. – Medicina Legalis Baltica, 3/4, 5–20.

Jaanits, K. & Ilomets, M. 1988. Umbusi mesoliitilise asula vanusest ja kohast Eesti keskmise kiviaja kronoloogias. – Loodusteaduslikud meetodid Eesti arheoloogias. Artiklite kogumik. Tallinn, 54–64.

Kriiska, A. 2001a. Archaeological field work on Stone Age settlement site of SW Estonia. – AVE, 2000, 19–33.

Kriiska, A. 2001b. Stone Age Settlement and Economic Processes in the Estonian Coastal Area and Islands. Academic Dissertation. Helsinki. <http://ethesis.helsinki.fi/julkaisut/kultt/vk/kriiska>

Kriiska, A. & Johanson, K. 2003. Kivisaare kiviaja asulakoht ja matmispaik. – Viljandi Muuseumi Aastaraamat 2002. Viljandi, 39–55.

Kriiska, A., Johanson, K., Saluäär, U. & Lõugas, L. 2003. The results of research of Estonian Stone Age. – AVE, 2002, 25–41.

Miles, A. E. W. 1963. The dentition in the assessment of individual age in skeletal material. – Dental Anthropology. Oxford, 191–209.

Ubelaker, D. H. 1978. Human Skeletal Remains. Analyses, Interpretation. Chicago.

Åkerlund, A., Regnell, M. & Posnert, G. 1996. Stratigraphy and chronology of the Lammasmägi site at Kunda. – Coastal Estonia. Recent Advances in Environmental and Cultural History. PACT 51. Rixensart, 253–272.

ARHEOLOOGILISED UURIMISTÖÖD KIVISAARE KIVIAJA ASULA- JA MATMISKOHAL

Aivar KRIISKA, Raili ALLMÄE, Mari LÕHMUS ja Kristiina JOHANSON

2003. aastal jätkusid välitööd Kesk-Eestis Kivisaare kiviaja asula- ja matmispaigal. Voore keskosas avati kaks väikest kaevandit (24 m²) ning jätkati prooviaukude kaevamist, et teha kindlaks eriaegsete elupaikade ulatus ja kultuurikihi säilivus (joon. 1; 2). Ilmnes, et mesoliitilised asustusjäljed katavad enam kui saja meetri pikkust ala, ulatudes ka Kivisaare voore keskosas. Nöörkeraamika kultuuri asulakoha tuumikala paikneb voore lõunaotsal ja on vaid mõnekümne meetrise läbimõõduga.

Leiurikka elutegevuskihi tüsedus ulatus kaevandites kohati üle poole meetri, kuid selle ülemine osa oli pikaajalise põlluharimisega segamini küntud. Mingeid selgemaid kiviaegseid kinnisobjekte ei avastatud, leiti aga inimluude kogum, mis võiks olla haud või osa sellest.

Kaevanditest ja prooviaukudest koguti 1236 leidu, millest enamus pärineb kiviajast. Vaid 53 eset või selle katket (glasuurkeraamika ning fajanss- ja portselannõude fragmendid, padrunikestad, klaasikilud jms.) seonduvad inimtegevusega Kivisaare voorel viimasel paaril sajandil.

Leiuainese enamuse moodustavad kivileiud – kokku 1168, neist 1134 tulekivist (97,1% kivileidudest), 19 kvartsist ja 13 muudest kivimitest. Tulekivi on erineva kvaliteediga ja tõenäoliselt kohalikku päritolu. Vähemalt osa tulekivist on murtud lubjakivilademetest ja toodud kohale väljapoolt asula territooriumit. Sellele osutab mitme killu ja ühe suurema struktuuririkkega tulekivikamaka pinnal esinev kore ning kulutamata lubjakivikoorik. Üks kild ja laastnukleuse katke on kvaliteetsest mustjashallist tulekivist, mille tooraine võib pärineda Lõuna-Leedust või Põhja-Valgevenest.

Valdav osa leidudest on killud: 825 tulekivikildu (72,6% tulekivileidudest, joon. 3: 3, 4, 10), 17 kvartsikildu ja 10 kivikildu. Rohkesti on laaste (joon. 3: 11, 12) ja laastukatkeid (joon. 3: 13–22), millest üks on kvartsist, teised tulekivist. Laastukatked pärinevad nii distaal- ja proksimaalotstest kui ka laastude keskelt. Otsustades proksimaalotste, laastude laiuse, lööginibu ja sisepinnal nähtavate murdejäljendite põhjal on laaste surutud ning tehtud pehme ja tugeva löögiga.

Ühtekokku koguti 25 nukleust ja 4 nukleuse katket, neist 28 tulekivist (2,5% tulekivileidudest) ja 1 kvartsist. Tulekivinukleuste hulgas domineerivad bipolaarsed (joon. 3: 7, 8), peamiselt kaksikkoonilise kujuga eksemplariid, kuid on ka kahe või enama löögiplatvormiga ebakorrapärase kujuga kildnukleusi (joon. 3: 6), üheplatvormilisi koonilise kujuga laast- (joon. 3: 1, 2) ja kildnukleusi ning mitmeplatvormilisi kaksikkoonilisi laastkildnukleusi. Neljast tulekivinukleuse katkest pärineb kaks laastnukleusest (joon. 3: 9) ja kaks laastkildnukleusest.

Teisese töötusega esemeid leiti 53, kõik tulekivist (4,5% tulekivileidudest). Suurima rühma moodustavad kõõvitsad – kokku 30 eksemplari (sh. 3 katket; 56,6% teisese töötusega esemetest). Neist 19 on valmistatud killust ja 8 laastu katkest (joon. 3: 5). 12 kõõvitsat on otsteraga, 9 ots-külg teraga, 4 külgteraga ja kolmel on teritatud kõik küljed. Enamikul on tera tehtud järsu retušiga. Lauget retušši esineb vähe. Tulekivinugasid saadi 2 (3,8% tulekiviesemetest, joon. 3: 23). Üks on valmistatud kaheharjalise laastu katkest ja nii, et ühe serva ulatuses esineb lauge retušš. Teine nuga on tehtud killust, sellel on lühike tera ja lauge retušš. Rohkesti esineb veel teisest töötust ka laastudel, laastukatketel ja kildudel, kusjuures mitmeid on arvatavasti kasutatud pistikteradena. Seetõttu võib need liigitada mikroliidideks. Lisaks leiti üks viltuse ja järsult retušitud teraga mikroliid.

Võrdlemisi vähe avastati Kivisaarest raieriistu – kokku vaid kolm lihvitud talva või kirve katket. Selgemate töötlus-, peamiselt lihvimisjälgedega loomaluid on leiumaterjalis kaheksa, sh. üks ahingu või harpuuni katke, millel on sisselõigatud kiskusälg.

Muinasajast pärit savinõukilde leiti 5, millest on täpsemalt määratavad kolm fragmenti: üks orgaanilise lisandiga mõlemalt pinnalt silutud nöörikeramikast, teine orgaanilise massi ja liivaga segatud savist mõlemalt pinnalt silutud nöörikeramikast ja kolmas kivipurraga segatud savist riibitud pinnaga käsikeraamikast.

Kivisaarest leitud lõhestustehnikas tööriistadele ja tootmisjääkidele esineb vasteid Kesk- ja Edela-Eesti mesoliitilises aineses. Tähelepanuväärseks tuleb aga pidada Kivisaare laastude, laastukatkete ja neist tehtud esemete suurt osakaalu (21,5 %). Selline suhtarv on Pulli asula materjali järel kolmas ja ületab 3–12% teiste arheoloogiliselt kaevatud Kesk-Eesti asulakohtade ainek. 2003. aastal Kivisaarest kogutud kiviaines on tüpoloogilise ja tehnoloogilise määrangu järgi pärit mesoliitikumist. Ilma radiosüsiniku dateeringuteta on selle täpsema vanuse kindlakstegemine siiski raske. Kuna Suur-Võrtsjärve taganedes voolas Kivisaare voore juurest läbi Põltsamaa jõgi või selle haru, siis sobis sinne paik elamiseks läbi kogu kiviaja. Samas on Kivisaare leiumaterjalis mitmed tunnused, mis osutavad sealse asustuse algusele juba varamesoliitikumis. Sellisteks tunnusteks on laastude, laastukatkete ja neist valmistatud esemete suur osakaal. Kuigi peetakse võimalikuks, et mainitud esemete erinevused asulakohtade vahel on olnud juhuslikku laadi ja sõltusid tooraine maksimaalse ärakasutamise vajadusest või hoopiski kivimi rohkusest, võib Eesti aineses selgesti näha laasttehnikaga osakaalu vähenemist mesoliitikumi lõpus. Nii on Kivisaare 2003. aasta leiuaines laastude-kildude-laastesemete osakaal võrreldav pigem Kirde-Eestis asuva Kunda Lammasmäe ja Põhja-Lätis paikneva Zvejnieki II asula varamesoliitilise kihiga, kui neist nooremateks peetavate teiste Kesk-Eesti asulate materjaliga. Nii Kunda Lammasmäe kui ka Zvejnieki II asula on alguse saanud juba preboreaalsel kliimaperioodil. Mesoliitikumi varasemale järgule on iseloomulikud ka järsu retušiga pistikterad, samuti 2002. aastal leitud arvatav Pulli tüüpi nooleotsa katke ja kolmnurkne mikroliit.

Käesolevas ülevaates analüüsitakse ka Kivisaare asula 2002. aasta kaevamistelt leitud inimluid. Toona saadi neid nii kaevandi alalt kui ka prooviaukudest. Luuaines koosnes katkendlikest skelettidest. Inimluude leviku järgi (joon. 4) eristus kaevandialal kaks suuremat leiukontsentratsiooni – üks lõuna- ja teine põhjaosas. Üksikuid hajali paiknevaid luid leiti mujaltki. Lõunapoolse ala sees eristus omakorda kaevandi kagunurk ja edelaosas 1965. aasta kaevandialalt välja tulnud u. 2 x 1 m suurune looduslikku moreeni süvendatud lohk on 20. sajandi sissekaeve, kuhu on ümber maetud lõhutud kiviaegsete matuste luud. Kahte rühma saab jagada ka kaevandi põhjaosas avastatud luud: osaliselt välja kaevatud lohust leitud fragmendid ja hajali paiknenud üksikluud. Nimetatud lohk oli korrapäraselt ovaalne ja eristus muust pinnasest tumedama värvusega, mistõttu võis seda interpreteerida lõhutud ja segatud hauapõhjana.

Kuna leitud luustikud ei olnud täielikud, siis eristati üksikindiviide vaid juhul, kui piiratud alalt kogutud luukatkendid ja/või hambamäärangud langesid samasse vanuserühma. Minimaalselt saab 2002. aasta kaevandis eraldada kuue inimese säilmeid. Lähtudes sellest, et luuleidude vahemaad on piisavalt suured, võib aga oletada, et leitud säilmed kuuluvad koguni üheksale inimesele: (1) 2–3 aastane laps kaevandi põhjaosa oletatavas lõhutud haulohus, (2) 7–8 aastane laps kaevandi põhjaosa hajaluude hulgas, (3) üle 30 aastane täiskasvanu kaevandi põhjaosa hajaluude hulgas ja (4) alla 30 aastane täiskasvanu kaevandi põhjaosa oletatavas lõhutud haulohus ning lähiala hajaluude hulgas, (5) naine kaevandi edelaosas paiknenud ümbermatuse lohus, (6) mees kaevandi edelaosas paiknenud ümbermatuse lohus, (7) 5–8 aastane laps 2002. aasta kaevandi keskossa jäänud 1965. aasta kaevandi nurgas, (8) kuni 6 aastane laps kaevandi lõunaosas ja (9) üle 30 aasta vanune täiskasvanu

kaevandi lõunaosast (vt. tab.). Inimluid leiti ka voore lõunaotsale kaevatud neljast prooviaugust. Arvestades prooviaukude kaugust üksteisest (vahemaa u. 10 m või isegi enam) kuuluvad luud tõenäoliselt neljale indiviidile. Kuna maetud on kiviaegsele asulakohale ja ükski matus pole säilinud tervena, osutus matustega kaasnevate panuste kindlakstegemine raskeks. Siiski leiti 2002. aasta kaevandist kokku 5 hammasripatsit, mis on olnud peamisi panuseid ka Kivisaares varem uuritud haudades. Vähemalt ümbermatuse juurest leitud kolm hammasripatsit on arvatavalt panused. Paleozooloog Lembi Lõugase määrangul on kolmest ripatsist üks tehtud koera kihvast, teine metssea lõikehambast ja kolmas hülge kihvast (joon. 5). Olgu mainitud, et üks hülge hambast ripats on leitud Kivisaarest juba varemgi.

Nii nagu asulakohta on raske dateerida ilma radiosüsiniku analüüsi tulemusteta, on ka kalmistu täpsema vanuse määramine komplitseeritud. Võttes arvesse juba varem Kivisaarest väljakaevatud matused tuleb tõdeda, et neis puuduvad nöörkeraamika ja kammkeraamika kultuuride haudadele iseloomulikud esemed. Seetõttu võibki oletada, et Kivisaare matused on vanemad ja võivad kuuluda mesoliitikumi ja/või varaneoliitikumi. Varaneoliitilisele dateeringule osutab Lembi Lõugase arvates Kivisaare koerahammastest ripatsite võrdlus Zvejnieki kiviaegse kalmistu analoogidega.