land, Russia, Belarus, Estonia, Denmark and Sweden.
Participants of the conference were welcomed by Rector of Vilnius University Academician B. Juodkaitis, the opening address was made by Prof. habil. Dr. M. Micheltbertas.

The conference mostly focused on archaeological issues related to western Balts, including Prussians, Gallinarians, Sodavians, Curonians and Latvianis. The reports touched upon issues related to the burial sites as well as burial practices and customs of some Baltic tribes (Dr. A. Birner-Wołtewa, Warsaw, Prof. habil. Dr. W. Nowakowski, Warszawa), separate lands, micro regions and individual monuments (Dr. A. Bliutienė, Vilnius, Mgr. P. Iwanicki, Warszawa, Dr. P. Szymański, Warszawa, Mgr. M. Engel, Warszawa). Other subjects that were discussed also included problems related to the periods of prehistoric periods (Doc. Dr. V. Šimenas, Vilnius), chronology of artefacts (Habil. Dr. V. Kulakow, Moskow, Mgr. A. Juga, Warszawa, J. Ciglis, Riga) and symbolism of some artefacts (Prof. habil. Dr. A. Vasks, Riga). A number of reports were devoted to the relations of the Balts and their neighbours (Prof. habil. Dr. V. Žužkus, Klaipėda), formation of some Baltic and Slavic tribes (Prof habil. Dr. V. Sedov, Moskow), border archaeology of the Baltic and Slavic tribes (Mgr. P. Sikora, Kraków, Doc. Dr. H. Semiančuk, Grodno) as well as the relations of the Balts and the Slavs with Vikings (Dr. W. Duceko, Upošia). The mediæval archaeology of the Balts was not forgotten either, some trade routes and formation of towns (Dr. A. Radas, Riga), cremation practices at late cemeteries (Dr. G. Zabiela, Vilnius), as well as the archaeo-
logiological aspects of the town of Kerna (Dr. G. Vėlius, Vilnius) - were also discussed. One report also dealt with historiographical issues, namely the attempt to publish a

substantial study of Lithuanian archaeology in the middle of the 19th century (Habil. Dr. V. Kazakevičius, Vilnius).
The conference also discussed recent investigations of fossil fields in northwestern Lithuania (Doc. Dr. A. Morkūnas, R. Nemickienė, Vilnius). Prof. Dr. V. Lang, Tartu, presented investigations of such fields in Estonia. Archaeo-
logical problems of the neighbouring countries were touched upon in a number of reports, including issues re-
lated to the Slavic ethnogenesis in the work of Polish
researchers (Prof. habil. Dr. M. Parczewski, Kraków), imports from eastern Europe in the 10th-13th century in Poland (Mgr. M. Wołoszyński, Kraków), transition from the economy of hunters-fishers-gatherers to farming economy in Estonia (Doc. Dr. A. Kriška, Tartu) some burial aspects of the late Iron Age in Estonia (Mgr. M. Koasa, Tamm), defence facilities in Denmark (Prof. K. Brundborg, Copenhagen). Many reports instigated a lot of questions and discussions; researchers from different countries had a possibility to exchange verbal information about the most recent investigations and discoveries. After the conference, the participants had a chance to see a number of archaeological sites in western Lithuania.

The present volume of "Archaeologija Lituana" is devoted to the publication of the conference data. Some of the reports have been expanded and replenished. Unfor-


luckily, some of the speakers failed to forward the texts of their reports. Nevertheless, we hope that this publica-
tion of the conference material will serve as an interesting and valuable contribution both to the Baltic archae-
ology and the archaeology of the broader region of the Baltic area. Let me once again convey sincere thanks to all the participants of the conference.

Mykolas Micheltbertas
Vilnius, May 2003

From hunter-fisher-gatherer to farmer – Changes in the Neolithic economy and settlement on Estonian territory

Alvar Kriška

Publications about the Metal Age often give the impression that it was only then that people awoke from the lethargy of the Stone Age and began to lead an entirely different life, both socially and economically. Looking at the data gathered so far, one can see that some of the important representations of economy, settlement and social date back as far as the Neolithic. It was then that foraging began to lose its importance, and agriculture became the main means of hunter/gathering food. The settlement pattern changed completely, and the coastal areas that until then had been densely inhabited were now left unoccupied. Use of the coast intensified again only in the Middle Ages (1200–1500 AD) or in the Late Iron Age (1000–1200 AD), when coastal villages occupied by Swedish traders arose in northwestern and western Estonia (for example Mandel, 1993, p. 50; Markus, 2002, p. 127–

128). This could hardly have failed to influence the social organisation, religion, ideology and mentality.

In order to understand the process and extent of "neolithisation" on Estonian territory, one must observe the rather long period from the Late Mesolithic (6000–5000 cal BC) to the Early Bronze Age (1800–
1100 cal BC), analysing how people managed their lives, the settlement system, the use of natural and anthropo-
genic/artificial (including especially animals and plants) supplies, possible means of land cultivation, exchange patterns etc. This article is able only to sketch the

outlines of this issue, presenting a vision that is based on one hand on the results of new fieldwork research and analyses, and on the other hand on the changes in theore-
tical understandings that have taken place in Estonian archaeology during the past ten years. This has brought about a need to revise many earlier viewpoints, looking for new interpretations and creating hypotheses that seem more accurate or more explanatory.

The writing of the article has been supported by Estonian Science Foundation grant no. 4558. The author would like to thank palaeontologists Ph.D. Siim Veski and Ph.D. Anna Post for valuable advice and comments, and artist Ene Tapper for the drawings.

ESTABLISHED FORMATIONS SETTLEMENT

By the Late Mesolithic (Fig. 2), a foragers' settlement had been established on Estonian territory. The main fea-
tures of this settlement – the settlement pattern, orienta-
tion towards the foraging economy, use of resources etc. – can be observed (although more eminently) for thousands of years and in some places even in the Late Neolithic. In about 7000 cal BC, a dual settlement pattern, in which inland and coast are distinguished, began to develop. In-
landers lived by the shores of lakes and rivers; coastal people inhabited the seaside or, if possible, nearby river deltas. At that time people often took advantage of the areas of contact of several habitat types (ecological border

1 In Estonia, as in many places in eastern and northern Europe (for example Lithuania, Latvia, Finland and other countries) the transition to the Neolithic is marked by the beginning of agriculture but the introduction of pottery making (on the periods and chronology of Estonian prehistory, see Lang & Kriška, 2001)
2 All dates are presented in the solar calendar. 14C dates are calibrated with the computer program CALIB4.14DATA
OnCal v2.18 ce r4 ud12 protchran
I was probably during seal-hunting trips that the distant western Estonian islands were discovered, and there is reason to believe that permanent habitation already developed on Saarema Island (Fig. 3) during the Late Mesolithic (Kriiska, 2002b). The islands of Hiiumaa and Ruhnu, then only a few square kilometers in size, where traces of Mesolithic settlement have also been found, were suitable only for temporary hunting camps. At that time inhabitation of the coast and islands took place on a very large area around the Baltic Sea, and many Finnish islands like Kemiö (Asplund, 1957, p. 218), Åland (Naníez & Gustavsson, 1995, p. 233) and Vantaa Kíleri and Jorsnas (Purhonen & Ruonavuori, 1994, p. 91) were at least seasonally colonized. Around this time, the coastal settlement of Denmark developed (Andersen, 1993, p. 66-67) and considerably expanded settlement on the coast of southern Sweden (Larsson, 1997, p. 14).

In the Late Mesolithic, the size of the territory occupied by individual communities decreased in Estonia and neighboring countries. One of the reasons for this change was probably the increase in the population. More globally, on the Fennoscandian level, the decrease in the size of the territories in use could be related to the slower formation of new mainland territories (that was probably caused by the retreat of glaciers and rapid compensatory land upheaval), which, while still ongoing, was significantly reduced during the Atlantic period. This led to changes in the settlement pattern (Halinen, 1999, p. 38). Diminished opportunities for hunting and seasonal migrations on various communal territories inevitably caused the need to intensify foraging and make it more complex. The latter in turn increased the role of central habit in the settlement model, and it is likely that during the Late Mesolithic year-round villages began to arise in many places. The intensification of human impact at this time is evident also in the pollen diagrams of Estonian bog and lake sediments (Veski, 1998, Fig. 32, 93; Puska, 2001). Ruined farm areas, larger than before, as well as more sparse woodland and felled areas generated by the gathering of flint, wood and timber developed in the surroundings of year-round villages.
The Late Mesolithic is a time of innovation throughout the Northern Europe. In many places changes in settlement and economy took place, as well as demographic processes that probably affected the entire society. Such development of more sedentary habitation is noticeable in many parts of Europe. This may also explain the appearance of large burial sites – for example Olteni Ostrov in Karelia, Zvenjekhi in Latvia, Skatolahem in Sweden – in Eastern and Northern Europe. The same phenomenon is also observed as the reason for the development of the rock art in the Vingen fjord in western Norway (Lådebø, 2002, p. 198).

During the Neolithic the institution of the Stone Age village reached the peak of their development. At that time settlement sites covered huge areas, had thick cultural layers rich in finds, and their osteological material indicates the best hunting-collaging times for various animals and fish. To these characteristics one could probably also add houses with stronger structure, including large ditches with sunken wells (Kriiska, 2002a). The Stone Age villages in the forest zone were probably never too crowded, and most likely the number of inhabitants there remained below 50 (estimated average 20). Apparently it was the existence of long-term year-round villages and the system of established communal territories that made the spread of agriculture possible.

**THE RISE OF AGRICULTURE**

Although the overall appearance of the settlement did not change, several very important processes took place in the Middle Neolithic. The Typical Comb Ware Culture developed in the Baltic Sea region at about 4000 cal BC. In addition to Estonia, the culture spread in Finland as far as Rovaniemi (Carlsson, 2002, kartu D) and partly even reached northern Sweden in the north (Håkä, 1992), as well as the major part of Karelia in the north-east (Vitenko, 1996). St. Petersburg and Narvored region in the east (Timofeev, 1993, p. 26-30) and Latvian territory in the south (Leev, 1984). In Lithuania individual artifacts characteristic of Comb Ware Culture have been found (Rimantiené, 1996, p. 152–153) and a few fragments of pottery have also been found (Gininkas, 2000a, p. 103), but the latter are still exceptions in the context of another material culture (the Narva Culture), the exceptions that one can see almost everywhere in the contact areas.

This was a time when very broad contacts were reflected in the material culture. While the raw material and some of the readymade items had already moved hundreds of kilometers during the earlier period, even as far as 750 km within the territory of the Kanda Culture in the Early Mesolithic, occupied in the case of the Comb Ware Culture the distances had more than doubled. Flint from the Central Russia, slates from the Omega region and amber from the Eastern Baltic spread throughout the entire territory occupied by the culture.

From Lillberg, a Typical Comb Ware Culture settlement site in Northern Sweden, investigators have found a flint originating from an area 650–1600 km away in Central Russia, reddish-green jasper originating from the Ural region (around 2100 km away) and in an extreme case, from somewhere in Northern Russia, and copper, the chemical structure of which also shows Uralic origin (Häkä, 1996, p. 288–291). A slider runner and two spoons of arrola pine found in Finland also offer evidence of Uralic origin (Edgren, 1984, p. 57). In addition to Lillberg, copper from a specific context of the Comb Ware Culture has also been obtained in Finland, the settlement site of Rääkkylä Vihni (Pesonen, 1998, p. 26).

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3 Only two clear dwelling depressions from the Stone Age have been found in Estonia to date. Both were found at the Rääkkylä 1 settlement site and are connected to the Late Comb Ware Culture. On the basis of the sunken floors, the dwellings occupied an area of 50–60 sq. m (Gurina, 1967, p. 22–23; Kriiska, 2002a, p. 137).

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Table 1. The pollen of cereals dating from before the Corded Ware Culture, in Estonian bog and lake sediments

<table>
<thead>
<tr>
<th>No</th>
<th>Location</th>
<th>Area</th>
<th>Plant</th>
<th>Date (cal BC)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kuupja Aravao Bog</td>
<td>Northeast Estonia</td>
<td>Cerealia*</td>
<td>4300</td>
<td>Poska, 1994</td>
</tr>
<tr>
<td>2</td>
<td>Võsso Bog</td>
<td>Western Estonia</td>
<td>Arvaa</td>
<td>4000</td>
<td>Vestki, 1998</td>
</tr>
<tr>
<td>3</td>
<td>Kõvaesoo Bog</td>
<td>Hiiumaa</td>
<td>Hordeum Arvaa</td>
<td>3900</td>
<td>Köögison et al., 1998</td>
</tr>
<tr>
<td>4</td>
<td>Mustjärv Bog</td>
<td>Western Estonia</td>
<td>Arvaa</td>
<td>3800</td>
<td>Vestki, 1998</td>
</tr>
<tr>
<td>5</td>
<td>Vedrukes Bog</td>
<td>Saaremaa</td>
<td>Arvaa</td>
<td>3700</td>
<td>Poska &amp; Stoor, 2001</td>
</tr>
<tr>
<td>6</td>
<td>Maardu Lake</td>
<td>Northern Estonia</td>
<td>Tritici</td>
<td>3500</td>
<td>Vestki, 1998</td>
</tr>
<tr>
<td>7</td>
<td>Tõbela Lake</td>
<td>southeastern Estonia</td>
<td>Cerealia</td>
<td>3500</td>
<td>Vestki, 1998</td>
</tr>
</tbody>
</table>

* The pollen of other big Cerealia can be identified as Arvaa (Ph.D. Siim Vestki personal comment 13.02.2002).

The Typical Comb Ware Culture that seems uniform as a material heritage still demonstrates distinctive local features. Just as the author believes that there is no reason to think that this culture belonged to one ethnos, there is also no reason to assume uniformity in the socio-economic, legal and political structure of the area. The territory of Estonia differs from other regions in that agriculture was known here even at the beginning of the Typical Corded Ware Culture.

Until the mid 1990s the Typical Comb Ware Culture was considered to have been a purely foraging culture. It is true that the possibility of farming during this period has not been ruled out either (for example Jääma, 1992, p. 46). However, probably to the surprise of many archaeologists, during the past decade the pollen of crops have been found in layers of bogs and in lake sediments, the dating of which correlates with the Middle Neolithic (Veski, 1998; Poska et al., 1999; Poska, 2001).

The pollen of cereals from that period has been collected from a total of seven places in Estonia (Table 1; Fig. 4), and wheat, barley and oats are represented. The latter may have been a weed in barley fields at this time, and not an independent cereal. The existence of many find locations seems to rule out randomness and the possibility that pollen might have been blown onto Estonian territory from somewhere else. The fact that the people of Corded Ware Cultures farmed fields could indirectly be supported by the decrease in tree pollen and the increase in the proportion of herbaceous plants evident in bog and lake sediments (Veski, 1998; Poska, 2001).

It remains unclear how important a role farming played in the economy. During this early period agriculture, next to hunting and fishing, probably remained an exceptional activity that did not cause changes in settlement strategy and material culture. The relatively stable development of combed ware cultures that did not include any great and abrupt changes allows one to assume that the local people learned to use the cereals.

It is remarkable that all of the evidence of early agriculture comes from the coast of mainland Estonia and the islands, which may indirectly point to overseas contacts. The seal-hunting trips and high seas fishing indicated in the archaeological and palaeo-ecological material leave no doubt that the coastal inhabitants of the Stone Age period undertook long fish hunting and fishing trips. On those distant journeys they probably met people from other regions. Established contacts may have developed into long-term communication, trading or, via marriages, even into family relations. As regards the development of farming in neighboring countries, the crops and basics of agricultural activity may have been obtained either from the northern part of Central Europe or southern Scandinavia. Southern influences cannot be ruled out, as a few signs of Middle Neolithic farming have also been identified in western Estonia (Veski et al., 1999, p. 296; Poska, 2001, Fig. 5, Tab. 4). One should also consider the possibility that the differentiation of the coastal areas on the basis of the pollen of crops from the rest of Estonia does not offer a realistic picture of the past, but reveals the shortcomings of research in inland areas.

At present no bones of livestock specifically dating back to the Middle Neolithic have been found on Estonian territory.

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7 Preliminary results of the bog sediments of eastern Estonia do indicate that Cerealia pollen predating the Corded Ware Culture can also be found in that area (PhD Annelli Poska, pers.comm. 13.02.2003).
From hunter-fisher-gatherer to farmer — Changes in the Neolithic economy and settlement on Estonian territory

<table>
<thead>
<tr>
<th>Site</th>
<th>Area</th>
<th>Goat of sheep (regardless)</th>
<th>Domestic Pig (sex distribution)</th>
<th>Cattle (drip harvest)</th>
<th>Pig (sex)</th>
<th>Other (Eurasian)</th>
<th>Perch (Perca fluviatilis)</th>
<th>Carp (Cyprinus)</th>
<th>Other</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sope burial site</td>
<td>Northeast Estonia</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anlu burial site</td>
<td>Northern Estonia</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tika burial site</td>
<td>Saaremaa Island</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kunda burial site</td>
<td>Central Estonia</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ringastar XIV settlement</td>
<td>Northeast Estonia</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Jaanits, 1952

Indeke, 1938

Jaanits, 1952

Jaanits, 1952

Kriiska, 2000

layer of the Tamula I settlement site in southeast Estoni
are also related to the Corded Ware Culture (Pauver, 1965, p. 440; Jaanits, 1992, p. 48). A Corded Ware sherd with burnt barley seed on its surface was obtained from Iru settlement site near Tallinn in northern Estonia (Jaanits, 1992, p. 49).

In several Estonian bogs and lakes there has been found pollen of crops that indicates the cultivation of barley and wheat (Veski, 1998; Posto et al., 1999; Posto, 2001). While earlier tests of agriculture are found mainly on the coast, the pollen of cereals from the Corded Ware Culture period has also been found in eastern Estonia (Pirrus & Röök, 1988) and pollen from the Early Bronze Age in southeastern Estonia (Lauli & Kihnu, 1998, p. 11). The pollen diagrams include oats, but as indicated before, this may have been a weed in the barley fields. The first eye pollen from the bog of Maarua in northern Estonia also dates to about 2000 years cal BC (Ph.D. Siim Veski, pers. comm. 13.02.2002), at which time it was probably a weed of other cereals. The constant representation of cereal pollen in the diagrams offers evidence of intensive farming in the Late Neolithic. The increase in the share of herbarious plants, especially photophilous and typical meadow species, is clearly evident. The amount of particles of tree charcoal is also greater; this may be connected with the fires caused by human activity — the use of fire to clear forest and brushwood for fields and pastures. The natural banks of rivers, lakes, and seashore — periodically flooded pastures and coastal pastures — were used for grazing cattle, but seminatural communities — forest pastures similar to wooded meadows — also developed.

Unlike the field-systems of the Late Bronze Age and later times (for example Lang, 1994; Lang, 2000, p. 221–249; Kriiska, 1998a), the field patches of the Stone Age, from which stones were not gathered, have not left any visible marks on the ground. It is likely that slash-and-burn agriculture was practiced, and the soil was loosened manually without using a plough.

We know very little about cattle breeding during this period. According to the classification of animal bones gathered from Late Neolithic and Early Bronze Age dwellings in Latvia and Lithuania (Ostrowskis, 1998, from Scandinavia to Switzerland, the Czech Republic and the middle reaches of the Dnieper in the Ukraine (see for example Carpelan, 1999, p. 261, fig. 4; Kruk & Milianus, 1999, p. 334). Due to the shortage of radiocarbon dates the beginning of the Corded Ware Culture in Estonia has not yet been precisely determined, but based on the dates in neighboring countries this may have taken place at approximately 3000 years cal BC.

There is already plenty of evidence of an agricultural economy, including pastoralism, during the period of the Corded Ware Culture in Estonia. The bones of domestic animals — sheep, goats, pigs and cattle, and artifacts made from those animals, have been found at burial sites (Table 2). It is possible that the few bones of domestic animals, mostly pigs, collected from the upper part of the cultural

THE LATE NEOLITHIC BREAKTHROUGH

In the Late Neolithic the Corded Ware or Battle Axe Cultures arose across vast areas of Northern, Central and Eastern Europe. These cultures, which share common features (more than 20 in total), are distinguishable from the Volga River in Russia to the Rhein in Germany, and

Fig. 4. Typical and Late Combed Ware culture sites, and places with Mittlere Neolithische Cerealia pollen. Symbols: 1 — settlement site, 2 — 2-5 settlement sites, 3 — burial site, 4 — settlement site and burial site, 5 — a bog or a lake where Cerealia pollen from the Middle Neolithic has been collected, 6 — pottery find, 7 — present sea border, 8 — the area inundated by the Litoranea Sea in the Middle Neolithic.

4 par. Tipusis ir visosios šiaurės keramikos šaltinio pamininkai bei viduriniojo neolio Cerealia radiniovieta. Sutartiniai ženkla: 1 — pamininkas, 2 — 2-5 pamininkai, 3 — laidojimo pamininkas, 4 — gyvenvičių ir laidojimo pamininkas, 5 — pelkė ar ezeras, kur buvo surinktos Cerealia žiedainelės ir viduriniojo neolito, 6 — keramikos radiniai, 7 — dabaristų jūros riba, 8 — plotas, kuri viduriniojojo neolito buvo apsėmusi Litoraneos jūra.
p. 271), one could assume that foraging may have formed an even more prominent part of food supplies. But the importance of pastoralism must have proceeded at an increasing pace, since by the time of the Late Bronze Age (1100–500 cal BC) the meat of cattle and goats/sheep made up a considerable part of food consumption on Estonian territory (65.7% among the animal bones of Aara fortified settlement and 78.1% among the mammal bones of Ridelu fortified settlement; the basis of the calculations: Paaver, 1965 appendix II; Lõugas, 1994, p. 74).

During the Late Neolithic and the Early Bronze Age, domestic animals were probably kept through the winter in open paddocks – enclosed pastures. For the hunter, however, extra fodder was apparently needed. During the early phase of pastoralism, made it is very difficult to date the beginning of haymaking with any great precision, but cutting tools suitable for this work were only introduced in the Pre-Roman Iron Age (50 cal BC–50 cal AD) (Laul & Tõnison, 1991, p. 70). In historic times, twigs from aspen, birch, rowan, ash and other trees have been used as animal fodder (Kuik & Koll, 1997, p. 34-35). Dried sheaves helped animals to survive even winters with abundant snowfall. Pastures and fields were initially situated in the vicinity of dwellings, but one should not rule out the exploitation of slopes close to the coast for agricultural purposes.

Several artifacts and a few animal bones obtained from the dwelling sites indicate that the people went on hunting and fishing trips. The charred bones of bird and fish have been found at the Riiukiela XIV settlement site (Kriiska, 2000, p. 74), and spearheads made of bone appear among the goods in a few graves (Jaanits, 1985, p. 26, fig. 5). Agriculture, however, was so important that it changed the entire settlement pattern.

In Estonia, more than 50 Corded Ware Culture sites are known (Fig. 5). These are unfortunately found by chance in the course of excavating other sites (Kriiska, 2000, p. 70). Only in a few places have the traces of settlement left by the culture not become mixed with finds from other periods or destroyed during later farming. Usually the cultural layer of the Corded Ware Culture sites is rather weak, as a result of which few finds are collected during excavations – from a handful to a couple of thousand pottery sherds, some stone tools and debris from processing flint and quartz.

The Corded Ware Culture people based their choice of settlement location on entirely different principles than used in previous times. Living in the close vicinity of large bodies of water was no longer important. Several coastal and island areas known from earlier times but by then already far from the seashore were now re-inhabited (see for example Kriiska, 1998b, p. 18; Kriiska, 2000, p. 72). In Kõpu (site 1) on the island of Hiiumaa, the settlement site of the Corded Ware Culture period was located about 1 km, in Võhma (site 1), northwest Saaremaa, about 1.5 km (Fig. 6) and the XIV site in Riiukiela, in northeast Estonia, on the lower reaches of the Narva River, was situated about 1.5 km from the seashore. A similar change seems to have taken place on the banks of Lake Võrtsjärv in central Estonia.

It is obvious that the resources used are directly connected to the natural habitat of the Stone Age people. Thus one can assume that the choice of settlement location reflects their economic strategy, and the type of ancient landscape helps to determine the nutritional base. This position of dwelling sites was probably conditioned by the needs of agricultural activity, since the places included both good natural pastures for breeding cattle and suitable soil for farming. In northern Estonia people preferred to live on the lowlands near the Geln (Lang, 1996, fig. 101, 120; Lang & Konsa, 1998; Lang, 2000, p. 77, 79), where they found easily cultivated alvar soils rich in humus. In southwest and eastern Estonia the settlement of the Corded Ware Culture seems to have remained connected to the banks of rivers (Kriiska, 2000; Kriiska & Saluäär, 2000), but these places are also the best farming areas of otherwise boggy land. At a time when almost all of Estonian territory was covered with forests and bogs, the floodplain meadows were the only open areas with rich flora, and the periodically flooded parcels of land were also suitable for farming (Jürvedik, 2000, p. 56). For example, due to the boggy and moist soil the agricultural lands in southwest Estonia were even during historic time situated as narrow strips on the banks of the Parnu River where the runoff was better (Must, 1977, p. 66).

An analogous shift in the settlement pattern in connection with the development of agriculture can be observed in many parts of Europe, but also in the Corded Ware Culture in Finland (for example Pohjakaarlo, 1994, p. 65), although such ancient remains of farming activity have not been found there.

The small settlements and burial sites of the Corded Ware Culture, where usually one or two, and less fre-
Fig. 7. Vihusoo-Palme area in the Late Neolithic and Early Bronze Age and areas supposedly used, on the basis of Thieszen Polygons (for the basis, see Lang 2000, Fig. 7). Symbols: 1 - settlement site, 2 - boat area, 3 - late stone axe, 4 - several stone artifacts, 5 - the border of the supposedly used territory, 6 - the basis of Thieszen Polygons, 6 - wet area, 7 - high glint, 8 - low glint.

Fig. 8. The Stone Age sites in southwestern Estonia and the territories presumably used by the communities. Symbols: 1 - stone antrices (stray finds), 2 - late stone antrices (stray finds), 3 - Neolithic settlement site, 4 - coastal settlement site, 5 - Neolithic settlement site, 6 - Height, 7 - the supposed used area of the communities (inner circle 10 km in diameter, larger circle 15 km in diameter).

The spread of stone axes from the end of the Stone Age and the Bronze Age (1800-300 cal BC) indicates that it was during this time that a considerable intensification of settlement took place on the territory of Estonia. The signs of agriculture at this time are revealed in the sediments of many bogs and lakes (Neski, 1998; Poins). While the settlement of the Corded Ware Culture has a certain degree already covered areas on the margins of the heights, finds from the Bronze Age - mostly so-called late stone axes with a shaft-hole - from several places in the Vooremaa, Sakala, Pandivere, Karula, from hunter-fisher-gatherer to farmer - Changes in the Neolithic economy and settlement on Estonian territory

Hejna and Otepää Heights indicate that in these areas the agricultural economy was also developing, and fougher soils were cultivated (Fig. 9). The pollen of barley and oats, dated to about 1700 years cal BC has re-appeared in the sediments of Hino Lake on the southeastern slope of Hejna Heights (Lau & Kihno, 1999a, p. 246). The amount of pollen of typical meadow plants becomes constant in the diagrams since the Early Bronze Age. The increase in human impact, which actually already begins from the end of the Stone Age, is evident also in the sediments of Lake Muistjärv, the small lake adjacent to Hino Lake, although the crops appear in the Late Bronze Age layer (Lau & Kihno, 1999b, p. 9). From the end of the Early Bronze Age pollen from crops has also been obtained from Lake Alu-Pika in Otepää Heights (Kihno & Vuk, 1999, p. 233-234). Slash-and-burn agri-
land and sea mammals, fishing on the high seas and inland bodies of water. We are barely dealing with the alleviation of food shortage through a new product. We should instead look elsewhere for the reasons for the rise of farming, and the security gained by sedentary broad-based foraging as a specific basis and "guarantee" that made the beginning of cultivation possible.

The initially marginal "side interest" of the foraging communities of the Tectical Combed Ware Culture (living on the coast and islands) developed into an important means of livelihood in the Corded Ware Culture during the Late Neolithic. From this period there is already abundant direct as well as indirect proof of fishing and also the bones of cattle. The role of agriculture must have been so strong that it brought about the transition to a different settlement strategy and the splitting of the Stone Age village into smaller settlement units – farmsteads. The latter is typical to most of Estonian territory practically throughout the first half of the Iron Age (Lang, 2002, p. 13). If and to what extent it was caused or at least supported by migration – new people who acquired farming skills somewhere else moving to Estonian territory – is not explicitly clear. Previously rather generally emphasized "mass" migration (for example Moora, 1956, p. 55; Jaanits et al., 1982, p. 102) has been justifiably called into question (in Estonia for example Lang, 1998), and at the same time there is no reason to rule out the addition of smaller groups of people, for instance a few families.

Unlike in the past, the people of the Corded Ware Culture on the coast established their dwelling sites far from the immediate shoreline, and in the inland different places were inhabited, although the disappearance of water-related settlement is evident there also. Analogous to the Scandinavian Pit Ware Culture (for example Burenhult, 1999, p. 317-348) another – the Late Combed Ware Culture – persisted alongside the Corded Ware Culture on Estonian territory. The members of the former lived on the banks of bodies of water and collected their main food supplies from foraging. On the basis of this close Scandinavian parallel (Ahlfeldt et al., 1995, p. 64, 56), it is also possible that in addition to hunting and fishing, pigs were grown on the Estonian islands13. This dual cultural and economic picture can be observed until the end of the Stone Age. The youngest dates of the Late Combed Ware Culture belong to the period 2000–1900 BC (Lang & Kiirika, 2001, p. 92, Fig. 1).

At the end of the Stone Age and the beginning of the Bronze Age, strong winds and pollens indicate the expansion of agricultural settlement, also comprising the areas of the heights that in previous investigations were considered to be inhabited only around the middle of the I millennium AD (Moora, 1966, p. 129–138), leaving untouched only the highest central areas. Based on the existing material, it is impossible to say whether and to what extent the Combed Ware Culture and "almost pure" foraging continued, but by the next period, i.e. the Late Bronze Age, for which the data is sufficiently representative, cultural as well as economic differences had disappeared.

REFERENCES


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13 In the osteological material of the Loona Late Combed Ware Culture settlement site in Saaremaa (radio-carbon dates on average between 2850 and 2600 BC – preliminary data Lõugas et al., 1996, p. 405), the bones of 30 pigs have been separated, and these have been interpreted as belonging to young individuals in the process of being domesticated (Paafer, 1965, p. 440; Jaanits, 1992, p. 50).


The symbolism of stone work-axes (based on material from the Daugava Basin)

Andrius Vasks

The simple stone axes called ‘work-axes’ represent one of the most characteristic artefact categories of the Early Metal Period. These have been found in settlement site excavations and occasionally at burial sites, but the great majority are stray finds. Although the number of finds of simple stone axes from the territory of Latvia is considerable, so far they have not been treated in detail. The most extensive description was published by J. Graudonis in 1967 (1967, c. 82–84).

My interest in stone work-axes was aroused in the course of research on the settlement pattern of the Daugava Basin and changes in this settlement pattern in the Bronze and Early Iron Age.

Of all stray finds of stone artefacts, which include maceheads, mace-heads, celts and grindstones, shaft-hole axes form the most numerous group. A proportion of these axes can be classified as battle-axes. These are generally from 11–12 to 17–18 cm in length. On the whole, the battle-axes are very carefully made and symmetric, which gives some foundation for the view that their significance was more symbolic than practical (Loze, 1996, 34). Battle-axes are characteristic of the Late Neolithic, but derived forms, i.e. axes that have lost some of the features mentioned, may be dated to the Early Bronze Age.

It is quite difficult to determine the number of battle-axes found in Latvia, because a strict boundary cannot be drawn between axes showing all of the characteristic features and those axes that have largely lost these features. If only the former are included, i.e. so-called early battle-axes, the number is reckoned as 20–30 (Loze, 1996, p. 34).

The chapter in the book Archaeology of the Latvian SSR on the Late Neolithic gives a figure of 120, evidently including late battle-axe forms (LA, 1974, p. 48). In the Daugava Basin around 30 such axes might be added.

Whatever the number of axes included as battle-axes, depending on the various features considered, it is considerably smaller than the number of simple stone axes. These are smaller than the battle-axes: about 70% are 6–12 cm in length. The simple axes tend to lack a carefully formed body – they are often asymmetric and less carefully made. The simplicity of the form and the markedly broadened blade permits them to be regarded as tools, and in consequence they are referred to as work-axes (LA, p. 81).

In terms of find circumstances, work-axes may be divided into two groups. The first includes axes found at Early Metal Period living sites – hillforts and open settlements. Hillforts have been more extensively excavated than open settlements, and the number of work-axes found at hillforts is accordingly greater. Thus, Doles Kivuctals hillfort produced 98 whole and fragmentary axes (Fig. 1:1–4), 30 were found at Kokneses Mūkūnais, 26 at Iedaņu Brikulj, 11 at Lievārdes Dzivukals and four at katlabā Kaļķuļģels. Single stone axes and axe fragments have also been found at several other excavated hillforts where habitation began in the Early Metal Period (Daugava, Aste, Madalini and others). There are also isolated finds of axes and axe fragments from open settlements such as Kerkūzi, Vīlāni I, Plāteri etc. (Bucks, 1991, p. 130–174). It should be emphasised that settlement sites produce mainly fragments of broken axes, intact examples being rare. On the other hand, grave inventories from the Early Metal Period are very poor and often entirely absent. Out of about 30 excavated Early Metal Period cemeteries in Latvia, only Salaspils Reizma has produced two stone axes: one of these is a rare form – a double-bladed axe, the other being a work-axe (Graudonis, 1961, p. 35, tab. I: 10, 24). Altogether, excavation of settlement sites in the Daugava Basin has produced about 200 work-axes, mainly in a broken state.

Stray finds of work-axes represent a second group. Most commonly they are found in fields in the course of ploughing or harvesting, less commonly during other digging work – while digging ditches, potato pits, foundations etc. Recovered by non-specialists, these axes usually are not accompanied by a detailed account of the find circumstances. For most of the finds of stone axes that reach museums we know only the name of

1 Daugelis tyrinėtojų aspigudina rytinio Baltijos regiono perėjimą prie žemės ūkio ir kai ką procesų: įvairižiū, pastaraisiais metais Lang, 1999a, 1999b; Girininkas, 2000a; Antanaitis et al., 2000.

2 Osteologinių metodų iš Loona vėlyvomsios žodynu. Kauno mokslų akad. teis. 1964, p. 138–139. 3 Dėl mūsų tyrimų metu nustatytų, kad įvairiu kariaus žodynu nustatytų, kad įvairiu kariaus žodynu


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