

HOES AND THE FIRST FARMERS ON LITHUANIAN TERRITORY: FROM HOE TO ARD

ALGIRDAS GIRININKAS

Abstract

A hoe is a hand tool which appeared in Lithuania in post-glacial times together with the first population. Later, in the Mesolithic, the hoe became a universal tool used for versatile foraging purposes. Only antler hoes are known from these periods. The same function of hoes continued into the Neolithic/Bronze Age, with the only difference that their shapes changed, adapting to new work related to the cultivation of the first crops. In the Neolithic, stone and wooden hoes appeared along with antler hoes. In the Bronze Age, the function of hoes remained the same as in earlier times, but their wider use was related to hoe-farming. The shape of hoes was changing, especially of snake-head hoes, which could be used for various ritual ceremonies. Only in the Middle to Late Bronze Age did the Neolithisation process come to an end, with the development of slash-and-burn agriculture and the domestication of animals. The first horn ards appeared in the Late Bronze Age.

Key words: hoes, boot-tree hoe, snake-headed hoe, ard points, agriculture, Lithuania.

DOI: <http://dx.doi.org/10.15181/ab.v26i0.2023>

Introduction

There are no research articles devoted to hoes as working tools in the east Baltic region. The present article is an attempt to demonstrate the diversity of appearance and function of the hoe in the Late Palaeolithic/Bronze Age. Hoes are mainly associated with agricultural tools. Yet even in the Neolithic and Bronze Age, hoes were used not only for agricultural purposes. They were universal tools, with different functions. Hoes can be associated with agriculture only from the Middle Bronze Age, when in the territories of Lithuania, Latvia and the former Prussia, very fine hoes appeared with cut surfaces, probably used for hoe-farming rituals rather than direct agricultural work. There are different opinions as to the function and chronology of these 'snake-head' and 'boot-tree' hoes.

Written data about boot-tree and snake-head hoes from the Bronze Age is known from the middle of the 19th century (Vasiliauskas 2015, 110-111, Fig. 6). Stone boot-tree and snake-head hoes found in Lithuania (Tarasenska 1928; Puzinas 1983, 55), former Prussia and Germany (Åberg 1918, 112; Gaerte 1923, 140; Gaerte 1933, 241-254; Engel 1935, 153; Ebert 1926, 301; Kilian 1939, 107-114) Poland (Kostrzewski 1931, 297-302), Latvia (Šturms 1936, Tab. VI.:3-4) and Estonia (Tallgren 1922, 65) were described by archaeologists in the first half of the 20th century. At that time, 14 snake-head hoes, called 'Lithuanian hoes, from East Prussia', three from Latvia, and two from Lithuania, were known. Two snake-head hoes from Dzērva (Liepāja district, Latvia) and Jēkabpils (Latvia) were exhibited in an archaeological exhibition at

a conference of Baltic archaeologists and published in the conference catalogue (Catalogue 1930, 26, Taf 5: 8, 11). Later, in the middle and the second half of the 20th century, archaeologists who wrote about stone hoes from the Bronze Age, mainly L. Kilian (1939, 107-114; 1955, 179), P. Tarasenska (1928), P. Kulikauskas, R. Kulikauskienė, A. Tautavičius (Kulikauskas et al. 1961, 105), O. Bagušienė and R. Rimantienė (Bagušienė, Rimantienė 1974, 84-105), presented data from the German archaeologists and J. Puzinas about the spread, typology, origin and evolution of stone hoes, and mapped them. M. Gimbutienė, like other authors mentioned, repeated the opinion of German researchers from the first half of the 20th century that snake-head hoes were widespread in the Baltic region in the Bronze Age. Over 100 items of such hoes from the southeast and east Baltic region were known (Gimbutas 1965, 406). Some time later, Latvian archaeologists indicated that about ten snake-head hoes were known in their territory (Apals et al. 1974:81). Isolated boot-tree hoes have been found in Papyvesiai (Pasvalys district) (Fig. 4), Rūgiai, Klepai, Gaisriai and Veršiai (Šakiai district) (Juodagalvis 2012, Figs. 5, 8).

The German archaeologist W. Gaerte (1923, 140-243) and the Polish archaeologist J. Kostrzewski (1931, 297-302) were the first to conduct typological analyses of hoes.

The only typology of stone hoes from Lithuania was suggested in 1974 by O. Bagušienė and R. Rimantienė (Bagušienė, Rimantienė 1974, 101-103). According to their typological scheme, stone hoes in five forms were distinguished: irregular and oval, tetragonal, trap-



Fig. 1. Lyngby type artefacts: 1 Šnaukštai (Klaipėda district); 2 Parupė (Biržai district); 3 Kalniškiai (Jurbarkas district).

ezoid, rounded and snake-head, and boot-tree. Along with the typology, the authors attempted to determine the time when these hoes were in use. In later studies, R. Rimantienė (2005, 195) ascribed these hoes to Baltic Coastal culture.

The diversity of hoes in the Stone Age and the Bronze Age

Late Palaeolithic hoes

The hoe is an ancient working tool, which is primarily associated with agriculture and its development. Yet hoes made from bones, antlers, wood and various stones were also used by Palaeolithic, Mesolithic, Neolithic and Bronze Age populations for purposes other than agriculture. Soil had to be dug not only to grow crops. Hoes were used for harvesting edible roots, looking for stones as raw material, including assemblages of flint, building constructions and fireplaces, and digging pits, etc.

In 2014 and 2015, three Middle/Late Palaeolithic artefacts of Lyngby type, an axe and hammer hoes made from reindeer antler (*Rangifer tarandus*), were found in Lithuania (Girininkas et al. 2017, 4–23) (Fig. 1). Artefacts of Lyngby type are distinguished by the blades in the form of an axe, hoe or hammer (Clark 1936, 80, Fig. 127). One of the finds, an axe, was discovered at a depth of 1.5 metres during trench digging seven metres from the left bank of the River Nemunėlis, and about 300 metres from the confluence of the Nemunėlis

and the Apaščia in the village of Parupė (a suburb of Nemunėlis-Radviliškis, in the Biržai district). Second hoe of Lyngby type was found in a gravel pit in the suburb of Kalnėnai west of Jurbarkas. A third was found in a gravel pit near the village of Šnaukštai (Klaipėda district), on the left bank of the River Agluona.

All these artefacts are dated to the Palaeolithic (Girininkas et al. 2017, 7). Similar antler hoes of Lyngby type are known from Maurušaičiai (formerly Grenzfelde and Pillkallen) in the Kaliningrad Region (Šturms 1970), Latvia (Zagorska 2012, 14), and the northern part of western Europe (Girininkas et al. 2016, 13–30; Girininkas et al. 2017, 18). These artefacts made from reindeer antler were used either as axes or as hoes, depending on the angle of the blades.

Mesolithic hoes

In the Mesolithic, the natural environment (an increase of forested areas) and the fauna changed. In the Late Mesolithic, the red deer (*Cervus elaphus*) populations expanded markedly. Their antlers were used for manufacturing various work tools, including hoes. One hoe from the River Smeltė in Klaipėda is dated to 6920±40 BP (5840–5750 cal BC) (Poz-61594). Some authors classify it as an axe (Piličiauskas et al. 2015, 18). A hoe made from antler with a hole for a handle was found in the same site (Fig. 2). As the majority of hoes have not been dated, we can assume that some of them belonged to the Neolithic Age. In the Mesolithic, antler sockets for either axe or hoe were used (for example, Panevėžys). One such socket was uncovered in the vil-

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Fig. 2. A Mesolithic antler hoe from the mouth of the River Smeltė (Klaipėda).

lage of Visėtiškiai (in the Anykšėiai district), near the River Jara (Girininkas 2009, 79). Hoes/axes (including T-shaped antler axes) made from red deer antler have been found in Dovydiškiai (Ukmergė district), Turniškė (Vilnius), Kudirkos Naumiestis (Šakiai district), and Ražiškiai (Kaunas district), etc. Clipped antler rosettes served as heads, and holes for handles were either cut out or drilled. The blade was formed by cutting the antler section obliquely above the rosette. Similar hoes/axes are known not only from the east Baltic region, but also from Western Europe (Elliott 2012; 2015, 222–244).

Neolithic hoes

In the Neolithic, the use of hoes became noticeably wider. It is not clear whether this was associated with cultivating soil for crops. This period abounds in stone and antler hoes of different types. Neolithic stone hoes have one common feature: one of the sides is almost flat, the other side stands out, like a slightly irregular bow (Fig. 3:3). From the Middle Neolithic, holes for handles were drilled in the widest part of round hoes. Some oval hoes were found with stoneware of Narva culture in the Kretuonas 1B and Lake Žeimenis 1 settlements (Švenėionys district) (Fig. 3:1-2). One such hoe was found in the village of Laumėnai (Kaunas district). And one more was found in the village of Rudnia (Varėna district). Holes were often drilled on both sides of hoes (Girininkas 2009, 157, Fig. 117; Engel 1935, Taf. 28a). Hafted antler hoes were similar. They were mainly polished only in the blade area, and had no holes for handles. Antler handles with a sheath were

adapted to such hoes. For a long time, it has been accepted that holes for handles in stone axes and hoes appeared under the influence of the axes of Corded Ware culture (Rimantienė 1962, 234; Baguėienė, Rimantienė 1974, 101). Yet, as is mentioned above, stone hoes with a hole for a handle appeared in the Middle Neolithic (Girininkas 1990, 44, Fig. 46). In the Late Neolithic, the hole for a handle in stone axes of Corded Ware culture was drilled in the wider part of the head (Girininkas 1990, 69; Rimantienė 2005, 238; Baguėienė, Rimantienė 1974, 91–97). Stone axes ascribed to Late Narva culture also had holes for handles in the widest part of the head (Girininkas 1990, 69). But stone hoes and axes ascribed to Late Neolithic Narva culture communities were mainly hafted. Round hafted hoes found in the environs of Rumėiškė (Kaiėiadorys district), Samantonys (Ukmergė district), Eiguliai and Zapyėkis (Kaunas district) are examples of this type (Fig. 4). Late Neolithic communities used hoes with a polished surface and a hole for a handle (Girininkas 2009, 157, Fig. 117), and hafted hoes with an unpolished surface. So far, no chronological differences between Neolithic stone hoes with holes for handles and hafted hoes have been determined. Antler hoes known in Lithuania from the environs of Birėzai (Fig. 5), the Curonian Spit, Paėventupys (Prienai district), Samantonys (Ukmergė district) and Turlojiėkė (Marijampolė district) also have holes for handles.

Wooden Neolithic hoes known from the Šventoji 6 settlement have not been subjected to radiocarbon dating. They are made from the inner part of a tree trunk. A projecting branch of these hoes served as a handle

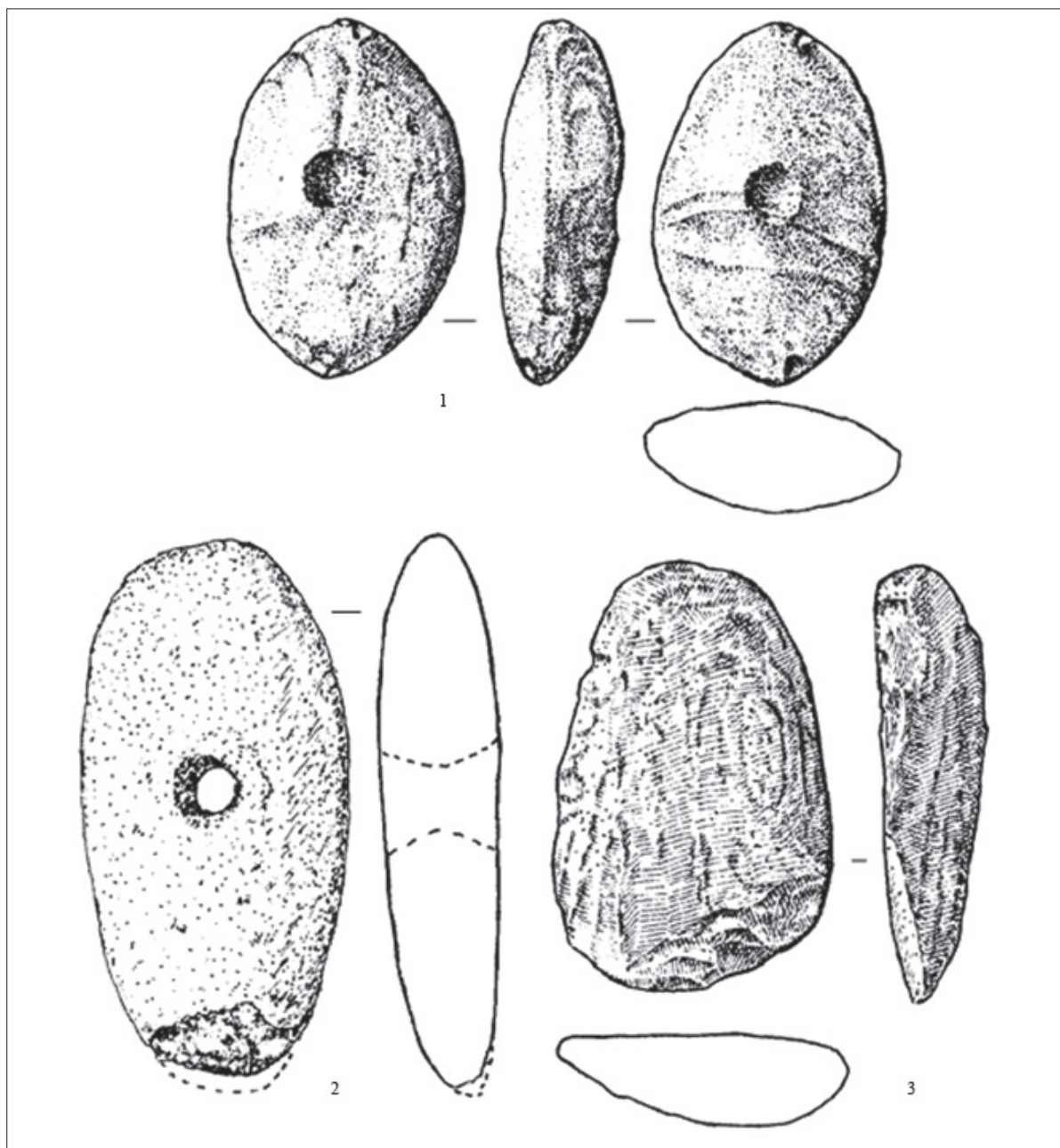


Fig. 3. Middle Neolithic stone hoes: 1, 3 Lake Žeimėnis settlement 1; 2 Kretuonas settlement 1B.

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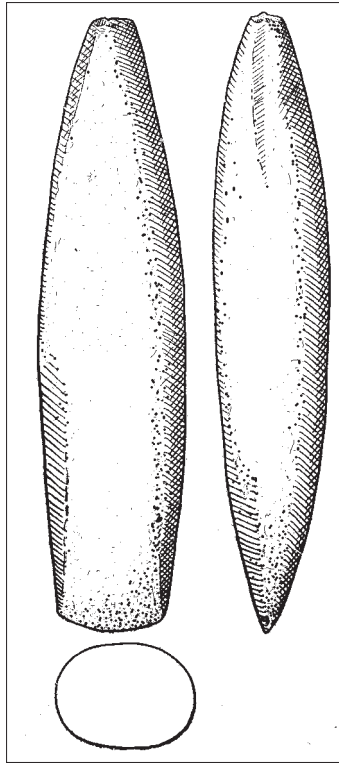


Fig. 4. A Mesolithic round hoe from Zapyškis (Kaunas district).



Fig. 5. A Neolithic antler hoe from the environs of Biržai.

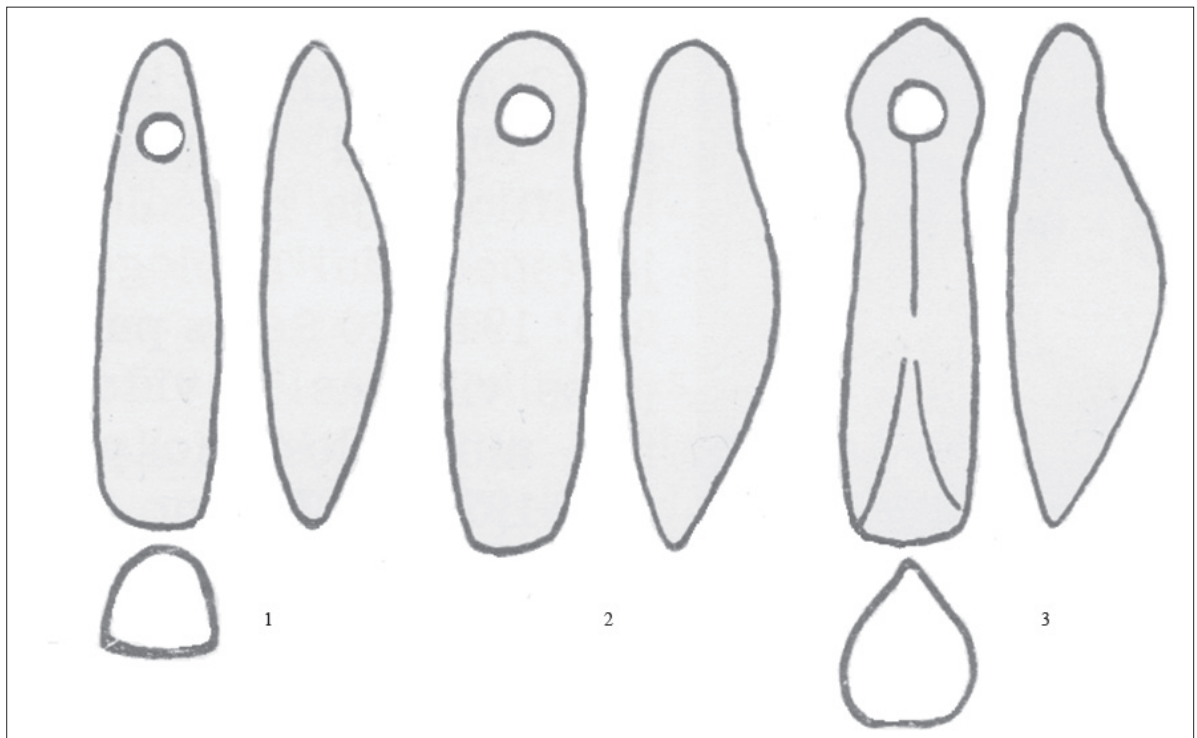


Fig. 6. The evolution of boot-tree and snake-head hoes in the Middle Bronze Age: 1 a boot-tree hoe; 2 a hoe of transitional type; 3 a snake-head hoe.

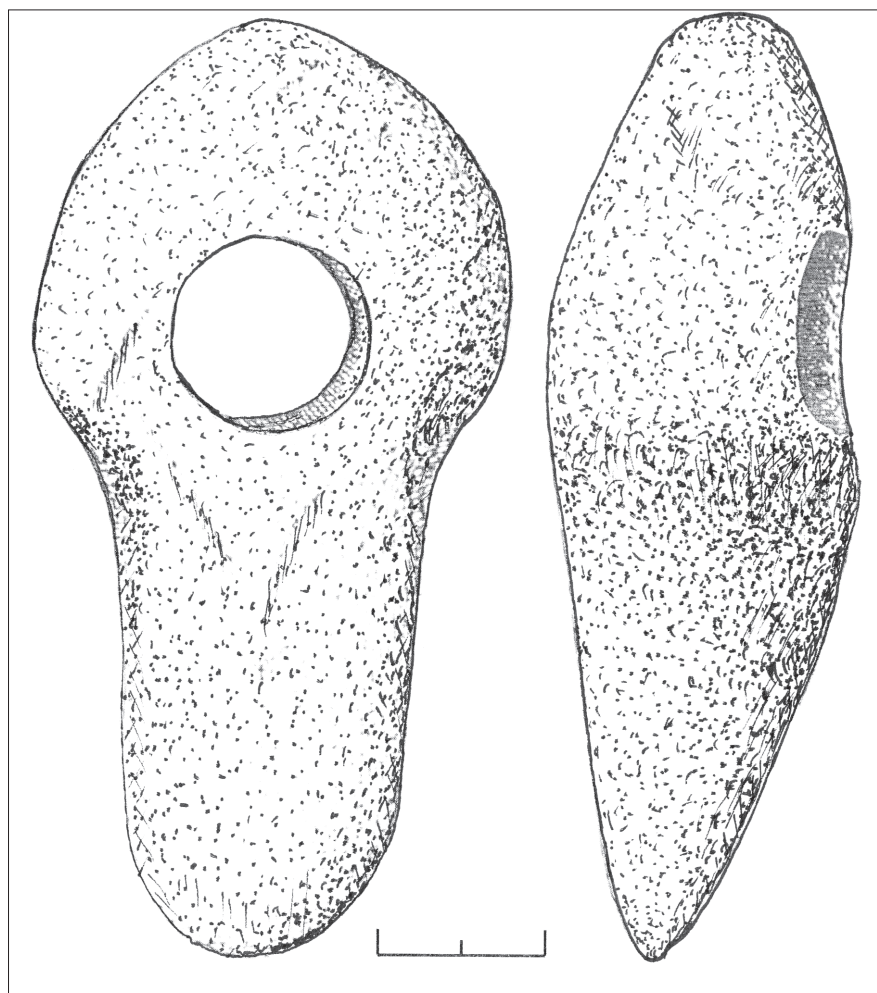


Fig. 7. A Middle Bronze Age stone snake-head hoe from Kaišiadorys.

(Rimantienė 2005, 395). Similar hoes dated to the Late Neolithic were found in the settlement of Sarnate (Latvia) (Vankina 1970, 48, Fig. 75; Bērziņš 2008).

R. Rimantienė points out that wooden hand ploughs were found in the Late Neolithic settlement of Šventoji 6, and a wooden model of oxbow and an ard yoke were found in the Late Neolithic Šventoji 2/4A settlement (Rimantienė 2005, 290). But the dating of the ard yoke showed that it belonged to Roman times (Mažeika, Petrošius, 1998, 481). Therefore, we can hardly speak about arable farming in the Neolithic.

Bronze Age hoes

As is proven by the abundant Lithuanian archaeological material, Bronze Age stone hoes adopted their form and handle fixing from the stone and antler hoe manufacturing techniques used by Neolithic communities: the formation of a small hump, the polishing of the surface, the choice of place for the hole for a handle.

In the Bronze Age, as in the Late Neolithic, stone hoes with polished and unpolished surfaces were used. The

hafted hoes with an unpolished surface used in the Neolithic persisted until the appearance of the first hill-forts, i.e. the Late Bronze Age (Girininkas 2013, 177). In the Late Bronze Age, they were used along with antler ploughshares found in early hill-forts (Girininkas 2013, 178). The only difference is that hoes in new forms appeared: boot-tree and snake-head hoes. Boot-tree and snake-head hoes are comparable. But a comparison clearly shows that they belong to two types (Fig. 6). The blade of boot-tree hoes is usually tapered, with the side basils growing larger towards the hole, and the crest is sharper. Snake-head hoes have a wider head around the hole, parallel side basils, and their blade width is the same as that of the hoe's body (Fig. 7).

The topography of the occurrence of boot-tree and snake-head hoes shows that they are most widespread in the western part of Lithuania, and least widespread in eastern Lithuania (Fig. 8). In northern Lithuania, they are known from Trumpaičiai (Joniškis district), and the northern parts of the Šiauliai, Radviliškis and Panevėžys districts. In 2018, they were found in the

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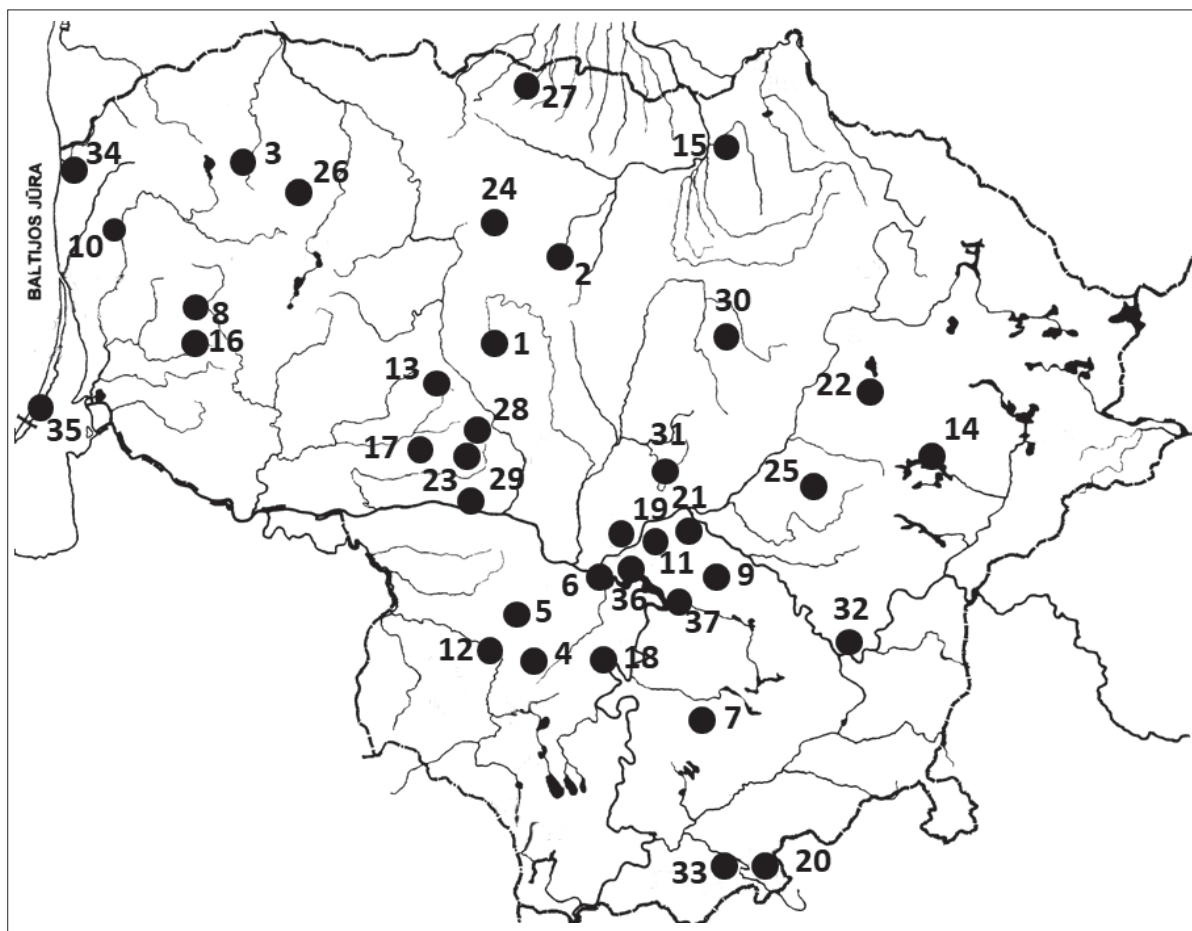


Fig. 8. The distribution of boot-tree and snake-head hoes in Lithuania. Middle Bronze Age: 1 Akstinai, Pagojokai area, Raseiniai district; 2 Baisiogala, Radviliškis district; 3 Brizgai, Telšiai district; 4 Baraginė, Trakiškės area, Marijampolė district; 5 Gaisriai, Kazlų Rūda municipality; 6 Garliava, Kaunas district; 7 Genionys, Pavarenis area, Varėna district; 8 Kalnalis, Švėkšna area, Šilutė district; 9 Kaišiadorys district (two items); 10 Kartena, Kretinga district; 11 Petrašiūnai (Kaunas); 12 Marijampolė (three items); 13 Kalnūjai, Raseiniai district; 14 Mateliai, Inturkė area, Molėtai district; 15 Papyvesiai, Pasvalys district; 16 Pavilnutis, Švėkšna area, Šilutė district; 17 Pocaičiai, Gabšiškės area, Jurbarkas district; 18 Prienai; 19 Radikiai, Ražiai area, Kaunas district (three items); 20 Prauda, Kaniava area, Varėna district; 21 Skaruliai, Dumsiai area, Jonava district; 22 Sudeikiai, Utena district; 23 Rupeikiai, Stakiai area, Jurbarkas district; 24 Šiauliai; 25 Špokiškis, Gelvonai area, Širvintos district; 26 Telšiai (two items; one is held in Jelgava in Latvia); 27 Trumpaičiai, Skai-stgirys area, Joniškis district; 28 Trakiniai, Kalujai area, Raseiniai district; 29 Veliuona, Jurbarkas district; 30 Vadokliai, Panevėžys district; 31 Vanagiškiai, Kulva area, Jonava district; 32 Vilnius, Karoliniškės area; 33 Zervynos, Marcinko-nys area, Varėna district (held in Gardinas in Belarus); 34 Būtingė (Palanga); 35 Nida; 36 Eiguliai (Kaunas district); 37 Rumšiškės (Kaišiadorys district).

village of Papyvesai (Pasvalys district) near the confluence of the rivers Mūša and Pyvesa (Fig. 9).

Along with snake-head and boot-tree hoes, Late Bronze Age communities used antler ploughshares. One was recovered at the Narkūnai hill-fort (Kulikauskienė 1986, 24, Fig. 22). Similar ploughshares from the same period were found in the Asva (Estonia) (Lang 2007, Fig. 48:4; Sperling 2014, 324-327) and Kivutkalns (Graudonis 2001, 128, Fig. 90) hill-forts. Moreover, plough marks left by a ploughshare were found in Latvian archaeological sites (Graudonis 2001, 128). This suggests that arable farming in Lithuania and the eastern parts of the Baltic region could have appeared only in the Late Bronze Age. Arable farming in Western

Europe is also known from the middle of the first millennium BC. Døstrup, Donnerupland and other known ploughshares are dated to this time (Glob, 1951). The theory that arable farming appeared in Lithuania in the Late Neolithic (Rimantienė 2005, 137-143) should be radically revised.

Boot-tree and snake-head hoes and their use patterns

Snake-head hoes acquired their name due to the resemblance of the head to a snake's head. There are two types of snake-head hoe. The head of the first type does not yet resemble a snake's head. The hole for the han-



Fig. 9. A Middle Bronze Age stone boot-tree hoe from Papyvesiai (Pasvalys district).

dle is drilled near the head. The front of this type of hoe is strictly convex, whereas the rear is flat or slightly convex. The head of hoes of the second type has wider sides, and is wasted below the hole. The form of the back of the head is variable: with a round upper part, slightly wasted below the hole for the handle, triangular, or massive and clearly separated from the neck. The front of the neck has a rather high hump, the back is slightly bent, and the blade is round. Some recovered hoes are long, high and narrow. Many archaeologists in the 20th century assumed that the initial version of a snake-head hoe appeared when a hole for a handle was drilled in a round hoe whose head did not yet resemble a snake's head. Later, the head was widened near the hole, preventing it from breaking off easily, and wasted below the hole. So far, 47 snake-head and boot-tree hoes are known in Lithuania, from 37 sites (Fig. 8). Snake-head and boot-tree hoes spread in the southeast part of the Baltic region in the Bronze Age (Girininkas 2013, 135–137). Snake-head and boot-tree hoes are known from Lithuania, Latvia, Belarus (the Grodno district) and the Kaliningrad Region. Snake-head hoes have also been found in East Pomerania in

Poland. Almost all archaeologists relate the spread of snake-head and boot-tree hoes to the developing Baltic cultural region.

The use of boot-tree and snake-head hoes is associated with the development of agriculture in the Bronze Age. The time of their use coincides with changes in the natural living environment. The populations of the Middle Bronze Age moved away from the habitation areas of the Stone Age and the Early Bronze Age. This trend is observed not only in Lithuania (Trumpaičiai, Joniškis district, Papyvesiai, Pasvalys district, Skaruliai, Jona-va district, Darsūniskis, Kaišiadorys district, Žemieji Petrašiūnai, Kaunas district, Samantonys, Ukmergė district, etc), but all over the eastern Baltic (Lang, 2007, 52; Vask 1994). In Lithuania, one such settlement (Reškutėnai 1) is known on the east shore of Lake Kretuonas (away from the former lake area). Its artefacts include pottery, flint and stone objects of Narva culture and Brushed Pottery culture (Girininkas 2013, 138–141). The changing topography of the settlements was probably associated with subtleties of farming, rather than with the changing natural environment, i.e. with the search for favourable ground for farming and stockbreeding. In this period, populations of western, northern and central parts of Lithuania were assimilating areas of sod-podzol and weakly podzolised soils. Boot-tree and snake-head hoes were uncovered namely in these areas.

The beginning of farming and stockbreeding in Lithuania can be associated with the Subboreal (SB2) changes of climate and vegetation in the first half of the Bronze Age. In most of Lithuania, the forests were dominated by spruce, birch, oak and alder (Balakauskas 2012, 231). By cutting down and burning trees, fields, mainly on river banks, were created for stockbreeding and crop growing. Archaeological artefacts related to farming are usually found on river banks and lake shores. At that time in the areas under consideration, Baltic boat-tailed stone axes with slanting sides, round heads and a hole for a handle were used for the creation of slash-and-burn forest clearings. Axes of this type were used all over Lithuania, but there are considerably fewer in the eastern and southern parts (Bagušienė, Rimantienė 1984, 90–91, Map. 16), where the natural conditions for farming were unfavourable. Axes of a similar form designed for similar purposes are also known from the River Daugava basin in Latvia (Vask 2002, 39–40).

Porphyritic rocks (rare in Lithuania) were used as the main material for boot-tree and snake-head hoes. Hoes of this type were made with great precision, and had polished surfaces. Making such hoes was time-consuming. Many intact hoes of these types are often

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found near rivers and lakes, and in waterlogged areas. The manufacture techniques and the find spots are indirectly indicative that some of these hoes could have been thrown into the water as offerings, in expectation of grace from the farming gods, rain and a good harvest. Bronze artefacts were also used for the same purposes in this period (Girininkas 2013, 235-237), as were imported hafted flint axes in the Neolithic. C. Engel (1935, 154), an archaeologist who investigated the prehistory of East Prussia, suggested an interesting view of the use of snake-head and boot-tree hoes not only for community rituals, but also as weapons. He pointed out that the blades of hoes of these types rarely bear marks of working the soil. Therefore, they could have been used as offerings during agricultural rituals in the occupation of new territories, and the development of settlements in areas with heavy soil.

The beginnings of agriculture in Lithuania

The Neolithisation process began in Lithuania in the Middle Neolithic (Girininkas, Daugnora 2015, 158–159). What was the pattern of the transition to the production economy of communities inhabiting Lithuania?

The transition to the production economy was a leap of Neolithic culture. The Australian archaeologist Gordon Childe called it the Neolithic Revolution (Childe 1936), during which populations could increase the immediately needed food supplies. This revolution not only affected the economy, but also entailed serious changes to social structures: an increase in the population, a less mobile lifestyle, developing social differentiation, changes in spiritual culture, and the development of new techniques and commodity production. All these processes took place in Lithuania as well.

Early practices of production worked their way into the forested environment of Lithuania at a very slow pace. The transition to a production economy was complicated by natural conditions, the effective subsistence economy, and the low level of technology. Thus, it is not surprising that the production economy developed in Lithuania slower than in Central Europe, with different environmental conditions and working tools. According to bioarchaeological and palynological data, the Neolithisation process in Lithuania was in keeping with the model of the development of the production economy suggested by M. Zvelebil and P. Rowley-Conwy (Zvelebil, Rowley-Conwy 1984, 104–128). According to this model, elements of the production economy first supplemented and then re-

placed forms of the subsistence economy. This process can be viewed as a manifestation of cultural diffusion in the trend of Neolithisation. The first elements of the production economy appeared at the turn of the Middle Neolithic, and continued into the Late Bronze Age. The Middle and Early Bronze Age can be distinguished by the intensive development of the production economy, which was not as intensive in the Late Neolithic. The final replacement of the subsistence economy by the production economy is dated to the turn of the Late Bronze Age. Neolithisation processes were more extensive in the continental part of Lithuania than in the coastal areas (Girininkas, Daugnora 2015, 2015). Strange as it may seem, the effective subsistence economy in the coastal area (fishing, seal hunting and trading in amber as a raw material and as articles) slowed down the Neolithisation process. Archaeological data shows that coastal communities were aware of the production economy, but were content with trading in fish, seal meat, leather, fat, wax and amber, in exchange for the achievements of the production economy (domestic animals and cereals) (Piličiauskas 2016, 60, 63). In the Neolithic, coastal communities took almost no part in the development of the production economy. The farming techniques and lifestyles of rudimentary communities of Globular Amphora culture and Corded Ware culture differed from the farming techniques and lifestyles of communities of Narva culture (Piličiauskas et al. 2017, 530–542) and Early Baltic Coastal culture. This was predetermined by the mentioned effectiveness of the subsistence economy, the natural conditions, and trading with communities of Globular Amphora and Corded Ware cultures.

The 14C dating of zooarchaeological and archaeological material (Girininkas, Daugnora 2015, 191, 205, 210, 219) has allowed us to correct the pattern of the development of the production economy in the Baltic coastal area in the Neolithic that was established in the late 20th and early 21st century, and elaborated by R. Rimantienė (1992, 367-376; 1995, 92-102; 1997, 213–218; 1999, 275-290; 2005, 135–146). The material obtained is indicative that some bones of domestic animals and archaeological artefacts (ploughshares, snake-head hoes and oxbow model) from the Šventoji settlements belonged to later periods (the Late Bronze Age, the Roman Age and the Middle Ages), and have nothing to do with the Neolithisation of Late Neolithic coastal communities. New palynological and zooarchaeological data from the Šventoji settlements also indicates that the data previously provided by R. Rimantienė is inaccurate (Motuzaitė Matuzeviciūtė 2018, 151–152; Griškėdis, Motuzaitė Matuzeviciūtė 2017, 3-5).

The data from the latest archaeological, bioarchaeological and palynological investigations demonstrates a clear difference between patterns in the economic and social development of Lithuania's Bronze Age population, and the economic and social development of Central European and Scandinavian populations. The whole Bronze Age can be characterised as the development of stockbreeding, farming and metallurgy, along with the development of traditional hunting and fishing techniques.

Early Bronze Age communities responded to the new cooler and dryer Subboreal (Sb2) climate conditions. In this period, communities of fishermen and hunters turned to the production economy. The social structure of the population changed (Girininkas 2012, 28–42). In fact, the Neolithic Revolution referred to by researchers of Central and northern Europe began in Lithuania only in the Early Bronze Age. This is proven by palynological and zooarchaeological data, and archaeological artefacts: metallurgical tools, metal objects re-smelted by local communities, and impressive settlements with remarkable cultural layers (e.g. the Kretuonas 1C settlement) (Daugnora, Girininkas 2004, 233–250). The development of the production economy allowed for a reduction of the huge land and water areas used for subsistence, and the production of food supplies from smaller cultivated plots of land, which needed more time and labour in tending. In this period, the hunting, fishing and gathering economy differed from one micro-region to another in Lithuania. The Early Bronze Age was also marked by the onset of horse breeding, which is proven by horse bones found together with the bones of other domestic animals (Girininkas, Daugnora 2015, 207–208). This means that the cattle used for the transport of heavy objects were replaced by horses (Johannsen 2005, 39–51).

In Lithuania, the traditions of the production economy and social structure developed on the basis of late Narva, Nemunas and Bay Coast/Rzucewo cultures, but under the strong influence of Central European communities. This is proven by the appearance of large well-structured settlements, which were characteristic of communities that were engaged in the production economy. Important noticeable economic changes took place in the Kretuonas 1C, Papiškės 4, Barzdžio Miškas, Dusia 8 and Nida (late stage) settlements. These changes were manifested through the addition to the previous traditional hunting/fishing/gathering economy of new elements of the production economy. Communities learned how to re-smelt metal objects and manufacture bronze objects. The cultivation of crops and stockbreeding intensified. These new farming techniques were first adopted by economically stronger communities living beside large bodies of wa-

ter and forests, where they could successfully fish and hunt, providing stable food supplies. These communities could allow for experimentation, without the fear of failure or food shortages. Elements of the production economy appeared in the settlements mentioned at different times, and manifested themselves at a different intensity. In the Early Bronze Age, elements of the production economy were more noticeable in the eastern part of Lithuania. What were the reasons for this process? It was first and foremost determined by the intrinsic characteristics of the communities. The lifestyle of east Lithuanian communities could have been the main cause of the difference. Communities in this part of Lithuania were settled, because fishing in inland waters was their main means of subsistence. Stockbreeding and farming increased the need to spend more time in the same area. Hunting was the main means of subsistence for south Lithuanian communities. They were more mobile, moving from place to place in search of new hunting grounds. These communities also exchanged flint for other goods. Fishing was the main occupation of Lithuania's coastal communities. But their geographical location was specific, favouring a close relationship with distant communities, exchanging seal products and amber for goods of the production economy. This did not encourage coastal communities to undertake farming or stockbreeding. Thus, in the Early Bronze Age, only the settled communities in the continental part of Lithuania, the eastern part in particular, turned to farming and stockbreeding.

The development of metallurgy in western Lithuania in the Early Bronze Age is put down to the depletion of amber resources, the geographical situation (the distance from the main trade routes), and the reduced importance of flint and raw materials achieved by fishing and hunting.

Communities of Late Corded Ware culture adhered to a mobile lifestyle until their disappearance. This is evidenced by burials and temporary settlements in the forest zone (Girininkas 2009, 197).

In the A time of the Middle Bronze Age, the habitation areas of communities changed. Some continued to live in areas favoured since the Stone Age; fishing and hunting were their main occupations. At the end of this period, settlements of communities of Reškutėnai and thick-walled lightly brushed pottery type settled in new areas with sod-podzolic and weakly podzolised soils (Girininkas 2013, 139–141). This could be taken as evidence of the adoption of new areas that were more favourable to farming, i.e. a new stage of economic development. But the failure to use metal tools predetermined the existence of Lithuanian continental communities. They continued to use the same slight-

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ly improved tools as in the Neolithic: stone axes and boot-tree and snake-head hoes with a hole for a handle. In the B time of the Middle Bronze Age, communities inhabiting West Baltic Barrow culture territories manufactured metal articles (e.g. battle-axes of Nortikėnai type) from imported raw materials. The manufacture and trade in metal goods show that these communities not only managed to enter Central European and southern Scandinavian markets, but by advantageously using amber resources, they also gained some influence in the southern Baltic territories. At that time, the development of the production economy in Lithuania was very intensive. Slash-and-burn farming appeared, accompanied by boot-tree and snake-head hoes, showing the significance of the process in terms of the spiritual culture.

In the B time of the Middle Bronze Age, the role of metallurgy (the re-smelting of metal items and casting of items from raw material in moulds) in central and east Lithuanian territories played a minor role in the development of the production economy. A. Luchtanas and R.V. Sidrys compared areas of fertile soils and the distribution of metal artefacts. They determined no strong correlation between soil fertility and the distribution pattern of bronze artefacts. Farmers in Lithuania were in no great need of bronze tools, and most fertile soils were not regarded as indicators of wealth, because stockbreeding could be developed even on poorer soils (Luchtanas, Sidrys 1999, 29–30). We can conclude that in the Middle Bronze Age, metal items were designed for military, prestige or spiritual culture. In domestic life, stone and flint tools were widely used. Their productivity was the same as the tools used in the Late Neolithic. The economic function of metal tools was negligible, and there was no import of metal items on a mass scale.

A similar Neolithisation process took place in Latvia, where it also ended in the Middle/Late Bronze Age (Vasks 2015, 97–143). In the Bronze Age, this process in Latvia was more intensive due to the River Daugava, which served as a trade route between communities of west and east Europe.

The Late Bronze Age in Lithuania ended the Neolithisation process, which lasted for one and a half thousand years. Communities in Lithuania eventually switched from flint to metal-processing technologies. Although metallurgy did not become the main branch of the economy, due to the lack of raw materials, an understanding of new technologies and the advantages of the use of metal were rooted in people's consciousness. This is evidenced by the disposable casting moulds around casting places found in east Lithuanian Late Bronze Age hill-forts. The majority of casting

moulds were designed for casting axes (of Mälär-type), and fewer were for bracelets, necklaces and rings (Luchtanas 1981, 8–12, 5, Fig. 6; Grigalavičienė 1986, 119, Fig. 24:1; Čivilytė 2014). In the Late Bronze Age, all communities in Lithuania were engaged in the production economy, but not in the establishment and continuity of metallurgical technology (Podėnas et al. 2016, 231). This is evidenced by zooarchaeological and archaeological material and crop cultivation (Minkevičius et al. 2019) from early Lithuanian hill-forts. The dated material from the Šarnelė settlement shows the beginning of the use of horses for economic purposes (Girininkas, Daugnora, 2015, 210). The use of horses in farming is also proven by Scandinavian rock drawings of horses pulling ards (Glob 1951, 56, Fig. 63). Recent data shows that in east Lithuania, the production economy tended towards stockbreeding rather than arable farming.

Two cultures can be distinguished in Lithuania in the Late Bronze Age: West Baltic Barrow culture and Brushed Pottery culture (Girininkas 2013, 158–189). The lifestyles of these two cultures differed in terms of economic activity. According to data from palynological and osteological investigations, stockbreeding was the main branch of the economy for communities of Brushed Pottery culture. The communities made much use of bone and antler tools, and stone hoes and axes.

The slow economic development of Brushed Pottery communities was predetermined by the geographical environment and the geopolitical situation. Being far from the main trade routes, the inland part of Lithuania lacked metal items and raw materials. Relations with communities of West Baltic Barrow culture living in the western part of Lithuania and in the Sambian-Natangian region did not ensure the necessary amounts of metal raw material. Therefore, inland communities had to adapt to these circumstances, and use bone, horn and stone implements, both for household and economic activities. The southeast and southern areas of Brushed Pottery culture could have been influenced by communities of Milograd culture, which, under the pressure of Zarubintsy culture in the south, gradually settled in the Middle Berezina river basin (Egoreichenko 2006, 53).

The Neolithisation process which started in the Middle Neolithic came to an end in the Late Bronze Age, when slash-and-burn farming and stockbreeding became the main branches of the economy. The process of Neolithisation in Lithuania was long and irregular. During the Neolithic period, only the rudiments of the production economy, which reached the inhabitants of Lithuania through cultural exchange, are noticeable. The main process of Neolithisation took place in the Bronze Age.

Conclusions

In Lithuania, the hoe was a universal tool used by communities since the Late Palaeolithic. Lyngby-type artefacts manufactured from reindeer antlers were typical of Lithuania, as they were of the whole northern region of Europe. In the Mesolithic, Lithuanian communities used hoes, with a hole for a handle, usually made from red deer antlers. Neolithic communities used stone and antler hoes. In the Middle Neolithic, stone hoes with holes for handles appeared, although hafted hoes were still widely used. At that time, oval hoes with a hole for a handle appeared among stone hoes. Hafted hoes were popular in the Late Neolithic, and almost without modification continued to the end of the first millennium BC. Antler hoes had a hole for a handle, and were in use until the end of the Late Neolithic. Hoes used by communities in Lithuania from the Late Palaeolithic to the end of the Late Neolithic were designed for domestic activities.

Stone boot-tree and snake-head hoes appeared in Lithuania, as in the whole southeast Baltic region, in the Middle Bronze Age. Their appearance was associated with the slash-and-burn farming of the Middle Bronze Age. The hoes mentioned are usually recovered unbroken, implying that some were used not only for the cultivation of sod-podzol soils in slash-and-burn clearings (along with the Baltic stone sleek-sided round axes with a hole for a handle), but also as offerings in rituals related to bodies of water.

The beginning of arable farming in Lithuania can be dated to the Late Bronze Age, when the first antler ploughshares appeared. At that time, the Neolithisation process came to an end; considerably later than in Central Europe.

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Received: 1 October 2019; Revised: 15 October 2019;

Accepted: 22 November 2019

Algirdas Girininkas
 Institute of Baltic Sea Region History and Archaeology,
 Klaipėda University,
 Herkaus Manto street 84
 LT-92294, Klaipėda LITHUANIA
 E-mail: sakaliske@gmail.com

KAPLIAI IR PIRMIEJI ŽEMDIRBIAI LIETUVOJE: NUO KAPLIO IKI ARKLO

ALGIRDAS GIRININKAS

Santrauka

Kaplys yra universalus darbo įrankis, kuris Lietuvos teritorijoje atsirado dar prieš paskutinio apledėjimo laikotarpį vidurinio paleolito pabaigos laikotarpiu ir buvo naudojamas iki vėlyvojo paleolito pabaigos. Vėliau, jau mezolito laikotarpiu, kaplys tapo universaliu darbo įrankiu, jį naudojant įvairiuose to meto pasisavinamojo ūkio darbuose. Iš paleolito ir mezolito laikotarpių žinomi tik raginiai kapliai (1–2 pav.). Tokia kaplių paskirtis išliko ir neolito / bronzos amžiaus laikotarpiu, tik pakito jų formos, prisitaikant prie naujų ūkio darbų, susijusių su pirmųjų kultūrinių augalų kultivavimu. Iš neolito laikotarpio radinių, be raginių kaplių, aptinkama akmeninių (3, 5 pav.) ir medinių kaplių. Bronzos amžiuje kapliai buvo naudojami tiems patiems darbams kaip ir ankstesniais laikotarpiais, tik platesnis jų naudojimas buvo susijęs jau su kapline žemdirbyste. Todėl keitėsi kaplių forma, o ypač kurpalinių ir gyvatgalvių kaplių (6, 7, 9 pav.), kurie galėjo būti naudojami įvairiose ritualinėse apeigose. Tik viduriniu–vėlyvučiu bronzos amžiaus laikotarpiais baigėsi neolitizacijos procesas, kai susiformuoja lydiminė žemdirbystės forma, gyvulininkystė tampa vyraujančia ūkio šaka. Vėlyvučiu bronzos amžiaus laikotarpiu pasirodo pirmieji raginiai arklai. Neolitizacijos procesas Lietuvos teritorijoje buvo ilgas ir nenuoseklus. Neolito laikotarpiu pastebimi tik gamybinio ūkio pradmenys, kurie Lietuvos teritorijos gyventojus pasiekė kultūriniais mainais. Pagrindinis neolitizacijos procesas vyko bronzos amžiuje.

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