Periodization and Chronology of the Neolithic in Lithuania

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Introduction

Accurate chronological data and a consensus of period classification is necessary for not only a proper evaluation of the sequential development of certain processes throughout prehistory, but also for the comparison of that evolutionary sequence with those of other regions and cultures. The Neolithic's subperiod boundaries in Lithuania have not been agreed upon (see Rimantienė 1996a, 1995, 1992a, 1984; Girininkas 1994a, 1985, Girininkas and Lukoševičius 1997, Daugnora and Girininkas 1996). Moreover, recently acquired radiocarbon data from Lithuanian Stone Age site material (Ramsey et al. 2000:244, Antanaitis 1999:91, Antanaitis and Girininkas 2000:5) requires an adjustment of its presently published Neolithic periodization scheme[1]. In this article, we first outline this chronological data in light of the traditional East Baltic subperiod criteria and then suggest a second periodization scheme based on the traditional "Neolithization" criterion of the West – a criterion which, to our mind, should be collectively considered. Some analogies with neighboring territories are included; they are important because of the limited amount of chronological (and economic) data in Lithuanian territory. These two sections are accompanied by a discussion and a list of calibrated radiocarbon dates from the East Baltic region.

Before the dawn of archaeological science in Lithuania and the East Baltic, the Neolithic period was dated in many various ways. The very term "Neolithic" that was first used by John Lubbock (Lord Avebury) in 1865 (Lubbock 1865) was still unknown to East Baltic prehistorians for a long time. One of the first researchers to use the term "Neolithic" in his description of Stone Age chronology was Ed. Šturms (Šturms 1927: 4). He divided the Neolithic into the four axe-classification periods put together by Oscar Montelius (Montelius 1885: 88). The first archaeologist in Lithuania to present a European understanding of the Neolithic was Jonas Puzinas, who dated the Neolithic to 3000–1500 BC (Puzinas 1938: 16). Today, more than sixty years after the periodization presented by Puzinas, we can say that the beginning of the Neolithic by the traditional scheme has been pushed back about 1500 years while the end of the period remains the same.

[1] For most of these radiocarbon data we are deeply indebted to Prof. Ken Antanaitis-Jacobs at the Université de Montréal.

Lithuania's Neolithic periodization in light of new chronological data

By most current tradition in the East Baltic, the Neolithic begins with the appearance of ceramics. The earliest known ceramic site in Lithuania for a long time was Žematiškė 3B (Švenčionys district) with a date of 5510±60 BP (BIn-2594) (Girininkas 1994a: 274). New chronological data have been obtained from southern Lithuania's Katra 1 site; charcoal from a hearth in very close association with pottery of the earliest stage of the Nemunas culture dates to 6550±70 BP (Ki-7642) (Antanaitis and Girininkas 2000: 5). This date is very similar to the earliest Early Neolithic date thus far in Latvia's Lubāns lowland at the Zvidze site: 6535±60 BP (TA-862) (Лозе 1988: 101)[2]. Adjacent to the Katra 1 site is the Katra 2 site, where Nemunas culture pottery is associated with the date 6080±70 BP (Ki-7645). The ceramic Early Neolithic in the southern Pskov region also begins in the second half of the 7th mil. BP, with the earliest date at Rudnja Sertejskaja of 6240±60 BP (ЛЕ-3054) (Микляев 1992: 24)[3].

The East Baltic Middle Neolithic begins with the appearance of the Typical Comb-and-Pit Pottery (or Combed Ware) culture. This culture appears to have had a stronger presence to the north of the Daugava River basin. South of the Daugava, the culture is thus far known in only five places in Lithuania: at Kretuonas 1 (Švenčionys district), Jara 4 and Jara 1 (Anykščiai district), Pasuojis (Molėtai district), and Pašvitinys (Pakruojis district) (Girininkas 2000a: 105). Kretuonas 1B is mostly Narva culture, however it contains some elements of the Comb-and-Pit Pottery culture complex, including pottery, arrow points, slate objects, small chisels, and axes. We now have radiocarbon dates from two graves at the Kretuonas 1B settlement: grave 3 dates to 5580±65 BP (OxA-5926) and grave 1 – 5350±130 BP (OxA-5935) (Ramsey et al. 2000: 244; Antanaitis 1999:91). These dates are similar to the earliest Middle Neolithic dates in Latvia. There, the end of the Early Neolithic at Zvidze is 5320±50 BP (TA-1800) (Лозе 1988: 101), while grave 206 associated with the Typical Comb-and-Pit Pottery culture in the Zvejnieki cemetery dates to 5285±50 BP (Ua-3643) (Zagorska 1994: 21).

The Late Neolithic is associated with the appearance of the Corded Ware culture complex. The earliest known date from a site with Corded Ware culture remains in Lithuania had been the Baltic Haff culture site of Šarnelė in Northwest Lithuania (Plungė district): 4260±90 BP (Vs-318) (Butrimas 1996: 189). However, some archaeologists have doubts concerning this date's association; the radiocarbon date was obtained from a stake that could just have easily been associated with the Narva culture, since Narva culture pottery was also found at this site. The known Baltic Haff culture date of 4460±110 BP (charcoal from hearth N 46; Vs-632; Rimantienė 1989: 176) from the Nida settlement is not fully reliable, since it could belong to the earlier Narva culture layer. But there are now new Late Neolithic chronological data from the mainly Iron Age cemetery of Plinkaigalis (Kėdainiai district). This cemetery has two known burials clearly exhibiting features

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[2] Recently, Loze has noted Lake Lubāns's Early Neolithic chronology, of which the site of Zvidze is the base, as beginning at 6350 BP (Loze 2000: 47).

[3] Even earlier radiocarbon data with a ceramic association, from the end of the Early Atlantic period (AT1), have been noted from the upper reaches of the Daugava River from the site of Serteja: 7300±180 BP (ЛЕ-5260) and 7300±400 BP (ЛЕ-5261) (Мазуркевич 2000: 49). We feel these dates should be viewed with caution.

of the Corded Ware culture complex. The earlier of the two is Plinkaigalis grave 242 which dates to 4280±75 BP (OxA-5936) (Ramsey et al. 2000: 244, Antanaitis 1999: 91). Taken together, the Nida and Plinkaigalis dates show that the Late Neolithic in Lithuania could have begun from 4400/4300 BP. In neighboring Latvia, the earliest reliable Corded Ware culture associated finds are those at Abora 1, which are dated to 4490±80 BP (TA-2144) (Loze 1992: 316)[4]. It is possible that the Late Neolithic in Lithuania may begin closer to 4400 than 4300 BP.

The end of the Neolithic in the East Baltic is traditionally associated with the appearance of the first metals. However, such a site or burial is thus far unknown in Lithuania. We have only a few radiocarbon dates representing cultural layers in which artifacts characteristic of the Bronze Age (crucibles, metal casting forms) have been found. Such radiocarbon dates have been obtained from Žemaitiškė 2 (Švenčionys district) – 3570±120 BP (Vs-311) (Гириникас 1990: 10) and Papiškė 4 (Vilnius district) – 3685±75 BP (T-10602) (Rimantienė and Ostrauskas 1998: 213). A copper square-section wire and a stone form for casting bronze were found at the Early Bronze Age site of Kretuonas 1C. There are still no clear radiocarbon dates in the East Baltic that indicate the beginning of the Bronze Age. The often cited dates from the Lagaža site in the Lubāns lowland of Latvia are not considered reliable by all archaeologists[5]. At a recent seminar on the Bronze Age at Vilnius University[6], Lithuanian, Latvian, Estonian, and Finnish archaeologists unanimously decided that until solid radiocarbon data is obtained, the beginning of the Bronze Age in the East Baltic will continue to be considered 3500 BP.

Thus, by the traditional East Baltic criteria, the periodization of Lithuania's Neolithic is now as summarized in Table 1.

PERIOD	CHRONOLOGY
Early Neolithic: ^{14}C (BP)	6550/6300 – 5600/5400
Calibrated BC	c. 5500/5300 – 4400/4200
Middle Neolithic: ^{14}C (BP)	5600/5400 – 4400/4300
Calibrated BC	c. 4400/4200 – 3100/2900
Late Neolithic: ^{14}C (BP)	4400/4300 – 3500
Calibrated BC	c. 3100/2900 – 1800

Table 1. Lithuania's Neolithic periodization by the traditional criteria

[4] Recently, Loze distinguishes a separate Late Neolithic Abora culture at Lake Lubāns and dates its beginning to 4420 BP (Loze 2000:47).

[5] These Lagaža dates are 3865±80 BP (TA-749) and 3640±70 BP (TA-396) (Лозе 1979: 121). However, ~85% of the ceramics from what appears to be the same cultural layer is comprised of Late Narva culture (Late Neolithic "Lubāna type" by Loze) pottery (Лозе 1979: 29).

[6] This seminar, "The Bronze Age in the East Baltic Region", was held on Nov. 8–9, 2000 at Vilnius University. It was organized by Assoc. Prof. Algimantas Merkevičius of Vilnius University's Archaeology Dept.

Lithuania's Neolithic periodization in light of economic data

In the West and in other parts of the globe outside of Eastern Europe, the main defining signature of the Neolithic is a shift to an agricultural economy. In the interest of increasing globalization and uniform world-wide periodization schemes, we feel that a reassessment of the meaning of "Neolithic" based on this globally more popular criterion would be very beneficial.

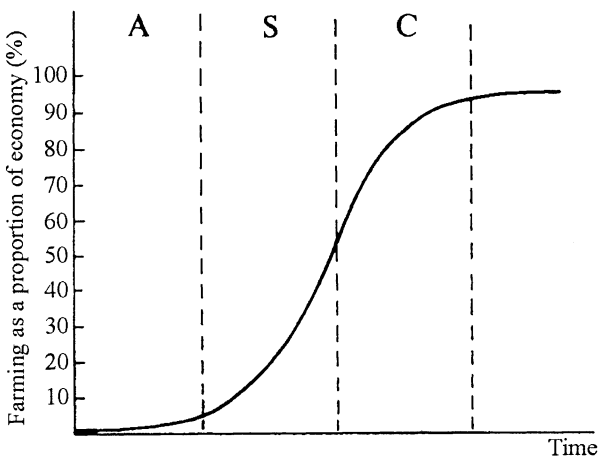

Fig. 1. The availability model for the transition to farming. A = availability phase; S = substitution phase; C = consolidation phase (Zvelebil 1998:10)

It is already an established fact that the shift to a subsistence economy based on biologically domesticated animals and plants in the East Baltic was a very slow, several millenia long process (for example, Паавер 1965; Zvelebil 1986, 1993, 1994, 1998; Zvelebil and Rowley-Conwy 1986; Dolukhanov 1986, 1993). A three-stage heuristic "availability" model for such a slow transition that allows a finer chronological resolution was initially proposed in 1984 by Marek Zvelebil and Peter Rowley-Conwy. See Figure 1. In the first phase, the availability phase, foraging is the principal means of subsistence, with domesticates and cultigens comprising less than 5% of the overall material record. In the second phase, the substitution phase, farming strategies develop while foraging strategies are maintained; in this stage, domesticates and cultigens comprise 5–50% of the total remains. In the last phase, the consolidation phase, farming is the principal means of subsistence, with domesticates and cultigens comprising more than 50% of the total remains (see Zvelebil 1998: 10). It is this model's substitution phase which is generally associated with "Neolithization" (Zvelebil 1998: 11).

Several points should be noted in our use of the availability model in determining the transition to farming in Lithuanian territory: 1. The preferred standard for assessing faunal remains is by MNI or the minimal number of individuals (Brewer 1992, Grayson 1973, 1979, 1981, 1984); this standard was used as much as possible, although, unfortunately, not all counts at sites are available by MNI. In the latter case, notation is by NISP (number of bone specimens). 2. Dog and horse counts are not included in any of the percentages; the dog's domestication is not directly related to the development of farming and the discernment of domesticated horse bone from Neolithic sites is problematic. 3. Palaeobotanical evidence is difficult to place into the availability model, however, we feel that this could, perhaps, be done on an "intuitive" level.

Palynological evidence of forest clearances, foremostly those related to fire, are probably indicative of purposeful activity by people for the purpose of increasing

plant yields and grazing land for animals – a "primitive" form of plant cultivation and animal husbandry (see, for example, Mellars 1976:26-27, Bogucki 1988: 38). Such evidence is present in the East Baltic since Mesolithic times, especially since the Late Atlantic period (Савукинене, Сейбутис 1974:96; Seibutis, Savukynienė 1998: 52). The Late Atlantic (c. 6700–5000 BP) includes not only the Late Mesolithic, but all of the Early Neolithic and a part of the Middle Neolithic. It is also possible that water chestnuts (*Trapa natans*) and hazelnuts (*Corylus avellana*) were cultivated early on in Lithuanian and East Baltic territory (Ванкина 1970: 134; Zvelebil 1994: 41; Butrimas 1996: 183). However, this type of evidence does not refer to the biologically domesticated form of plant or animal species. There are some possible cattle (*Bos bovis*) teeth pendants in Late Mesolithic graves at the site of Donkalnis (Daugnora, unpublished data). The earliest known single pollen grain of oat (*Avena*) has been encountered in probably the Early Neolithic part of the Late Atlantic period in Southeast Lithuania at Lake Duba (Stančikaitė 2000: 85). The first known pollen grains of hemp or hops (*Cannabis/Humulus*) date to c. 5900 BP in West Lithuania's Šventelė environs (Stančikaitė 2000: 183). It is possible that the availability phase of the transition to farming, or the very first appearance of domesticates, occurred as early as the Late Mesolithic or Early Neolithic in Lithuania.

There are no known domesticated animal bones in Lithuanian territory dating to the Early Neolithic. The principal archaeologically investigated sites from the Middle Neolithic are the sites of Kretuonas 1B which dates to the very beginning of this period, and Šventoji 4 and 2B (which are considered one site since 1996; see Rimantienė 1996b: 7), as well as Šventoji 1B. Most of the material from these Šventoji sites date to the middle and late part of the Middle Neolithic.

Goat/sheep (*Ovis avies/Capra Hircus*), cattle (*Bos bovis*), and pig (*Sus suis*) bones by NISP at Kretuonas 1B make up 6.15% of the total identified faunal sample (4046 bones) (Daugnora and Girininkas 1996: 27)[7]. The domesticated animal bone count at the Šventoji 4 and 2B site[8], determined only by NISP, is 0.31% (pigs); no domestic animal remains (except for those of dog) were identified at the site of Šventoji 1B (Rimantienė 1996a: 340–341, Daugnora 2000: 582–583, Daugnora's unpublished data).

Hemp or hops pollen dated to the earlier Neolithic was identified from Lake Pelesa in Southeast Lithuania. Cereal (*Cerealia*) pollen dated to the end of the Late Atlantic, probably from the Middle Neolithic, was found in the sediment sample from Žemaitiškė 3 (Kabailienė, Grigienė 1997: 47).

At Kretuonas 1, Funnel Beaker (TRB) culture pottery was also encountered (Girininkas 1994: 242). The same has been noted at the Zvidze site in Latvia (Лозе 1988: 67, Loze 1997: 40) and the Zedmar A and D sites in the Kaliningrad area (Тимофеев 1998: 275, 1996: 165). The TRB culture already definitely had a farming economy (Midgley 1992: 373); the appearance of this material culture's ceramics suggests contacts with the TRB culture, possibly in the form of trade or exchange that involved farming.

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[7] MNI counts for Kretuonas 1B are not available for the most recent statistics. Data available in 1990 showed that from a total of 1768 bone specimens, 0.7% belonged to domestic animals by NISP (cattle and sheep/goat) and 5.45% – by MNI (Гирининкас 1990:29).

[8] It should be noted that bone did not preserve well at the Šventoji sites.

Maybe flint sickle microblades at the Kretuonas 1 site (Girininkas 1990: 10) could be indicative of the production of fodder in the Middle Neolithic time period. Some hoes with a polished and unpolished surface, as well as a couple grinding stones were found at Kretuonas 1B and Žeimenis 1 (Гирининкас 1990: 44; Girininkas 1997: 33); some hoes, a couple digging sticks, grinding stone, small antler digging shovel, a wooden pestle – at Šventoji 1B and Šventoji 4B/ 2B (Rimantienė 1979: 43, 68, 1996a: 171–177, 1996b: 40–44). These tools cannot be proven to be associated with domesticated plant species, but they are suggestive of increased activity relating to "primitive" agriculture or plant husbandry. Some indication of a changing shape of dwellings appears at Pakretuonė 1. This Middle Neolithic site has the earliest square building in Lithuanian territory (Girininkas 1994a: 212).

By zooarchaeological, paleobotanical, and archaeological data, Lithuanian territory in the Middle Neolithic was in the availability phase.

Starting with the Early Subboreal, i.e., from the latter part of the Middle Neolithic, the percentage of cereal pollen slightly rises in pollen diagrams in Lithuanian territory in general. Wheat (*Triticum*) and barley (*Hordeum*) pollen occur, as do other plants indicative of anthropogenic activity (Kabailienė 1990: 101). Single pollen grains of wheat in sediments dated to the end of the Middle Neolithic (4600/4500 BP), for example, were identified at Lake Duba in Southeast Lithuania (Stančikaitė 2000: 85).

The Šventoji 23 and Šventoji 3B sites date to the end of the Middle Neolithic and beginning of the Late Neolithic. By NISP, at Šventoji 23, 1.98% (cattle, sheep/ goat) of the faunal assemblage (total of 354 identified bones) consists of domesticated animal bone (Rimantienė 1996a: 340–341, Daugnora's unpublished data); at Šventoji 3B (total bone count – 282 bones) – 0.71% (cattle) (Rimantienė 1996a: 340–341, Daugnora's unpublished data). In the Late Neolithic, by MNI, Žemaitiškė 2 has 6.45% domesticated animal bone (sheep/goat, cattle) (the entire assemblage consists of 31 individuals) (Гирининкас 1990: 29, Daugnora, unpublished data); Daktariškė 5 (44 individuals) has 13.64% (cattle, sheep/goat) (Daugnora and Girininkas 1996: 78); Kretuonas 1A (cattle and pig) – 23.33% (30 individuals total) (Daugnora and Girininkas 1996: 74), Kretuonas 1D (55 individuals) – 5.45% (cattle) (Daugnora and Girininkas 1996: 70). In addition to the small zooarchaeological assemblages at many of these sites, however, it is important to note that some stratigraphical mixing also occurs at the sites of Daktariškė 5 and Kretuonas 1A. No domesticated animal bones were identified at other Late Neolithic sites (Šventoji 6, Šventoji 26) (Daugnora, Girininkas 1996: 76; Rimantienė 1996a: 341).

Hemp (*Cannabis*) has been found in seed form in comparatively many West Lithuanian Middle to Late Neolithic transition and Late Neolithic archaeological sites – at Šventoji 3B, 23, 6, 1A, 9, and at Šarnelė; these same sites have tools such as hoes, pestles, antler shovels, grinding stones (Girininkas 1977: Rimantienė 1979: 43, 1980: 19–20, 1996a: 177; Butrimas 1996: 183). 75 hoe heads or their fragments, 41 hand grinding stones, a few mortar stone fragments, sickle blades, as well as storage places in dwellings were encountered at Nida (Rimantienė 1989: 68–77). A few possible hand ards (especially at Šventoji 6), a miniature model of an ox yoke (Šventoji 4/2), and increasing occurrences of digging sticks and shovels, hoes, and grinding stones in the Late Neolithic suggest the development of agricultural activities (Rimantienė 1979: 43–45, 1980: 20, 1989: 68–77, 1992b: 121–123, 1996a: 171–176, 1996b: 40–41, 1997: 21, 1999: 277–283). Millet (*Panicum miliaceum*, *Setaria italica*) was also identified at the Late Neolithic sites of Šventoji 6 and 9,

wheat (*Triticum, Triticum dicoccon*) – at Šventoji 4A, 6, and Nida (Rimantienė 1980: 19–20, 1996a: 177, 1996b: 44, 1989: 68, 1992: 123, 1999: 276)[9]. Barley and wheat grain imprints have been found on Late Neolithic pottery in the Courish Lagoon area (Rimantienė 1980: 20, 1989: 68). West Lithuanian Lake Biržulis palynological data show a rise in cereal pollen in the beginning of the Late Neolithic (Guobytė and Stančikaitė 1998: 128, Stančikaitė 2000: 136). In general, the amount of *Cerealia* pollen and associated plant pollen which is indicative of agricultural activity begins to spread more significantly in investigated palynological sections only in the Late Neolithic, albeit sporadically, and not everywhere (Stančikaitė 2000: 199).

Maybe longhouses appear in the East Lithuanian site of Kretuonas 1 in the Late Neolithic or Early Bronze Age. Also found at this site were more flint sickle blades for cutting grass. Stone hoes were encountered at Žemaitiškė 2 and Kretuonas 1A (Гирининкас 1990: 88–91).

The Corded Ware culture in the Late Neolithic could have been an archaeological culture that bridged the southern cultures of the region with the northern forest zone cultures – the Late Nemunas and Late Narva cultures – as far as a farming economy is concerned. In neighboring territories, domestic animals at the East Latvian (Lubāns) site of Abora comprise 3.14% (cattle and goat/sheep) of the total faunal remains by MNI, and at Lagaža, which is also partially Early Bronze Age, the domestic animal count is 2.8% by MNI (cattle and goat/sheep), at Eiņi – 3% (cattle and goat/sheep)āns) site of Abora comprise 3.14% (cattle and goat/sheep) of the total faunal remains by MNI, and at Lagaža, which is also partially Early Bronze Age, the domestic animal count is 2.8% by MNI (cattle and goat/sheep), at Eiņi – 3% (cattle and goat/sheep) land reached its maximum in the Early Subboreal (Kabailienė, Grigienė 1997: 51–52, Girininkas 1994b: 5–12), i.e., in the second half of the Middle Neolithic and the beginning of the Late Neolithic.

By zooarchaeological data, a productive farming economy began to intensify only in the Early Bronze Age. Kretuonas 1C in Northeast Lithuania shows 12.23% domesticated animals (by MNI – 139 individuals; cattle, sheep/goat, pig) (Daugnora and Girininkas 1996: 90); at Dusia 1 in Southwest Lithuania, the count is 14.06% (although this is by NISP of only 25–30 identified bones; here the count refers to cattle) (Juodagalvis 1999: 272). In the neighboring Usviaty microregion, domesticated animal bone fragment percentages make up 30% of the faunal record (Микляев, Долуханов1986: 5). At Kretuonas 1C, other tools related to farming include flint sickle blades, grinding stones, and hoes (Гирининкас 1990: 43–45, Girininkas 1994: 210–223).

The abundance of artifacts and structures related to fishing (like boats, nets, net floats and sinkers, weirs, lesiters, etc.) at both Neolithic and Early Bronze Age archaeological sites (Rimantienė 1979: 10, 24–43, 1980: 9–19, 1989: 65–66, 1996a: 164–171, 271–275; Гирининкас 1990: 37–43; Daugnora 2000 and unpublished data), even in the absence or scarcity of fishbone remains (which may either have not preserved well or not collected systematically), suggests the importance of water food resources during this time period. The first chemical (carbon and nitrogen stable

[9] The occurrence of millet may be contested in the case of Šventoji 23, where it was identified from pollen alone (Rimantienė 1979:12, 43); a macro or seed analogue is necessary for unrefutable identification. The chronology of Šventoji 23's wheat pollen (Rimantienė 1979:12) may also be questionable.

isotope) study on Neolithic and Bronze Age individual human bone samples (Antanaitis and Ogrinc 2000), albeit limited, upholds their significance. The chemical composition of an individual's bones contains information about what the individual ate. Five out of six of the Lithuanian Neolithic and Bronze Age samples in this study showed the importance of aquatic food resources. Successful lacustrine and maritime adaptations very likely delayed the development of a farming economy in Lithuanian territory.

The consolidation phase of the transition to farming, by zooarchaeological data, began probably in the Late Bronze Age, when hillforts (and cremations) appeared, together with Stroked Ware pottery. Examples of such hillfort sites are Narkūnai and Nevieriškės (pottery. Examples of such hillfort sites are Narkical data, čienė 1995: 98–99). By MNI count, roughly 50% of the zooarchaeological material at these sites already belong to domesticated animals[10]. Continuous and more intensive curves of cultivated land indicators and cereal pollen occur in palynological diagrams in Lithuanian territory only in the Bronze Age – sometimes in the Early Bronze Age, but especially obviously at the end of the Bronze Age (Stančikaitė 2000:199). A large amount of millet (*Panicum miliaceum*) seeds dated to 2590±75 BP (Ua-16681) – the end of the Late Bronze Age – was found in the Southwest site of Turlojiškė (Antanaitis, Riehl, Kisielienė, and Kelertas 2000: 52, 59–60; Antanaitis and Ogrinc 2000: 7). The impact of millet on the diet of two human individuals from this area (Kirsna and Turlojiškė – see below), whose bones were analyzed in the forementioned study, is apparent (Antanaitis and Ogrinc 2000).

It must be noted that ongoing research on the development of agro-pastoral farming incorporating archaeological, osteological, palynological, and macrobotanical data in Lithuania shows both local and temporal variations, illustrating the problems inherent in the availability model. The development of a farming economy was not necessarily of a progressively intensifying nature. However, if we are to go by general tendencies alone, putting together both palaeobotanical and faunal evidence, the earliest and most solid evidence so far places the rather meager beginnings of the substitution phase or "Neolithization" process in Lithuania into Corded Ware culture times. A productive economy such as was known in Central Europe's Neolithic, i.e., of the farming transition model's consolidation phase, occurred in Lithuania definitely not earlier than the Late Bronze Age.

Thus, by the farming economy criterion, we suggest starting the "Neolithic" in Lithuanian territory with what is now called the Late Neolithic.

Discussion

The Lithuanian chronological data presented above are not the only new data from this territory. Graves of Donkalnis (Telšiai district), Turlojiškė (Marijampolė district), Kirsna (Marijampolė district) also have new dates and important consequences (Antanaitis and Jacobs commentary in Ramsey et al. 2000: 244–246; Antanaitis 1999). Donkalnis burials have been believed to represent Late Neolithic Baltic Haff culture representatives (Butrimas 1985: 38, 47–48; Česnys 1985c, 1990: 28–32; Balčiūnienė 1985), however the new date of Donkalnis grave 4 – 6995±65 BP (OxA-5924; Ramsey et al. 2000) is some 2500–3000 years earlier than previously believed.

[10] By bone specimen percentages, the figures are ~70–90%. See Лухтан 1986: 6–7, Grigalavičienė 1995: 98–99.

The date implies that the rest of or at least a portion of the other burials at that site may belong to the same Late Mesolithic time period. It also highlights the probable serious stratigraphic problems of the settlement area of the site (which must date at least partially to the Late Neolithic due to the presence of Corded Ware culture pottery there; see Butrimas 1985). The Kirsna man's date of 2895±55 BP (OxA-5931) is at least 5000 years later than previously assumed (see Žilinskas 1931, Rimantienė 1996a: 107–108). The Turlojiškė individual's date of 2835±55 BP (OxA-5927) means we no longer have any clear Neolithic Nemunas culture representative (see Rimantienė 1996a: 205–206, Česnys 1990). What was thought to be Late Neoltihic turns out to be Late Mesolithic; what was thought to be Mesolithic, turns out to be Late Bronze Age. The individuals from Donkalnis, Kretuonas, Turlojiškė, Kirsna, and Plinkaigalis have been token representatives upon which the evolution of anthropological types in Lithuanian territory was based (Česnys 1985a–c, 1990). The new chronological data not only make it necessary to reasses previous ideas of the spatial and temporal distribution of anthropological types, but also those related to the development of burial rites and economy as well as other social processes. Both anthropological and archaeological data interpretations in Lithuania are in need of serious reevaluation.

The transition to farming in Neolithic Lithuania had been evaluated in terms of its formerly published subdivisions. But with the new subperiod classifications, the developmental evaluation automatically changes. The earliest ceramic dates from the Katra 1 and 2 sites, along with similar early ceramic dates in neighboring regions clearly show that in fact we have very little data so far on the ceramic Early Neolithic in Lithuanian territory. There are likely similarly dated Early Neolithic sites in at least Lithuania's southern region where we have hardly any solid absolute chronological data. Meanwhile there are also very little data related to the practical (animal and plant resource utilization) transition to farming from both this time period and from the region of southern Lithuania.

Although Kretuonas 1B retains its former designation of Middle Neolithic, it must be stressed that this site is 500–1000 years earlier than previously believed. The obtained radiocarbon dates show the very beginning of the Middle Neolithic.

The Šventoji sites which receive a significant amount of attention in assessments concerning the development of a farming economy in the Neolithic are critically affected by the periodization scheme. The principal investgator of the Šventoji site series excavations, R. Rimantienė, did not clearly distinguish the Early and Middle Neolithic; since coastal Lithuania apparently has no separate Comb-and-Pit Pottery culture complex finds, these two subperiods were generally lumped together. Keeping in mind that no generalized chronology is actually ideal, but some chronological division is necessary for comparative regional purposes, the Šventoji periodization scheme is in much need of refinement. By known ^{14}C dates, the sites that were considered Early Neolithic are not only actually Middle Neolithic, but fall mostly within the second half or even the end of the Middle Neolithic. Furthermore, what was called Middle Neolithic, by the radiocarbon dates, falls within the Late Neolithic[11].

A very important problem in researching the development of farming that needs to be mentioned is that of the chronology of some of the domesticated animal bone found on Lithuanian archaeological sites that is considered Neolithic.

[11] As regards the use of the marine curve for calibrating radiocarbon dates, the most recent palaeoenvironmental reconstruction of Šventoji differs from that proposed by Kunskas (Римантене, Кунскас 1984: 30–40). The sedimentation record shows no evidence of a marine effect (Šinkūnas and Stančikaitė, pers. com.).

It is not uncommon for some stratigraphic mixing to occur and it is possible that some of this domesticated bone may actually belong to later time periods. The only way to be absolutely certain of the bones' proper placement in time is to radiocarbon date such uncertain specimens.

Many Lithuanian Neolithic archaeological sites simply do not have radiocarbon dates; among these sites are Kretuonas 1A and 1D, Žeimenis Lake 1, Šventoji 26, Jara 1, 2, 4, Pakretuonė 3 and 4. Another equally important point is that other sites which were clearly long-lived have only one radiocarbon date representing their entire period of existence (for example Žemaitiškė 3B, Šventoji 23). This, too, is a problem; there should always be a series of dates associated with each site. In all cases, it is still crucial to pay attention to the typological material of the sites' entire complex; the radiocarbon dates are important, but not enough. For undated sites, it is unfortunately necessary to base chronology solely on assumed typologies and general datings. This lack of absolute chronology much hampers efforts toward a finer resolution determination of any kind of development.

Another significant problematic twist is that the radiocarbon dates cannot and should not all be judged on the same qualitative level. Many dates obtained in the 1970s and 1980s in East European laboratories have proved to be problematical; due to differences in equipment and chemical preparations, certain Neolithic dates, for example, can show innaccuracies of some 200–400 years (see Timofeev 1992: 11). A degree of caution is required in evaluating older radiocarbon dates from eastern European labs. This point should be markedly stressed, as so many of the "token" East Baltic sites upon whose dating chronological analogies of sites found later are made were dated in the early and problematical time of radiocarbon dating. Dates obtained within the last few years will be typically much more accurate than those obtained a few decades ago, due to improvements in equipment and procedures; the international intercomparisons of dating labs headed by the University of Glasgow within the last decade have demonstrated this (see Buck et al. 1994, Rozanski et al. 1992, Scott et al. 1992a, Scott et al. 1992b, Scott et al. 1998). These intercomparisons are ongoing and offer practical methodological advice to participating dating labs about the required steps to upgrade their dating procedures[12]. Dates obtained by AMS (AMS = Accelerator Mass Spectrometry) labs (i.e., Oxford, Uppsala, CAMS) offer significantly more accurate results than those obtained by standard radiocarbon dating laboratories.

Some labs have considerably more vigorous pretreatments for various contaminations than others. Pretreatment methods that clean out contaminations of modern material are one of the most significant factors in a radiocarbon dating lab's quality assessment. Better labs most often simply have more thorough pretreatment methods (pers. com. with C. B. Ramsey and M. Scott).

Table 2 lists the absolute dates of key East Baltic Neolithic sites (some dates considered the end of the Late Mesolithic in Estonia are included), along with their calibrated BC chronologies. Despite the reluctance of many East Baltic archaeologists of incorporating calibrated chronologies, the ready availability of calibration programs[13] as well as the increased use of calibrated chronologies by other East

[12] The most recent intercomparisons include the Kiev and Vilnius laboratories.

[13] Updated calibration programs are available for downloading from the internet; one such example is that of the Stuiver and Reimer "Calib 4.1.2" program available via Washington University's Quaternary Isotope lab's webpage http://depts.washington.edu/qil/calib/. Another example is the "OxCal" program found on the Oxford laboratory's webpage http://units.ox.ac.uk/depatrments/rlaha/orau/. The Washington laboratory and Cardiff University even offer on-line calibration services.

European scientists and their standard usage by colleagues in the West prompts the significance of incorporating their usage locally. The fact remains that although radiocarbon dating is among the most precise dating methods there is, already since shortly after its discovery in the late 1950s, a need for adjustment or calibration to the results achieved has been indicated.

Despite the apparently discouraging complexity (and expense) of the method, radiocarbon dating is still the most useful tool that archaeologists researching the Stone Age have for solving chronological problems.

Summary

Unclear Neolithic boundaries and recent acquisition of new chronological data motivate the clarification and adjustment of Lithuania's present Neolithic periodization scheme. By the traditional Neolithic criteria, Lithuania's Early Neolithic is now 6550/6300–5600/5400 BP, its Middle Neolithic: 5600/5400–4400/4300 BP, and Late Neolithic: 4400/4300–3500 BP (see Table 1). However, in the interest of increasing globalization and adoption of the most popular criterion defining the Neolithic – a food-producing economy – we employ Zvelebil and Rowley-Conwy's (1984) availability model in suggesting a redefinition of Lithuania's Neolithic. By the availability model, "Neolithization" begins with the substitution phase. Present archaeological, zooarchaeological, and palaeobotanical data together indicate that the very beginning of Neolithization in Lithuania began only during what is now called the Late Neolithic. Qualitative radiocarbon dating is the best means of solving chronologial problems. Calibration of ^{14}C dates is also encouraged (see Table 2). Although some problematic chronology related to Neolithic sites in Lithuania has been clarified, many instances still await clarification.

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Osa	Peat	ЛЕ-810	6580±70	4630±70	5640 (5512, 5498, 5485) 5380	5620–5480	
Osa	Wood	МГУ-1009	6560±440	4610±440	6330 (5506, 5504, 5482) 4500	5870–5040	
Katra 1	Charcoal from hearth	Ki-7642	6550±70	4600±70	5620 (5481) 5370	5610–5470	
Zvidze	Wood	TA-862	6535±60	4585±60	5620 (5480) 5370	5600–5470	
Osa	Burnt wood	Ri-272	6533±120	4583±120	5660 (5479) 5300	5620–5370	
Žemaitiškė 1	Peat	Vs-313	6510±160	4560±160	5720 (5477) 5080	5620–5320	
Zvejnieki gr. 85	Human bone	Ua-3637	**6460±60**	4810±60	5510 (5469, 5432, 5423, 5397, 5391) 5320	5480–5370	Date verified with Ua; error in Zagorska 1994:9 ("6760±60")
Zvidze	Wood	МГУ-1008	6450±250	4500±250	5840 (5468, 5438, 5422, 5399, 5387) 4800	5620–5080	

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Zvidze	Wood	Vs-518	6430±100	4480±100	5610 (5464, 5448, 5418, 5403, 5376) 5150	5480–5300	
Ruhnu II	Charcoal	ЛЕ-5629	6400±170	4450±170	5660 (5366) 4860	5510–5150	
Zvejnieki No 122	Human bone	OxA-5967	6395±75	4445±75	5480 (5364) 5150	5470–5300	
Suļka	Gyttja	ЛЕ-838	6380±120	4430±120	5610 (5358, 5351, 5340, 5329, 5323) 5050	5480–5210	
Pahapil-li I	Charcoal	ЛЕ-5452	6370±180	4420±180	5660 (5336, 5334, 5322) 4850	5480–5080	
Zvidze	Wood, burnt wood	ИГАН-614	6360±40	4410±40	5470 (5320) 5260	5370–5300	
Zvidze	Peat/ gyttja	TA-1746	6350±60	4400±60	5470 (5318) 5150	5460–5300	
Zvidze	Wood charcoal	TA-852	6315±60	4365±60	5470 (5302) 5080	5360–5210	
Zvidze	Wood	TA-883	6260±60	4310±60	5360 (5278, 5273, 5261, 5216, 5215) 5050	5300–5080	
Akali	Charcoal	TA-103	6255±100	4305±100	5470 (5276, 5275, 5260, 5235, 5235, 5216, 5214) 4860	5320–5060	
Võhma I	?	TA-2652	6245±200	4295±200	5610 (5258, 5239, 5233, 5218, 5213) 4710	5470–4860	
Rudnja Sertejs-kaja	Wood	ЛЕ-3054	6240±60	4290±60	5320 (5257, 5241, 5232, 5219, 5213, 5156, 5154) 5000	5300–5080	
Rudnja Sertejs-kaja	Wood	ЛЕ-2568	6230±40	4280±40	5300 (5230, 5221, 5211, 5158, 5151) 5060	5290–5080	
Zvidze	Wood	TA-1593	6210±80	4260±80	5360 (5225, 5225, 5209, 5164, 5145, 5106, 5104, 5086, 5085) 4860	5300–5050	
Zvidze	Wood	TA-1609	6210±70	4260±70	5320 (5225, 5225, 5209, 5164, 5145, 5106, 5104, 5086, 5085) 4870	5300–5050	
Zvidze	Burnt wood	МГУ-1010	6200±240	4250±240	5620 (5208, 5169, 5143, 5110, 5098, 5092, 5082) 4550	5470–4810	
Zvejnieki gr. 251	Human bone	OxA-5987	6195±60	4245±60	5300 (5208, 5173, 5142, 5112, 5095, 5081) 4950	5280–5050	
Zvidze	Burnt wood	TIn-812	6195±40	4245±40	5300 (5208, 5173, 5142, 5112, 5095, 5081) 5000	5260–5060	
Rudnja Sertejs-kaja	Wood	ЛЕ-2569	6180±70	4230±70	5300 (5206, 5177, 5139, 5128, 5077) 4860	5260–5000	

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Kõpu VIII	Hazelnut shells	TIn-2024	6172±50	4222±50	5300 (5205, 5179, 5137, 5131, 5075) 4870	5230–5040	
Zvidze	Wood	TA-1592	6170±70	4220±70	5300 (5204, 5179, 5137, 5131, 5073) 4860	5260–5000	
Ruhnu II	Charcoal	ЛЕ-5627	6150±60	4200±60	5300 (5189, 5184, 5059) 4860	5230–4960	
Zvidze	Nutshells	Vs-521	**6130±100**	4180±100	5310 (5048) 4780	5260–4860	Date verified with Vs; error in Лозе 1988:101 and Тимофеев, Зайцева 1996:338 ("6180±150")
Rudnja Sertejskaja	Wood	ЛЕ-2579	6130±40	4180±40	5230 (5048) 4860	5210–4960	
Zvidze	Wood	TA-1608	6110±80	4160±80	5290 (5036, 5010, 5002) 4800	5210–4860	
Zvidze	Wood	ЛЕ-1724	6080±70	4130±70	5260 (4959) 4780	5190–4850	
Katra 2	Charcoal from hearth	Ki-7645	6080±70	4130±70	5260 (4959) 4780	5190–4850	
Zvidze	Burnt wood	Ri-359	6052±150	4102±150	5320 (4940, 4867, 4862) 4550	5210–4740	
Zvidze	Peat	TA-1798	6050±100	4100±100	5260 (4940, 4867, 4862) 4720	5190–4800	
Riigiküla IV	Charcoal	TIn-1989	6023±95	4073±95	5230 (4910, 4871, 4856) 4690	5040–4780	
Narva Joaoru	Layer 2, bone	TA-17	6020±120 6073±129#	4070±120	5280 (4909, 4872, 4855) 4620 5310 (4955) 4690	5060–4740 5210–4800	
Katra 2	Hearth charcoal	Ki-7643	6020±70	4070±70	5200 (4909, 4872, 4855) 4720	5000–4800	
Kunda		TA-16	6015±210	4065±210	5470 (4906, 4885, 4884, 4873, 4854) 4400	5230–4630	
Zvejnieki gr. 182	Human bone	OxA-5970	6005±75	4055±75	5190 (4903, 4888, 4878, 4874, 4852) 4720	4980–4780	
Zedmar A	Wooden post	ЛЕ-1270	6000±90	4050±90	5210 (4901, 4889, 4876, 4875, 4851, 4815) 4690	5000–4740	
Zvidze	?	TA-1782	5990±60	4040±60	5040 (4899, 4891, 4848, 4817, 4813) 4720	4940–4780	
Katra 2	**Burnt bones**	Ki-7644	5950±70	4000±70	5000 (4830, 4823, 4804) 4690	4910–4720	δ13C estimate uncertain
Suļka	Gyttja	ЛЕ-837	5940±95	3990±95	5050 (4825, 4800) 4550	4940–4710	

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Rudnja Sertejskaja	Wood	ЛЕ-2566	5940±60	3930±80	4940 (4825, 4800) 4690	4900–4720	
Rudnja Sertejskaja	Wood	ЛЕ-4101	5940±45	3900±70	4920 (4825, 4800) 4720	4900–4730	
Zvidze	Wood charcoal	TA-1810	5870±60	3870±200	4900 (4769, 4753, 4721) 4550	4780–4690	
Osa	Wooden object	ЛЕ-961	5880±80	3830±70	4940 (4771, 4751, 4724) 4540	4840–4620	
Rudnja Sertejskaja	Wood	ЛЕ-4100	5850±70	3830±50	4900 (4765, 4763, 4716) 4540	4800–4620	
Narva Joaoru	Top layer	TA-33	5820±200	3820±60	5230 (4707, 4702, 4692) 4253	4910–4460	
Osa	Wood	ЛЕ-962	5780±70	3820±60	4800 (4671, 4659, 4651, 4639, 4618) 4460	4770–4540	
Rudnja Sertejskaja	Wood	ЛЕ-2577	5780±50	3795±65	4770 (4671, 4659, 4651, 4639, 4618) 4470	4710–4550	
Rudnja Setejskaja	Wood	ЛЕ-2570	5770±60	3780±50	4770 (4667, 4663, 4646, 4644, 4616) 4460	4710–4540	
Zvidze	Wood	TA-1818	5770±60	3748±70	4770 (4667, 4663, 4646, 4644, 4616) 4460	4710–4540	
Zvejnieki gr. 153	Human bone	OxA-5967	5745±65	3740±45	4770 (4579, 4571, 4552) 4410	4690–4500	
Osa	Wood	ЛЕ-850	5730±50	3710±45	4770 (4548) 4460	4670–4470	
Kõpu I	Charcoal	TIn-1901	5698±70	3674±115	4770 (4535, 4533, 4524, 4507, 4504) 4360	4670–4460	
Zvejnieki gr. 300	Human bone	Ua-3642	5690±45	3660±60	4670 (4519, 4511, 4501) 4400	4550–4460	
Zvejnieki gr. 210	Human bone	OxA-5985	5660±45	3654±52	4600 (4492, 4473, 4462) 4360	4540–4410	
Riigiküla IV	Hearth charcoal	TIn-1990	5624±115	3630±65	4770 (4457) 4250	4550–4340	
Rudnja Sertejskaja	Wood	ЛЕ-5680	5610±60	3620±70	4550 (4455, 4415, 4412) 4340	4500–4360	
Kõpu I	Wood charcoal (N/14-16)	TIn-1873	5604±52	3590±60	4540 (4453, 4417, 4406) 4340	4490–4360	After Kriiska 1995:415
Kretuonas 1B gr. 3	Human bone	OxA-5926	5580±65	3580±110	4540 (4446, 4421, 4398, 4381, 4367) 4260	4490–4350	
Rudnja Sertejskaja	Wood	ЛЕ-2580	5570±70	3580±90	4540 (4439, 4423, 4363) 4260	4460–4340	
Dudka 1	Grease from pottery	Gd-5365	5540±60	3580±40	4490 (4357) 4250	4450–4340	

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Dakta-riškė 5	Charred wooden stake	Vs-808	5530±110	3560±60	4580 (4354) 4050	4460–4250	
Usvjaty IVB	Wood	ЛЕ-651	5530±90	3560±70	4540 (4354) 4170	4460–4260	
Rudnja Sertejs-kaja	Wood	ЛЕ-2573	5530±40	3540±65	4460 (4354) 4260	4440–4340	
Žemai-tiškė 3B	Wood	BIn-2594	5510±60	3540±45	4460 (4345) 4250	4440–4260	
Zvidze	**Wood**	TA-1799	5510±70	3530±60	4490 (4345) 4170	4450–4260	In Лозе, Лийва 1989:55 is peat; in Тимофеев, Зайцева 1996:338 is wood
Rudnja Sertejs-kaja	Wood	ЛЕ-4102	5490±65	3519±111	4460 (4340) 4170	4430–4250	
Rudnja Sertejs-kaja	Wood	ЛЕ-4101	5490±45	3514±96	4450 (4340) 4250	4360–4260	
Rudnja Sertejs-kaja	Wood	ЛЕ-3000	5480±60	3500±75	4450 (4338) 4170	4360–4250	
Riigiküla XI	Charcoal	TIn-1890	5469±111	3490±90	4520 (4335) 4000	4450–4170	
Kõpu I	Wood charcoal	TIn-1898	5464±96	3490±80	4490 (4334) 4040	4430–4170	After Kriiska 1995:415
Zacenje	Peat	ЛЕ-960	5450±75	3460±90	4450 (4331, 4268, 4263) 4050	4350–4230	
Zedmar A	Charcoal	ЛЕ-1269	5440±90	3450±150	4460 (4328, 4273, 4260) 4040	4360–4170	
Zvidze	Peat	TA-1594	5440±80	3440±40	4450 (4328, 4273, 4260) 4050	4350–4170	
Zvejnieki gr. 252	Human bone	OxA-5988	5410±90	3440±60	4450 (4320, 4294, 4252) 4000	4340–4050	
Ruhnu II	Charcoal (quad. 1)	ЛЕ-5628	5400±150	3420±68	4540 (4317, 4300, 4250) 3940	4360–4000	
Rudnja Sertejs-kaja	Wood	ЛЕ-3020	5390±40	3410±130	4340 (4248) 4050	4330–4170	
Rudnja Sertejs-kaja	Wood	ЛЕ-3001	5390±60	3410±70	4350 (4248) 4040	4330–4050	
Kõpu I	Wood charcoal (N-O/24-25)	TIn-1871	5370±68	3410±65	4350 (4229) 4000	4330–4050	After Kriiska 1995:415
Zedmar D	Organic residue on pottery	Ua-2383	5360±130	3400±130	4460 (4224, 4178, 4172) 3940	4340–4000	

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Katra 2	Charcoal from pit	Ki-7646	5360±70	3410±70	4340 (4224, 4178, 4172) 3990	4330–4050	
Kretuonas 1B gr. 1	Human bone	OxA-5935	5350±130	3400±130	4460 (4223, 4182, 4168) 3830	4340–3990	
Kõpu I	Wood charcoal	TA-1493	5330±90	3380±90	4350 (4221, 4192, 4163, 4118, 4112, 4056, 4055) 3960	4320–4000	After Kriiska 1995:415
Zvidze	Peat/ gyttja	TA-1800	5320±50	3370±50	4330 (4220, 4196, 4161, 4121, 4109, 4093, 4078, 4060, 4053) 3990	4230–4040	
Tamula gr. 11	Human bone	Ua-4828	5310±85	3360±85	4340 (4219, 4198, 4159, 4148, 4143, 4124, 4107, 4100, 4067, 4064, 4051) 3960	4320–4000	
Narva Joaoru	Top layer wood charcoal	TA-7	5300±250	3350±250	4690 (4218, 4200, 4157, 4151, 4141, 4127, 4049) 3540	4360–3800	
Zedmar A	Gyttja bottom layer	BIn-2163	5300±60	3350±60	4320 (4218, 4200, 4157, 4151, 4141, 4127, 4049) 3980	4220–4000	
Zvejnieki gr. 206	Human bone	Ua-3643	5285±50	3335±50	4310 (4216, 4202, 4137, 4132, 4046) 3980	4220–4000	
Zedmar D	Burnt organ. residue on pottery	Ua-2384	5280±80	3330±80	4330 (4216, 4203, 4136, 4134, 4045) 3960	4220–3980	
Zvejnieki gr. 124	Human bone	Ua-3639	5280±55	3330±55	4320 (4216, 4203, 4136, 4134, 4045) 3970	4220–4000	
Zedmar A	Bottom layer charcoal	BIn-2162	5280±50	3330±50	4250 (4216, 4203, 4136, 4134, 4045) 3980	4220–4000	
Riigiküla XII	Charcoal	TIn-1992	5268±58	3318±58	4250 (4043) 3960	4220–3980	
Sulka	Peat	ЛЕ-836	5260±70	3310±70	4320 (4042) 3960	4220–3980	Below cultural layer Лозе 1982:41
Zedmar D	Burnt organ. residue on pottery	Ua-2382	5230±100	3280±100	4330 (4038, 4021, 3997) 3800	4220–3960	
Zvejnieki gr. 185	Human bone	Ua-3641	**5230±65**	3280±65	4230 (4038, 4021, 3997) 3940	4220–3970	Date verified with Ua; error in Zagorska 1994:9 ("5200±65")
Zedmar D	Burnt organ. res. on pot.	Ua-2375	5180±100	3230±100	4250 (3977) 3710	4220–3820	

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Zedmar D	Wood charcoal	ЛЕ-3176	5170±70	3220±70	4220 (3973) 3800	4041–3940	
Zedmar D	Wood charcoal	ЛЕ-3388	5150±100	3200±100	4220 (3964) 3710	4040–3800	
Zedmar A	Bottom layer charcoal	ЛЕ-3923	5130±100	3180±100	4220 (3960) 3700	4040–3800	
Zedmar D	Burnt org. res. on pot.	Ua-2376	5120±100	3170±100	4220 (3958) 3670	4040–3790	
Usvjaty IVB	Wood	ЛЕ-4113	5120±80	3170±80	4220 (3958) 3710	3980–3800	
Zedmar A	Top layer charcoal	Bln-2165	5120±50	3170±50	4040 (3958) 3790	3970–3810	
Šventoji 4B	Wood from stake	Vs-811	5110±110	3160±110	4220 (3956) 3660	4040–3780	
Zvejnieki gr. 225	Human bone	OxA-5986	5110±45	3160 ± 45	3980 (3956) 3790	3970–3800	
Zedmar D	Burnt org. res. on pot.	Ua-2380	5100±100	3150±100	4220 (3944) 3660	3980–3780	
Zvejnieki gr. 282	Human bone	Ua-3645	5100±65	3150±65	4040 (3944) 3710	3970–3800	
Zedmar A	Top layer charcoal	ЛЕ-1389	5100±60	3150±60	4040 (3944) 3710	3970–3800	
Zedmar A	2nd gyttja sublayer	Bln-2164	5100±50	3150±50	3980 (3944) 3780	3960–3800	
Zedmar D	Wood charcoal	ЛЕ-3174	5090±50	3140±50	3980 (3942) 3770	3960–3800	
Zedmar D	Wood charcoal	ЛЕ-3924	5070±150	3120±150	4230 (3937, 3876, 3871, 3862, 3807) 3540	4040–3670	
Sārnate dwelling M	Burnt res. on pot.	Ua-15984	5065±75	3115±75	4040 (3936, 3877, 3866, 3865, 3804) 3660	3960–3770	
Zedmar D	Burnt org. res. onpot.	Ua-2377	5030±100	3080±100	4040 (3888, 3883, 3797) 3640	3960–3700	
Spiginas gr. 1	Human bone	ГИН-5569	5020±200 5073±206#	3070±200	4320 (3793) 3370 4340 (3938, 3875, 3875, 3860, 3811) 3380	4040–3640 4220–3650	Butrimas 1992:5 doubts date
Katra 1	Charcoal from pit	Ki-7635	4990±80	3040±80	3960 (3772) 3640	3940–3660	
Zedmar D	Wood charcoal	ЛЕ-3173	4990±45	3040±45	3940 (3772) 3660	3890–3710	
Osa	Wood charcoal	ЛЕ-798	4970±50	3020±50	3940 (3757, 3743, 3727, 3724, 3712) 3650	3790–3670	
Dudka 1	?	Gd-2878	4960±90	3010±90	3960 (3710) 3540	3910–3650	

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Zedmar D	Bumt org. res. onpot.	Ua-2378	4950±90	3000±90	3960 (3708) 3540	3890–3650	
Zedmar A	Charcoal	ЛЕ-1268	4955±110	3005±110	3980 (3709) 3520	3930–3640	
Šventoji 4	Bottom gyttja layer	T-13524A	4930±55	2980±55	3910 (3703) 3640	3770–3650	
Zedmar A	Top layer charcoal	ЛЕ-1388	4920±80	2970±80	3940 (3698, 3675, 3674) 3540	3780–3640	
Šventoji 4B	Wooden bridge stake	Vs-633	4910±110	2960±110	3960 (3690, 3682, 3663) 3380	3790–3540	
Zvejsa-la	Wood	TA-395	4905±70	2955±70	3910 (3662) 3540	3760–3640	
Zedmar A	Bottom layer charcoal	ЛЕ-1387	4900±80	2950±80	3940 (3660) 3520	3760–3640	
Zedmar D	Wood charcoal	ЛЕ-3926	4890±100	2940±100	3940 (3657) 3380	3770–3540	
Zedmar D	Wood charcoal	ЛЕ-3179	4880±50	2930±50	3770 (3653) 3540	3700–3640	
Švento-ji 4	Freshwa-ter fishbo-ne, bot. gyttja	TUa-2076	4875±65	2925±65	3780 (3652) 3520	3710–3640	
Utinoje Boloto	Wood charcoal	ЛЕ-1237	4870±230	2920±230	4220 (3650) 3020	3940–3370	
Dudka 1	?	Gd-2593	4870±110	2920±110	3940 (3650) 3370	3760–3540	
Zedmar A	Bottom layer charcoal	ЛЕ-1386	4870±80	2920±80	3890 (3650) 3380	3710–3540	
Usvjaty IVB	Wood	ЛЕ-256	4870±40	2920±40	3710 (3650) 3540	3690–3640	
Kääpa	Peat, bot-tom Nar-va c. lyr.	TA-5	4865±235	2915±235	4220 (3648) 3020	3940–3370	
Kudru-küla (grave No ?)	Bone	CAMS-6266	4860±60	2910±60	3770 (3647) 3520	3700–3540	
Zapsė 5	Wood from pit	Vs-977	4860±260	2910±260	4250 (3647) 2920	3960–3360	
Kääpa	Peat	TA-5	4850±235	2900±235	4220 (3644) 2930	3940–3370	
Suļka	Peat	ЛЕ-834	4850±60	2900±60	3760 (3644) 3520	3690–3540	
Zedmar D	Burnt org. res. on pot.	Ua-2379	4840±100	2890±100	3890 (3643) 3370	3710–3520	
Kudrukü-la	Seal bone	Ua-4827	4835±100	2885±100	3890 (3642) 3370	3710–3520	
Usvjaty IVB	Wood from pile dwel.	TA-242	**4830±30**	2880±30	3660 (3641) 3540	3650–3540	After Микляев 1992:29

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Zedmar D	Burnt org. res.on pot.	Ua-2381	4810±100	2860±100	3790 (3638) 3370	3690–3380	
Kudrukü-la	Human bone	CAMS-6265	4770±60	2820±60	3660 (3630, 3578, 3569, 3562, 3538) 3370	3640–3380	
Serteja VIII	Wood	ЛЕ-4112	4760±200	2810±200	3970 (3628, 3582, 3536) 2920	3710–3350	
Kääpa	Wood	**TA-478**	4760±80	2810±80	3700 (3628, 3582, 3536) 3360	3640–3380	After Тимофеев 1996:338
Kudrukü-la	Seal bone	Ua-4826	4750±100	2800±100	3710 (3625, 3588, 3525) 3350	3640–3370	
Zvidze	Peat or gyttja	TA-1801	4750±60	2800±60	3650 (3625, 3588, 3525) 3370	3640–3380	
Kääpa	?	TA-724	4740±60	2790±60	3650 (3622, 3600, 3523) 3370	3640–3380	After Тимофеев 1996:338
Zedmar A	Gyttja 2nd sublayer	ЛЕ-1319	4730±140	2780±140	3790 (3618, 3608, 3521) 3100	3650–3360	
Šventoji 2B	Wood	LJ-2523	4730±110	2780±110	3710 (3618, 3608, 3521) 3120	3640–3370	
Dubokraj V	Wood	ЛЕ-3003	4720±40	2770±40	3640 (3519) 3370	3630–3380	
Sārnate T/V	Bone	TA-26	4700±250 4753+255#	2750±250	3980 (3513, 3412, 3383) 2880 4040 (3626, 3585, 3528) 2880	3710–3100 3790–3100	
Piestiņa	Peat	ЛЕ-750	4670±150	2720±150	3760 (3499, 3457, 3435, 3377) 2920	3640–3140	
Sārnate S	Wood	TA-265	4630±70	2680±70	3630 (3485, 3474, 3370) 3100	3520–3350	
Žemaitiškė 3B	Charcoal	ЛЕ-4213	4660±350	2710±350	4220 (3497, 3463, 3376) 2470	3790–2910	
Kääpa	Peat	TA-815	4640±100	2690±100	3640 (3490, 3471, 3372) 3040	3620–3350	
Šventoji **1B**	Wood	**LJ-2628**	4640±60	2690±60	3630 (3490, 3471, 3372) 3140	3520–3360	After Gimbutas 1991:468; in Rimantienė 1996:149 is LJ-2528; in Тимофеев 1996:338 is LJ-2523
Sārnate N/S/L	Wood	BIn-769	4640±100	2690±100	3640 (3490, 3471, 3372) 3040	3620–3350	
Nida	Wood in pit bottom	Vs-321	4630±120	2680±120	3650 (3485, 3474, 3370) 2940	3630–3120	
Sārnate S	Wood	TA-265	4630±70	2680±70	3630 (3485, 3474, 3370) 3100	3520–3350	
Nida	Hearth 24; wood charcoal, plot 1	Vs-631	4620±110	2670±110	3640 (3368) 3020	3620–3120	
Serteja VIII	Wood	ЛЕ-4110	4620±200	2670±200	3790 (3368) 2880	3640–3030	

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Serteja VIII	Wood	ЛЕ-4108	4590±130	2640±130	3640 (3360) 2920	3520–3100	
Usvjaty IVB	Wood from pile dwel.	TA-105	4570±70	2620±70	3520 (3355) 3030	3490–3110	
Švento-ji 4	Top gytt-ja col. Sample	T-13523A	4545±80	2595±80	3520 (3347) 2930	3370–3100	
Zvidze	Wood	TA-674	4540±60	2590±60	3500 (3345) 3030	3360–3100	
Švento-ji 4	Dogbone in birch-bark vessel	TUa-2075	4530±65	2580±65	3500 (3340, 3206, 3201, 3148, 3142) 3020	3360–3100	
Švento-ji 6	Trans sand + bottom gyttja	T-13525A	4530±75	2580±75	3500 (3340, 3206, 3201, 3148, 3142) 2930	3370–3100	
Piesti-ņa	Wood	ЛЕ-748	4520±120	2570±120	3630 (3335, 3210, 3191, 3152, 3137) 2890	3490–3020	
Sārnate N/S/L	Wood	ЛЕ-814	4510±110	2560±110	3620 (3331, 3214, 3186, 3156, 3123) 2900	3370–3020	
Usvjaty IV B	Wood from pile dwel.	TA-244	4510±70	2560±70	3500 (3331, 3214, 3186, 3156, 3123) 2920	3360–3040	
Abora I	Charcoal	TA-2144	4490±80	2540±80	3500 (3311, 3236, 3170, 3161, 3116, 3114, 3103) 2920	3360–3020	
Sārnate Y	Wood charcoal	TA-24	4490±250	2540±250	3770 (3311, 3236, 3170, 3161, 3116, 3114, 3103) 2470	3620–2880	
Kääpa	Elk bone	TA-6	4480±225 4533±230#	2530±225	3700 (3263, 3239, 3167, 3164, 3101) 2500 3780 (3342, 3147, 3143) 2580	3520–2880 3630–2900	
Švento-ji 4	Kull, bot. gyttja	TA-2637	4480±80	2530±80	3490 (3263, 3239, 3167, 3164, 3101) 2910	3350–3020	
Švento-ji 1B	Wood	ИГАН-12	4470±40	2520±40	3350 (3259, 3243, 3099) 2930	3330–3030	
Nida	Hearth 46, wood charcoal, plot 2	Vs-632	4460±110	2510±110	3500 (3097) 2880	3360–2920	
Usvjaty IVB	Wood	ЛЕ-2585	4440±60	2490±60	3350 (3090, 3057, 3044) 2910	3330–2930	
Zvidze	**Peat or gyttja**	TA-1802	4430±50	2480±50	3340 (3084, 3064, 3033) 2920	3260–2930	in **Loze 1988:109**; Тимофеев, Зайцева 1996:338 in-dicate wood

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Žemaitiškė 1	Wood	BIn-2593	4420±60	2470±60	3350 (3081, 3068, 3029) 2900	3260–2920	
Šventoji 3B	Wood	Vib-9	4410±70	2460±70	3350 (3078, 3071, 3025) 2890	3260–2920	
Šventoji 2B	Wood, bottom cult. Layer	Vs-23	4400±55	2450±55	3330 (3021) 2900	3100–2920	
Šventoji 1B	Wood	TA-247	4400±90	2450±90	3360 (3021) 2880	3310–2910	
Iča	Wood	TA-2247	4390±80	2440±80	3350 (3017, 2977, 2971, 2947, 2940) 2880	3260–2910	
Zvidze	Wood	TA-675	4370±80	2420±80	3340 (3005, 3002, 2923) 2880	3100–2900	
Daktariškė 5B	Wood stake 3	Vs-809	4360±90	2410±90	3350 (2921) 2710	3100–2890	
Šventoji 4	Stake	BIn-4385	4360±50	2410±50	3260 (2921) 2880	3080–2910	
Kääpa	Burnt wood	TA-4	4350±220	2400±220	3640 (2919) 2410	3360–2640	
Zedmar D	Wood	Ta-1173	4350±80	2400±80	3330 (2919) 2760	3080–2890	
Šventoji 4	Birchbark vessel	TUa-2636	4315±70	2365±70	3100 (2909) 2710	3020–2880	
Usvjaty IVB	Wood	ЛЕ-243	4310±80	2360±80	3260 (2906) 2700	3020–2880	
Šventoji 4	Burnt wood, quad.31z, 1.5 m	Vs-956	4305±70	2355±70	3100 (2904) 2700	3010–2880	
Tamula	Wood	TA-237	4300±70	2350±70	3090 (2902) 2700	3010–2880	
Zedmar D	Wood	ЛЕ-3169	4300±40	2350±40	3020 (2902) 2880	2920–2880	
Šventoji	Wood, quad 4, 1.5 m	Vs-812	4290±90	2340±90	3260 (2898) 2610	3010–2880	
Plinkaigalis gr. 242	Human bone	OxA-5936	4280±75	2330±75	3090 (2893) 2640	2920–2880	
Loona	Seal bone	Ua-4824	4270±75	2320±75	3080 (2888) 2630	2920–2790	
Krivina	Wood charcoal	GrN-5125	4270±40	2320+40	2920 (2888) 2720	2910–2880	
Turlojiškė	Gyttja, 102-107 cm	Vs-1162	4265±230	2315±230	3620 (2885) 2200	3330–2500	
Šarnelė	Wood	Vs-318	4260±90	2310±90	3090 (2884) 2580	2970–2700	
Zedmar D	Wood charcoal	ЛЕ-1343	4260±80	2310±60	3080 (2884) 2600	2920–2710	
Abora 1	Charcoal	TA-2145	4250±100	2300±100	3100 (2883) 2500	2920–2700	
Piestiņa	Peat	ЛЕ-867	4250±50	2300±50	2920 (2883) 2700	2900–2880	

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Zedmar D	Wood	ЛЕ-3171	4250±40	2300±40	2920 (2883) 2700	2900–2880	
Zedmar D	Wood charcoal	ЛЕ-1176	4240±90	2290±90	3080 (2882) 2580	2920–2700	
Švento-ji 4	Wood, quad. 30ž-x	Vs-968	4230±90	2280±90	3080 (2880) 2500	2910–2680	
Švento-ji 1B	Wood	ЛЕ-904	4225±70	2275±70	2920 (2879) 2580	2900–2700	
Usvjaty IVB	Wood from pile dwel.	TA-202	**4210±70**	2260±70	2920 (2877) 2580	2890–2680	After Микляев 1992: 29; in Тимофеев, Зайцева 1996:338 is 4230±70
Zedmar D	Wood	ЛЕ-3170	4210±45	2260±45	2900 (2877) 2620	2880–2700	
Švento-ji 4	Wood, under turf	Vs-957	4200±50	2250±50	2900 (2876) 2600	2880–2700	Error in Rimantienė 1999:283
Švento-ji 23	Wood	Vib-1	4190±80	2240±80	2920 (2873, 2800, 2784) 2500	2890–2620	
Zedmar D	Wood charcoal	ЛЕ-848	4180±50	2230±50	2900 (2866, 2805, 2781, 2769, 2762, 2717, 2710) 2580	2880–2640	
Tamula	?	TA-219	4180±100	2230±100	3010 (2866, 2805, 2781, 2769, 2762, 2717, 2710) 2470	2890–2580	
Nainieks-te	Peat	ЛЕ-648	4170±130	2220±130	3080 (2863, 2808, 2777, 2773, 2759, 2719, 2705) 2410	2900–2500	
Švento-ji 6	Upright wood stake	Vs-499	**4170±110**	2220±110	3020 (2863, 2808, 2777, 2773, 2759, 2719, 2705) 2470	2890–2580	Error in Rimantienė 1999:276, 1998:213
Zedmar D	Wood	ЛЕ-3177	4170±45	2220±45	2890 (2863, 2808, 2777, 2773, 2759, 2719, 2705) 2580	2880–2640	
Serteja 2	Wood from pile dwel.	TA-817	4150±80	2200±80	2910 (2858, 2812, 2745, 2724, 2698) 2470	2880–2580	
Švento-ji 4	Wood	T-11004	4145±80	2195±80	2900 (2857, 2813, 2736, 2725, 2697) 2470	2880–2580	
Katros ištakos	Charcoal	Ki-7620	4135±65	2185±65	2890 (2843, 2815, 2673) 2490	2880–2580	
Naaka-mäe (grave No ?)	Human bone	Ua-4822	4125±85	2175±85	2900 (2837, 2818, 2664, 2647, 2638) 2470	2880–2500	
Švento-ji 4	Wood stake, quad. 26u	Vs-967	4120±110	2170±110	2920 (2834, 2819, 2662, 2648, 2625) 2350	2880–2500	

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Zedmar D	Wood	ЛЕ-3992	4120±100	2170±100	2910 (2834, 2819, 2662, 2648, 2625) 2460	2880–2500	
Ič̆a	Wood	TA-2143	4120±90	2170±90	2900 (2834, 2819, 2662, 2648, 2625) 2460	2880–2500	
Švento-ji 1A	?	TA-246	4120±80	2170±80	2890 (2834, 2819, 2662, 2648, 2625) 2470	2880–2500	
Serteja 2	Wood from pile dwel.	TA-633	4120±60	2170±60	2880 (2834, 2819, 2662, 2648, 2625) 2480	2870–2580	
Usvjaty IVA/B	Wood from pile dwel.	TA-203	**4110±70**	2160±70	2880 (2829, 2822, 2659, 2651, 2623) 2470	2870–2500	In Микляев 1992:30 is 4100±70
Švento-ji 1B	Wood	ЛЕ-833	4100±60	2150±60	2880 (2656, 2654, 2622, 2607, 2602) 2470	2860–2500	
Švento-ji 1A	Wood, top cult. Lyr.	Vs-22	4100±100	2150±100	2900 (2656, 2654, 2622, 2607, 2602) 2350	2880–2490	
Serteja 2	Wood stake	TA-632	4090±60	2140±60	2880 (2620, 2609, 2599, 2586, 2585) 2470	2860–2500	
Spiginas gr. 2	Human bone	ГИМ-5570	4080±120	2130±120	2910 (2618, 2611, 2596, 2593, 2582) 2290	2880–2470	
Nainieks-te	?	TA-219	4080±100	2130±100	2890 (2618, 2611, 2596, 2593, 2582) 2350	2870–2470	
Serteja 2	Wood	TA-632	4080±60	2130±60	2880 (2618, 2611, 2596, 2593, 2582) 2470	2860–2500	
Dubo-kraj V	Wood	ЛЕ-2999	4080±40	2130±40	2860 (2618, 2611, 2596, 2593, 2582) 2470	2830–2500	
Nida	Hearth 56	BIn-2592	4070±50	2120±50	2860 (2617, 2613, 2580) 2470	2830–2500	
Širmės kalnas	Wood	Vs-319	4070±80	2120±80	2880 (2617, 2613, 2580) 2410	2860–2470	
Švento-ji 6	Wood	Vs-500	4070±110	2120±110	2900 (2617, 2613, 2580) 2290	2870–2470	
Loona	Boar/ pig bone	Ua-4825	4050±80	2100±80	2880 (2575, 2508, 2504) 2350	2840–2470	
Katra	Charcoal	Ki-7619	4060±70	2110±70	2880 (2615, 2615, 2578) 2460	2840–2470	
Su̯ka	Wood	ЛЕ-752	4060±60	2110±60	2870 (2615, 2615, 2578) 2460	2830–2480	
Tamula settle-ment	Elk bone	TA-28	4050±180 4103±186#	2100±180	3080 (2575, 2508, 2504) 2040 3260 (2826, 2824, 2657, 2653, 2622, 2606, 2603) 2140	2880–2310 2900–2460	

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Plinkaigalis gr. 241	Human bone	OxA-5928	4030±55	2080±55	2860 (2568, 2518, 2499) 2460	2620–2470	
Naumovo	Wood	ЛЕ-1007	4030±50	2080±50	2840 (2568, 2518, 2499) 2460	2620–2470	
Kreiči	Wood	TA-8	4020±300	2070±300	3370 (2564, 2522, 2497) 1690	2910–2070	
Daktariškė 5	Wood	Vs-813	4020±100	2070±100	2880 (2564, 2522, 2497) 2210	2830–2460	
Zedmar D	Wood	ЛЕ-1181	4020±80	2070±80	2870 (2564, 2522, 2497) 2300	2830–2460	
Eiņi	Wood	ЛЕ-751	4000±60	2050±60	2840 (2551, 2541, 2491) 2350	2620–2460	
Osa	Wood	ЛЕ-758	4000±60	2050±60	2840 (2551, 2541, 2491) 2350	2620–2460	
Leimaniški	?	TA-23	3970±250	2020±250	3260 (2470) 1750	2880–2070	
Riigiküla XIV	Charcoal	TA-2680	3970±100	2020±100	2860 (2470) 2150	2620–2310	
Naumovo	Wood	TA-583	3955±70	2005±70	2660 (2467) 2210	2570–2350	
Naumovo	Wood from pile dwel.	TA-583	3945±70	1995±70	2620 (2465) 2200	2560–2340	
Usvjaty IVB	Wood	ЛЕ-649	3920±90	1970±90	2830 (2460) 2140	2560–2240	
Naumovo	Wood	TA-466	3905±70	1955±70	2580 (2456, 2419, 2405, 2355, 2355) 2150	2470–2290	
Zedmar D	Wood	ЛЕ-3168	3890±60	1940±60	2560 (2401, 2378, 2350) 2150	2470–2240	
Krivina 1	Peat	ЛЕ-757	3880±60	1930±60	2550 (2398, 2382, 2346) 2140	2470–2210	
Osovec II	Wood charcoal	ЛЕ-936	3880±80	1930±80	2570 (2398, 2382, 2346) 2070	2470–2200	
Zedmar D	Wood charcoal	ЛЕ-3925	3870±290	1920±290	3100 (2395, 2391, 2338, 2318, 2313) 1530	2860–1920	
Abora	Peat	ЛЕ-671	3870±70	1920±70	2560 (2395, 2391, 2338, 2318, 2313) 2140	2470–2200	
Naumovo (Dubokrai)	Wood; ski fragment (quad. 9)	ЛЕ-2840	3870±40	1920±40	2470 (2395, 2391, 2338, 2318, 2313) 2200	2460–2240	
Šventoji 1A	Wood; depth 0.4-0.8 m	ЛЕ-835	3860±50	1910±50	2470 (2305) 2140	2460–2210	
Šventoji 9	Wood	**Vib-1**	3860±90	1910±90	2570 (2305) 2035	2470–2150	In Rimantienė 1996:149 (Šventoji 23) and Rimantienė 1980:7 (Šventoji 9) are Vib-1.

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Abora	Peat	ЛЕ-749	3860±100	1910±100	2620 (2305) 1980	2470–2140	
Naumo-vo	Wood charcoal	TA-469	3860±60	1910±60	2470 (2305) 2140	2460–2200	
Naumo-vo	Wood	TA-462	3830±60	1880±60	2470 (2287, 2246, 2239) 2050	2400–2150	
Naumo-vo	Wood	ЛЕ-2833	3830±40	1880±40	2460 (2287, 2246, 2239) 2140	2400–2200	
Kunda	Bone (unid. species)	Ua-3004	3805±130	1855±130	2620 (2273, 2255, 2227, 2223, 2204) 1830	2460–2030	
Naumo-vo	Wood	TA-467	3800±80	1850±80	2470 (2270, 2258, 2225, 2225, 2203) 1980	2400–2070	
Krivina 1	Wood	ЛЕ-1062	3800±60	1850±60	2460 (2270, 2258, 2225, 2225, 2203) 2040	2310–2140	
Naumo-vo	Wood	ЛЕ-2675	3790±40	1840±40	2400 (2202) 2050	2290–2140	
Švento-ji 4	Kull	TA-2638	3780±100	1830±100	2470 (2200) 1920	2400–2040	
Leima-niški	?	TA-27	3770±200	1820±200	2860 (2198, 2160, 2150) 1640	2470–1890	
Abora	Wood	TA-60	3770±70	1820±70	2460 (2198, 2160, 2150) 1980	2290–2040	
Daktariš-kė 1	Peat, No 3	Vs-363	3770±110	1820±110	2490 (2198, 2160, 2150) 1880	2400–1980	
Abora	Wood stake	TA-394	3770±60	1820±60	2400 (2198, 2160, 2150) 1980	2290–2050	
Žemai-tiškė 1	Wood	Vs-312	3710±100	1760±100	2460 (2135, 2079, 2056) 1780	2280–1950	
Naumo-vo	Wood from pile dw.	ЛЕ-816	3700±70	1750±70	2290 (2129, 2082, 2043) 1890	2200–1980	
Naumo-vo	Wood from pile dw.	ЛЕ-1004	3690±70	1740±70	2290 (2121, 2097, 2039) 1840	2200–1960	
Lagaža	Wood	TA-749	3685±80	1735±80	2290 (2115, 2099, 2038) 1830	2200–1940	
Papiškė 4A	Charcoal	T-10602	3685±75	1735±75	2290 (2115, 2099, 2038) 1830	2200–1950	
Šakės	Charcoal	ЛЕ-3710	3680±350	1730±350	3010 (2111, 2101, 2036) 1130	2570–1620	
Švento-ji 6	Wood; quad.16h, depth 0.5 m	ЛЕ-2602	3670±40	1720±40	2200 (2033) 1920	2140–1980	
Lagaža	Wood	TA-396	3640±70	1690±70	2200 (2018, 1996, 1980) 1780	2140–1890	
Naumo-vo	Wood	TA-634	3650±70	1700±70	2270 (2027, 1992, 1982) 1780	2140–1920	
Naumo-vo	Wood from pile dw.	TA-756	3620±80	1670±80	2200 (2008, 2003, 1976, 1969, 1962) 1740	2130–1830	TA-765 in Долуханов, Микляев 1985:84

Site	Sample material	Lab. No	14C date / Age (BP)	Uncalib. bc date	Calibrated BC, 2σ Maximum (calibr. age) minimum*	Calibrated 1 σ** range	Notes
Veršvai	Wood from stumps	Vs-648	3620±60	1670±60	2140 (2008, 2003, 1976, 1969, 1962) 1780	2110–1890	
Tamula	Wooden stake	TA-10	3600±180	1650±180	2470 (1943) 1520	2200–1690	
Villa I	Elk bones	TA-20	3570±240	1620±240	2580 (1916, 1895, 1895) 1320	2280–1620	
			3623±245#		2830 (2009, 2002, 1976) 1410	2340–1670	
Turlojiškė, gr. 2	Human bone	Vs-1097	3570±130	1620±130	2290 (1916, 1895, 1895) 1530	2130–1740	
Žemaitiškė 2	Creel wood	Vs-311	3570±120	1620±120	2280 (1916, 1895, 1895) 1620	2120–1740	
Kunda	Bone, sea eagle	Ua-3053	3555±55	1605±55	2030 (1884) 1740	1950–1780	
Žemieji Kaniukai	Hearth 24, wood	Vs-324	3540±90	1590±90	2140 (1882, 1836, 1834) 1640	2010–1740	
Šventoji 9	?	Ki-7617	3540±60	1590±60	2030 (1882, 1836, 1834) 1690	1940–1770	
Šventoji 9	?	Ki-7618	3490±60	1540±60	2010 (1864, 1843, 1808, 1802, 1774) 1640	1880–1700	
Nida	Wood and bones from pit	Vs-320	3470±70	1520±70	2010 (1767, 1761, 1751) 1620	1880–1690	
Kääpa	Wood	TA-747	3460±80	1510±80	2010 (1745) 1530	1880–1670	

Table 2. ^{14}C calibrated date list of East Baltic Neolithic (by the traditional criteria) sites

The extremes of the 2 sigma ranges (95.4% probability) are given with the calibrated ages in between in parentheses and the ranges rounded off to the nearest decade, as suggested by M. Stuiver and P. J. Reimer.

** Range of one sigma (68.3%) probability

This standard deviation (error) includes an error in estimated $\delta^{13}C$.

References: Stuiver et al. 1998a (used in conjunction with Stuiver and Reimer 1993), Gulliksen 1980.

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Any mistakes within this table are our own.

Notes:

– The atmospheric calibration curve was used in calibrating all dates.

– AMS labs¤, as well as some conventional labs, correct their obtained dates for isotopic fractionation ($\delta^{13}C$ or its estimate), others do not. Isotopic fractionation estimates that have been proposed for the Nordic countries are likely most comparable to regional East Baltic values (Gulliksen, pers. com.). For peat, gyttja, and terrestrial bone material, $\delta^{13}C$ should be measured to obtain optimal precision for the dates (Gulliksen 1980: 980); where necessary, the suggested $\delta^{13}C$ estimate of –21.7±3.0 was used for terrestrial bone collagen samples (Gulliksen 1980: 985). For wood and charcoal, the standard error in estimated $\delta^{13}C$ value will only increase uncertainty of a date ±50 years to ±55 years (Gulliksen 1980: 980) and were not corrected in the table's calibrations.

– There may be a need for a reservoir correction for peat and gyttja samples (P. Reimer, pers.com.); these corrections were not incorporated here.

– 'A' after lab nr.'s from Trondheim (T) samples indicate the NaOH- soluble fraction (Gulliksen, pers. com.).

Lab codes – Lab name (AMS¤), country

Bln	Berlin, Germany	TA	Tartu, Estonia
CAMS	Centeer for Accelerator Mass Spectrometry, USA¤	Tln	Tallinn, Estonia
		TUa	Trondheim and Uppsala
Gd	Gliwice, Poland	Ua	Uppsala Accelerator, Sweden¤
Ki	Kiev	Vib	Vilnius (Botanical Institute),
LJ	La JollaScripps (UCSD), USA¤	Vs	Vilnius (Geology Institute), Lithuania
OxA	Oxford Radiocarbon Accelerator Unit, England¤	МГУ	Moscow, Russia
		ИГАН	Institute of Geography, Russia
Ri	Rīga, Latvia	ГИН	Geological Institute, Russia
T	Trondheim, Norway		

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