

Late Bronze Age stone axe with a wooden haft from Nagļi (eastern Latvia)

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Received 13 September 2023, accepted 27 November 2023, available online 2 April 2024

ABSTRACT

In 2022, a simple shaft-hole stone axe was found in the village of Nagļi, Rēzekne district in eastern Latvia. In contrast to hundreds of other simple shaft-hole axes, this specimen – representing the so-called almond-shaped type – is distinguished by the fragment of a wooden haft preserved in the shaft hole. This provided a unique opportunity to date the axe: the Nagļi artefact is only the second Bronze Age shaft-hole stone axe that has been directly radiocarbon-dated in the eastern Baltic area. The result, 780–540 cal BC, confirms the typochronological conclusion that almond-shaped axes were used in Latvia in the Late Bronze Age (1100–500 BC). However, it cannot confirm or refute their continued use in the Pre-Roman Iron Age (500–1 BC). Analysis of the haft revealed that it was made of oak (*Quercus* sp.), distinguishing it from previously analysed Bronze Age stone and metal axes in the eastern Baltic region, where ash (*Fraxinus excelsior* L.) was often used.

KEYWORDS

simple shaft-hole axes, radiocarbon dating, tree species analysis, Late Bronze Age, Latvia.

Introduction

In 2022, digging a pond in the Nagļi village (Rēzekne district, eastern Latvia) led to an unexpected discovery: a simple shaft-hole stone axe. The find location lies on a south-facing slope of a garden and meadowland, about 50–60 m northeast of the River Vecmalta and approximately 650 m northwest of its confluence with the present-day Nagļi water reservoir (Fig. 1). The Nagļi village belongs to the Lake

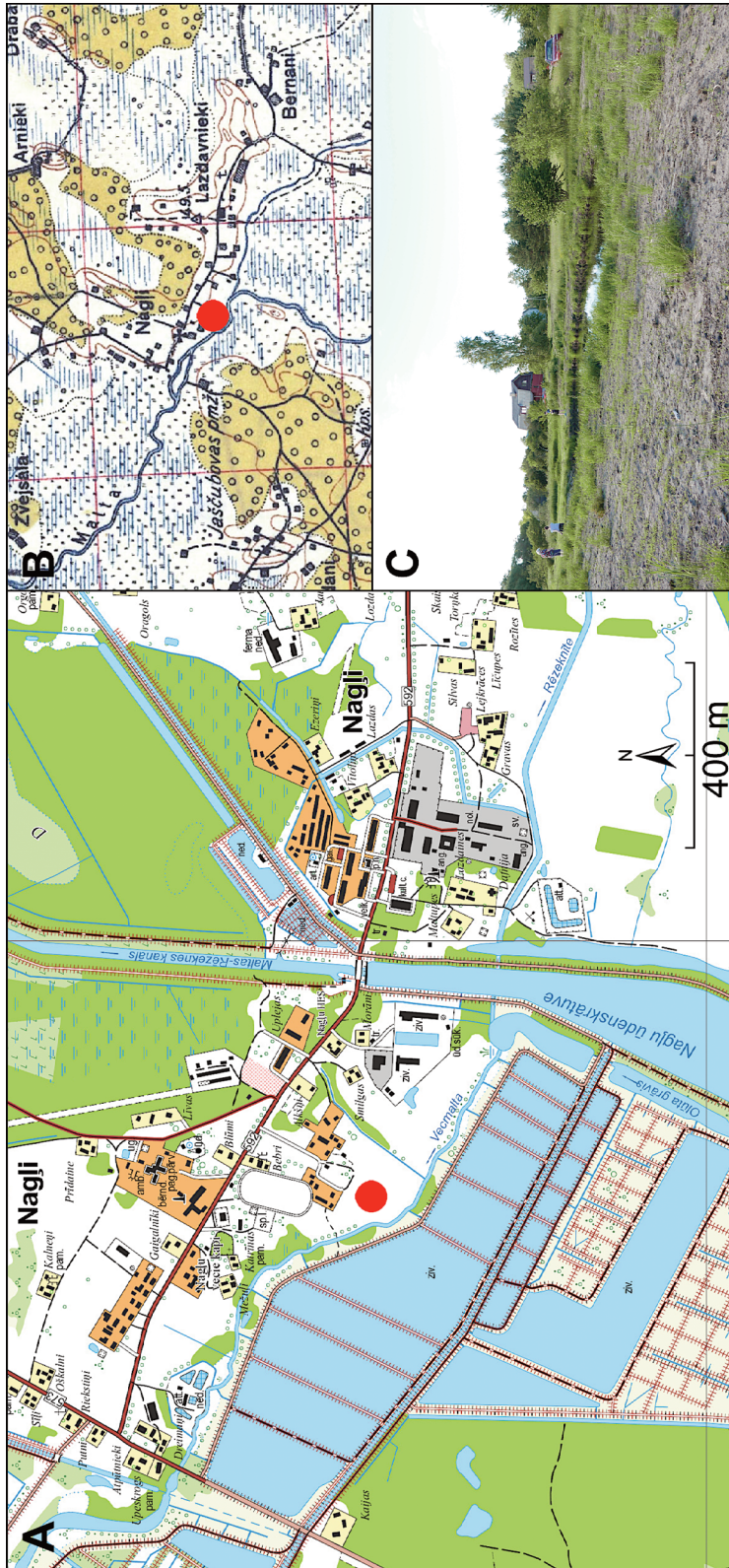


FIG. 1. The find location of the Nagli axe (A) and on a pre-World War II map preceding the major landscape modifications (B). Maps by Latvian Geospatial Information Agency (LĢIA kartes, kartes.igja.gov.lv). Photo by Kerikko Nordqvist.

Lubāns wetland area, a region that was severely altered during the large-scale Soviet amelioration projects between the 1960s and 1980s, and that is today characterised by a massive system of canals, dams, locks and ponds. The same works also led to the discovery and investigation of a large amount of Stone Age and some Bronze Age antiquities around Lake Lubāns (e.g. Loze 1979; Vasks 1994).

Simple shaft-hole axes are common finds in Latvia (Vasks 2019) and across the eastern Baltic Sea region in general (Meinander 1954; Lang 2007; 2020; Juodagalvis 2020). However, the Nagļi specimen truly stands out from the crowd: at the time of discovery, a part of the wooden haft was still in place inside the shaft hole. Although the wood dried quickly after the axe was removed from its place of discovery, it was stored by the finders, making the entire find available for further study. This provided a rare opportunity to look closer into the chronology of simple shaft-hole stone axes, since the Nagļi axe is only the second directly radiocarbon-dated specimen in the eastern Baltic area after the Vaibla stone axe from central Estonia (Kriiska 1998). The main aim of this article is to introduce the Nagļi find and its dating, followed by a brief contextualisation of the artefact within the 2nd–1st millennium BC Latvia and the eastern Baltic Sea area.

The artefact and its dating

The Nagļi axe is a simple shaft-hole axe and typologically (*sensu* Vasks 2019) represents the so-called almond-shaped type (Fig. 2). It is 10.4 cm long and 5.7 cm wide at the shaft hole, and weighs 558.4 g. Its planar shape resembles an unsymmetrical teardrop (‘almond’) with a cross-section of a rounded rectangle. The profile of the axe is nearly straight, widening only slightly towards the mid-part of the artefact (thickness: butt 5.1 cm, centre 5.4 cm, blade 5.2 cm). Both surfaces are even and polished, and the corners are rounded, while the sides are



FIG. 2. The almond-shaped axe found in Nagļi. Photo by Kerkko Nordqvist.

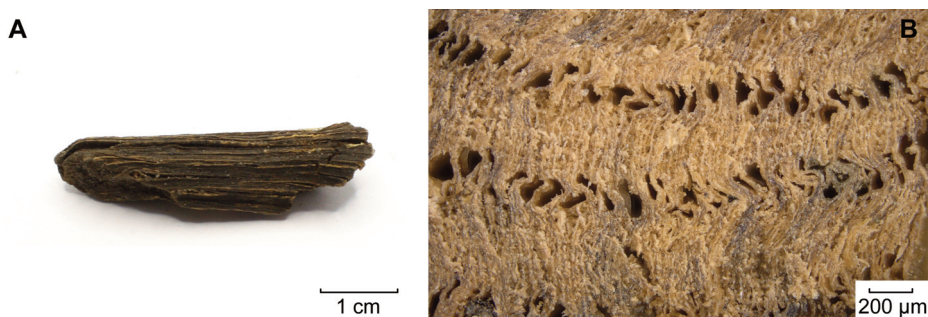


FIG. 3. The remains of the wooden haft preserved inside the shaft hole (A); the cross-section shows the ring-porous structure of oak (*Quercus* sp.) (B). Photo by Kerkko Nordqvist, microscopic image courtesy of Santeri Vanhanen.

ground and relatively flat. The butt is round but asymmetrical: polishing is evident only on the sides, while the butt end is unpolished with multiple impact marks. The blade is straight but broken due to a strong impact; a flake is missing on one side, later smoothed through polishing (additional recent damage to the blade is also present). The shaft hole, located to the back from the central line, is symmetrical (round) in the plane but slightly funnel-shaped (conical) in profile because the hole was drilled from one side only (shaft hole diameter 21.0–23.7 mm). The edges of the shaft hole are slightly worn and rounded, and towards the end of the drilling, a small groove was formed on the side; otherwise the inner wall is smooth.

The axe is made of diorite (Kalniņa & Strautnieks, pers. comm.), characterised by a black matrix and numerous large, white and light grey plagioclase crystals. Like all crystalline rocks in the area, such stones only occur in tills and other glacial deposits.

When the axe was found, a piece of wood was still filling the shaft hole, but by the time the artefact was studied, the wood had already dried, measuring $41.6 \times 13.6 \times 8.7$ mm and weighing 1.7 g. Even if the uncharred wood had shrunk, it could be recognized as oak (*Quercus* sp.) under a microscope with 50–1000x magnification, based on the ring-porous structure of the wood and the uniseriate rays (Vanhanen 2022; Bērziņš, pers. comm.; Fig. 3).

The other end of the wooden piece had cracked while drying and a small splinter had come loose – this detached piece was used to date the artefact. The sample, analysed in the Centre for Isotope Research of the University of Groningen (the Netherlands), gave an age of 2508 ± 27 BP (GrM-32278), i.e. 780–540 cal BC, calibrated using the IntCal 20 atmospheric curve (Reimer et al. 2020) and OxCal software, v4.4.4 (Bronk Ramsey 2009). This places the Nagli shaft-hole axe to the Late Bronze Age (1100–500 BC in Latvia), a dating generally in agreement with the typochronology that assigns such axes broadly to the Late Bronze Age and Pre-Roman Iron Age (500–1 BC; Vasks 2019, 15).

Discussion: the Nagļi axe in context

Simple shaft-hole axes were first discussed in Latvia by Eduards Šturms (1927, 13–16; also 1936). In the currently used classification system developed by Andrejs Vasks (2019, 14–16; see also Graudonis 1967, 83), they are divided into three main types: pentagonal and Augšzeme type axes, believed to have emerged in the Early Bronze Age (1800–1100 BC), and the almond-shaped type prevalent in the Late Bronze and Pre-Roman Iron Ages. Among the more than 1600 simple shaft-hole axes known in Latvia, over 80% of the typologically definable specimens fall under the almond-shaped type (Vasks 2019, 13). However, only less than 10% of all simple shaft-hole axes have been discovered in a documented archaeological context – open settlement sites or hillforts, but not burials (Vasks 2003, 27–28; 2019, 14). Consequently, despite their large number, simple shaft-hole axes remain a poorly known group of artefacts.

Since the majority of simple shaft-hole axes are stray finds with no information on the exact context, their dating has also remained unresolved. Furthermore, most of the axes discovered in settlements are heavily fragmented, which often makes typological determination uncertain or impossible. Under these circumstances, the Nagļi axe assumes significant importance, presenting a rare opportunity for direct – or any – dating of this group of artefacts.

The Nagļi axe is the first almond-shaped axe to be directly dated, confirming that the age previously given, based on stratigraphy and context dates, is relatively accurate. AMS dating of the haft wood shows that this type was used at least at the end of the Late Bronze Age. Unfortunately, the dating falls within a plateau in the calibration curve between about 800–500 cal BC (Reimer et al. 2020), widening the calendar year probability distribution. The end of the use of this axe type in the Early Pre-Roman Iron Age is currently explained by the find contexts at the Ķivutkalns hillfort near Riga (Vasks 2019, 15). However, the radiocarbon sequence from the site is not entirely unambiguous and suggests use during much of the 1st millennium BC (Oinonen et al. 2013; Vasks & Zariņa 2014). The present dating does not help clarify this issue.

The above-mentioned Vaibla axe found from Lake Võrtsjärv in Estonia is the only other directly dated simple stone shaft-hole axe in the eastern Baltic area (Kriiska 1998). It belongs to the Early Bronze Age, 1500–1060 cal BC (3060 ± 85 BP, Ua-12770), and typologically represents the earlier pentagonal type. The Vaibla axe is made of diabase, another commonly used raw material for ground stone tools in the area. The axe's shaft, constructed from ash tree (*Fraxinus excelsior* L.), aligns with the prevalent use of common ash for hafting materials in the eastern Baltic region. This is further evidenced by three out of the four analysed wooden shaft remains of early socketed bronze axes from Estonia and Finland, with the remaining one crafted from juniper/spruce (*Juniperus/Picea*) (Paavel et al. 2019, 14; Soikkeli-Jalonen 2021, 80–81).

Oak (*Quercus* sp.) has not been previously recorded in the eastern Baltic area, even if this was suspected based on the dimensions of the axes and shaft holes (Graudonis 1967, 84). Similar to ash, oak is hard and durable, making it a preferred wood for hafting early metal artefacts, for example, in central Russia (Jungner & Carpelan 2005, 112), central Europe (Gross et al. 2017, 218) and the British Isles (Roberts & Ottaway 2003, 124). Unfortunately, the wood remains of both the Vaibla and Nagļi axes are too small to examine other details of hafting.

Thousands of simple shaft-hole axes are known in the eastern Baltic area, being most abundant in the south – southern Latvia, Lithuania, northern Belarus and Poland – and gradually diminishing, though remaining far from rare, towards the north – northern Latvia, Estonia and Finland (Meinander 1954; Lang 2007; 2020; Vasks 2019; Juodagalvis 2020). Compared to the Stone Age finds, their distribution across the landscape is wider and includes more environments away from shores and wetlands. This is related to the socio-economic changes during and after the Bronze Age transition: new modes of subsistence (cultivation and animal herding) and land use, settlement expansion, and a possible demographic increase (Lang 2020, 164; Vasks 2021, 142; Zariņa et al. 2023).

The changing morphology and find contexts of the axes also illustrate the new meanings given to the artefacts. Often referred to as work axes (e.g. Vasks 2019), they are primarily viewed as tools for clearing land, felling trees, cutting bushes and shrubs, and – based on observed breakage and wear – soil tillage (Vasks 2003, 28; Lang 2007, 28–29). However, in the absence of specialised studies, alternative uses cannot be ruled out. Although impact marks on the butt and blade of the Nagļi axe show its usage, no further information can be reported, as no microscopic use-wear analysis was performed.

The Nagļi specimen can be considered a typical representative of almond-shaped axes, constituting a loosely defined group of often simple-shaped artefacts of varying size. This is interpreted to mean that the utilitarian function or purpose of these axes largely overshadowed other considerations, such as aesthetic aspects, in their manufacture (Vasks 2019, 8; though cf. Graudonis 1967, 83). At the same time, given that many stray finds are complete specimens (as opposed to fragmented items found in settlements), the objects found in fields and meadows are considered to be a kind of talismans or amulets deliberately placed at particular points in the landscape – a practice that is also interpreted to reflect the new agricultural mindset (Vasks 2003, 31; 2019, 20; Lang 2007, 29; see also Johanson 2006).

Simple shaft-hole axes are often found in Latvia in tills (moraines) or alluvial soils (Vasks 2019, 18–19). The find location of the Nagļi axe is associated with the latter and the River Vecmalta or Malta ('Old Malta'). Based on its elevation (ca 94 m a.s.l.), it is unlikely that the find location was lake-shore-bound, even during the transgression (ca 92 m a.s.l.) of Lake Lubāns in the early Subatlantic

(Eberhards 1985, 373, fig. 6.9). However, the find circumstances suggest that the Nagļi axe was probably in a secondary context of deposition. The course of the river was greatly altered during the amelioration works in the 20th century, with much of the original River Malta disappearing beneath ponds and canals (Kalniņa, pers. comm.; Fig. 1). Even the better-preserved parts of the River Vecmalta downstream from the Nagļi reservoir, where the find location is situated, have undergone modifications. Moreover, natural changes in the riverbed over time, including meandering and redepositing sediments, have occurred in the area. The dynamic environment and anthropogenic impact (the area was also used as agricultural land) are evidenced by mixed sediments and a jumble of washed wood and branches, as well as an assortment of various unworked domestic and wild animal bones, and other refuse unearthed during the pond's digging. Consequently, it is no longer possible to determine the original deposition context of the Nagļi axe.¹

Lake Lubāns, the largest lake in Latvia, is directly connected to the River Daugava basin through its outlet, the River Aiviekste. The importance of the River Daugava dates back to the Stone Age and likely increased during the Bronze Age, when it served as a major thoroughfare and transport route for metal and other material cultures, influences and innovations between the East and the West (Lang 2020, 157; Vasks 2021, 141). The surroundings of Lake Lubāns contain a substantial accumulation (several dozens) of simple shaft-hole axes (Fig. 4).² Additionally, Bronze Age materials have been identified at several multi-period open settlement sites in the vicinity (Loze 1979; Vasks 1994, fig. 36, appendix). Traces of early metalworking have also been found (Loze 1979, 58, 78–79), most notably at the Brikuļi hillfort from the Late Bronze–Early Iron Age, situated about 5 km north of the Nagļi find location (Vasks 1994, 61–62).

Nevertheless, the actual number of Bronze and Early Iron Age sites and finds in the Lake Lubāns region is lower compared to the rich Stone Age heritage. Acknowledging probable changes in the volume and ways of producing, using and discarding material culture, the decrease in the intensity of archaeological traces is likely due to a shift in the focus of activity and settlement from previously central wetland locations to areas better suited for new subsistence and land use practices (Vasks 1994, 66, 73; Zariņa et al. 2023). The Nagļi axe is only a small indication of this new socio-economic and cultural landscape emerging in the eastern Baltic area; at the same time, it provides a solid chronological anchor point, showing that the tradition of producing and using ground stone axes survived there at least until the Late Bronze Age.

- 1 A brief inspection of the find location revealed no further prehistoric finds.
- 2 Archival data report another simple axe found in the Nagļi village (Vasks 1994, 81), and there are at least four other Bronze Age stone axes and axe fragments in the local collections, including the former Nagļi school collections (Nos 24, 27 and sine numero).

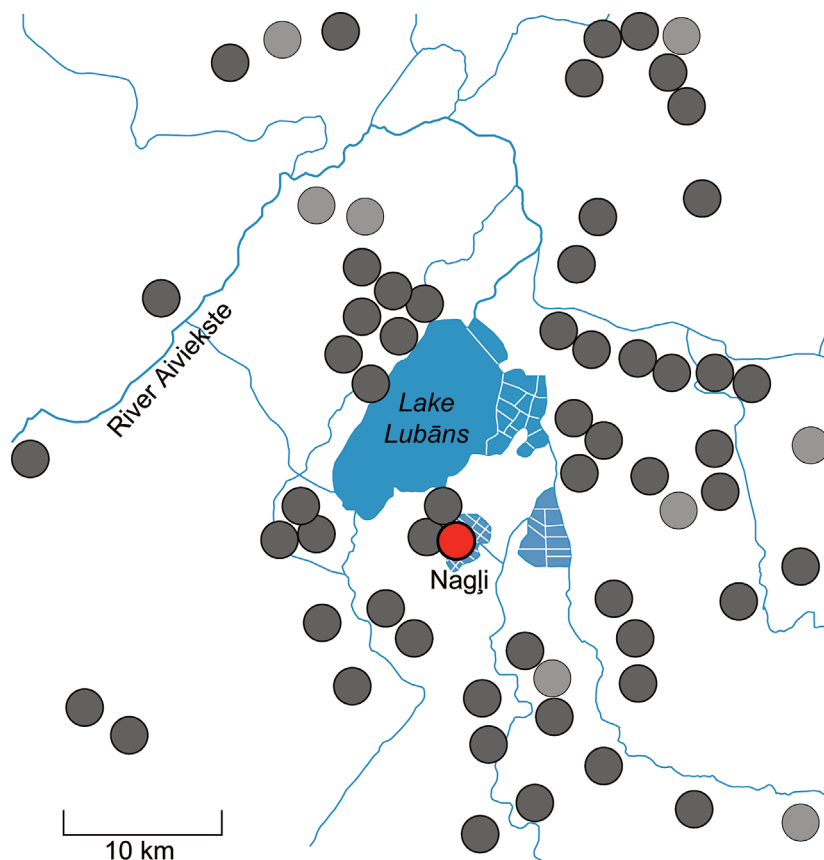


FIG. 4. Distribution of simple shaft-hole stone axes in the Lake Lubāns area (after Vasks 2019, figs 3–4, amended). Clear pentagonal and Augšzeme type axes are shown in lighter grey, the Nagļi find location is marked with a red dot. Illustration by Kerikko Nordqvist.

Conclusions

The axe from Nagļi resembles hundreds of other simple shaft-hole axes found in Latvia and the eastern Baltic area. At the same time, it is unique due to the preserved piece of a wooden haft, which allowed its AMS dating. The result, 780–540 cal BC, generally aligns with the typochronological age, placing the use of such almond-shaped axes in the Late Bronze Age. However, it falls short of confirming their continued use as late as the Pre-Roman Iron Age, though this possibility cannot be ruled out based on a single dating.

The preserved wood fragment is too small to reveal the details of hafting, but analysis shows that it was made of oak. While the selection of oak aligns with practices observed in central Russia and western Europe, this represents the only oak shaft of a Bronze Age axe identified to date in the eastern Baltic area, where common ash appears to have been the more prevalent choice. Similar to most other simple shaft-hole axes, the Nagļi axe is a stray find, but it is connected

to the new cultural landscape around Lake Lubāns in the Bronze Age. Simultaneously, it shows the persistence of ground stone tool production in the eastern Baltic Sea area long after the introduction of metal tools.

ACKNOWLEDGEMENTS

The authors would like to thank the finders of the artefact, Santeri Vanhanen and Valdis Bērziņš for tree species identification, Laimdota Kalniņa and Ivars Strautnieks for the geological determination of the stone raw material and information about the palaeoenvironment of the area, and Andrejs Vasks and another reviewer for their valuable comments on an earlier version of this manuscript. The AMS dating, tree species analysis and writing of this paper, as well as publication costs, were funded by the project ‘Estonian Corded Ware identity and its manifestation in a hunter-gatherer environment’ (Alfred Kordelin Foundation, grant No. 210084; KN). The preparation of the manuscript was also supported by the project ‘Skills in synergy, crafts in context: an integrated study of eastern Baltic Stone Age technologies’ (Latvian Council of Science, project lzp-2021/1-0119; AM). The publication costs of this article were partially covered by the Estonian Academy of Sciences.

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Hilispronksiaegne puust varrega kivikirves Ida-Lätist Nagļist

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RESŪMEE

Artiklis kāsitletakse lihtsat varreauguga kivikirvest, mis leiti 2022. aastal Lubāna jārve mārġalal asuvast Nagļi kŭlast Rēzekne rajoonis Ida-Lātis. Arvukatest teistest sarnastest kirvestest eristab seda varreaugus sãilinud puidust varrekatke, mis andis ainulaadse võimaluse dateerida kirvest AMSiga. Kesk-Eestist Vaiblast leitud kivikirve jãrel on Nagļi artefakt alles teine pronksiaegne varreauguga kivikirves Ida-Baltikumis, mis on radiosŭsinikumeetodil dateeritud. Artiklis tutvus-

tatakse Nagļi kirvest, esitatakse selle dateering ja puuliigi määrang ning analüüsitakse tulemusi 2.–1. aastatuhande eKr Lāti ja Baltikumi kontekstis.

Nagļi kirves on valmistatud dioriidist ja on 10,4 cm pikk, varreaugu juurest 5,7 cm lai ning kaalub 558,4 g. Uurimise ajaks oli varreaugu sees säilinud puidutükk juba kokku tõmbunud ja selle mõõtmed olid $41,6 \times 13,6 \times 8,7$ mm ning kaal 1,7 g. Praegu kasutusel olevate Lāti tüpoloogiate järgi esindab Nagļi kirves nn mandlikujulist tüüpi. Üldiselt on lihtsad varreaugukirved levinud kogu Läänemere idarannikul ja neid teatakse tuhandetes – ainuüksi Lätis ulatub nende arv üle 1600.

Varre küljest eraldunud kild esitati radiosüsinikdateerimiseks, mis andis vanuseks 2508 ± 27 BP (GrM-32278) ehk 780–540 kal eKr. See kinnitab tüpokronoloogilist järeldust, et mandlikujulisi kirveid kasutati Lätis hilispronksiajal (1100–500 eKr), kuid samas ei saa kinnitada ega ümber lükata nende jätkuvat kasutamist eelrooma rauaajal (500–1 eKr). Mikroskoopilise analüüsiga määrati puidujäänused tammeks (*Quercus* sp.). Kuigi on teada, et tamme on mujal varretamiseks kasutatud, on nüüd esimest korda tuvastatud selle kasutamine varrematerjalina pronksiajal ja varasel rauaajal Läänemerest ida pool. Varasemad analüüsid on siin valdavalt näidanud saarepuu (*Fraxinus excelsior* L.) kasutamist.

Nagu enamik teisi lihtsaid varreauguga kivikirveid on ka Nagļi kirves juhuleid, millel puudub selge leiukontekst. Üldjoontes on leid seotud laiemate sotsiaalmajanduslike muutustega, mis toimusid üleminekul pronksiaega ja pärast seda. Nagļi kirves on vaid väike peegeldus idapoolsetes Läänemere maades kujunenud uuest sotsiaalmajanduslikust ja kultuurimaastikust, kuid samas on see selge viide, et kristalsetest kivimitest lihvitud kivikirveste valmistamise ja kasutamise traditsioon säilis siin vähemalt kuni hilise pronksiajani.