Teemu Väisänen & Janne Soisalo

VERTAISARVIOITU
KOLLEGIALT GRANSKAD
PEER-REVIEWED
www.tsv.fi/tunnus

Seal Hunters of the Archipelago: Kirkkokangas IV settlement site of Kiukainen Culture in Pori, Satakunta

This article presents the results of archaeological research at the Kirkkokangas IV settlement site in Pori, Satakunta, Finland, dated to the Kiukainen culture (ca. 2500–1750 BC). The study combines evidence from surface survey and a trial excavation conducted in 1996 and 1999 with systematic excavations carried out in 2021–2023. The results reveal a well-preserved coastal site specialised in seal hunting and fishing. The assemblage comprises lithic artefacts, Kiukainen Ware pottery, and osteological material dominated by seal remains. Radiocarbon dates place the main phase of occupation between 2000 and 1800 BC. Reconstruction of the palaeoenvironment indicates that the site was situated within a sheltered outer-archipelago setting during the Late Stone Age. The site's environmental context, lithic technology, and faunal composition support its interpretation as a task-specific hunting station linked to larger settlement centres in the Kokemäenjoki River delta. Comparative analysis with contemporaneous Kiukainen culture sites, including Etukämppä and Kraakanmäki, highlights the role of specialised maritime sites within broader subsistence and settlement strategies during the Late Neolithic – Early Metal Period transition in western Finland.

Saariston hylkeenpyytäjät: Kiukaisten kulttuurin asuinpaikka Kirkkokangas IV, Pori, Satakunta

Artikkelissa esitetään tulokset arkeologisesta tutkimuksesta Satakunnan Porissa sijaitsevalla, Kiukaisten kulttuuriin (n. 2500–1750 eKr.) ajoitetulla Kirkkokangas IV -asuinpaikalla. Tutkimuksessa yhdistetään vuosina 1996 ja 1999 toteutettujen pintainventointien ja koekaivausten tulokset vuosina 2021–2023 tehtyjen systemaattisten kaivausten tuloksiin. Tulokset paljastavat hyvin säilyneen, hylkeenpyyntiin ja kalastukseen erikoistuneen rannikkokohteen. Löytöaineistoon kuuluu kiviesineitä, Kiukaisten kulttuurin keramiikkaa sekä pääosin hylkeistä peräisin olevaa osteologista materiaalia. Radiohiiliajoitusten perusteella kohteen intensiivisin asutusvaihe ajoittuu vuosille 2000–1800 eKr. Muinaisympäristön rekonstruointi viittaa siihen, että kohde sijaitsi myöhäiskivikaudella ulkosaaris-

Teemu Väisänen & Janne Soisalo: Seal Hunters of the Archipelago: Kirkkokangas IV settlement site of Kiukainen Culture in Pori, Satakunta. *Muinaistutkija* 1/2026: 5–26. https://doi.org/10.61258/mt.161393

ton suojaisella alueella. Kohteen sijainti, kiviesineteknologia ja eläinjäänteiden koostumus tukevat tulkintaa, jonka mukaan kohde oli erikoistunut metsästysasema, joka oli yhteydessä Kokemäenjoen suiston laajempiin asuinkeskuksiin. Vertailevat analyysit samanaikaisiin Kiukaisten kulttuurin kohteisiin, mukaan lukien Etukämppä ja Kraakanmäki, alleviivaavat erikoistuneiden merellisten kohteiden asemaa laajemmissa toimeentulo- ja asutusstrategioissa myöhäisneoliittisen ja varhaismetallikautisen ajan siirtymävaiheessa Suomessa.

Introduction

The Kiukainen culture represents a coastal Neolithic cultural tradition dated to approximately 2500–1750 BC (Soisalo 2025). Known settlements are concentrated along the shores of the Baltic Sea, extending from Middle Ostrobothnia to the eastern Gulf of Finland. Only a limited number of inland sites have been identified, all of which are located within the Kokemäenjoki River watershed (Meinander 1954; Soisalo & Roiha 2022).

Kiukainen communities have traditionally been interpreted as practising a mixed subsistence economy combining foraging with elements of agriculture (Huurre 1991: 233; Salo 2004: 121–136). Palynological evidence indicates limited cereal cultivation during this period (Alenius 2008), while the oldest directly dated cereal grains on the Finnish mainland (2191–1884 BC) derive from the Kiukainen culture site of Räntämäki Riihivainio in Turku (Lempiäinen-Avci et al. 2024). Furthermore, stone tools potentially associated with agricultural activities, such as grinding stones and narrow-edged axes, have been associated with the Kiukainen culture, although their cultural attribution remains partly unclear (Ailio 1909: 82; Meinander 1954: 113–114; Salo 1981: 307–309; Edgren 1984: 93).

Zooarchaeological evidence for animal husbandry during the Kiukainen period is sparse but increasing. The earliest radiocarbon-dated domestic animal bone in Finland – a sheep or goat carpal bone dated to 2200–1950 BC – originates from a Kiukainen culture context (Bläuer & Kantanen 2013: 1651). More recently, an unburnt cattle tooth dated to 1917–1749 cal BC was recovered from the Kiukainen-associated site of Ölmosviken in Kemiönsaari (Soisalo 2025). In addition, two cattle bones, a sheep bone, and a pig bone from Åland have been radiocarbon dated

to the same period, although their cultural association is less certain (Storå 2000).

Despite this evidence, seal remains overwhelmingly dominate faunal assemblages from Kiukainen culture sites, and hunting equipment constitutes a major component of the artefact record. This pattern suggests that seal hunting played a central role in subsistence strategies. The relative scarcity of domestic animal bones has been explained by several factors, including research bias towards coastal sites, the morphological distinctiveness and preservation of seal bones, and the possibility that domestic animals were kept or processed away from habitation areas (Ukkonen 2002; Hallgren 2008; Bläuer & Kantanen 2013).

The aim of this article is to examine the role of specialised maritime hunting sites within the settlement and subsistence system of the Kiukainen culture through a detailed case study of the Kirkkokangas IV settlement site in Pori, western Finland. Specifically, the study seeks to (1) document the archaeological material and spatial organisation of the site, (2) assess its function through lithic, ceramic and faunal analyses, and (3) situate Kirkkokangas IV within its palaeoenvironmental and regional settlement contexts. By comparing Kirkkokangas IV with contemporaneous Kiukainen culture sites in Satakunta, the article contributes to broader discussions on mobility, seasonal resource exploitation, and the organisation of coastal subsistence during the Late Neolithic – Early Metal Period transition.

Kirkkokangas IV settlement site

Previous field work and finds

The Kirkkokangas IV settlement site (Fig. 1) is located in the city of Pori, western Finland, in a flat sandy pocket within gently sloping terrain. The site was first identified during a field survey conducted by Esa Laukkanen in 1996, when Stone Age artefacts were observed on the surface of a forest road cutting across the site (Laukkanen 1996: 125). Plans to expand a sand pit in the area prompted a trial excavation by the Finnish Heritage Agency in 1999. This investigation yielded a substantial assemblage of pottery sherds, quartz and stone flakes, as well as tools includ-

Fig. 1. An ongoing excavation at Kirkkokangas IV settlement site. Photo: T. Väisänen.

ing whetstones and scrapers. Based on pottery decoration, the site was initially attributed to the Late Stone Age Kiukainen culture (Vanhatalo 1999: 3).

In the immediate vicinity of the settlement lies a Bronze Age burial cairn, Kirkkokangas II, approximately 20 m in diameter. Although the cairn has not been excavated, its monumental character and construction have led to its attribution to Bronze Age periods II–IV (c. 1500–800 BC; Salo 1981: 203). Furthermore, several additional undated cairns are located nearby; three of these were excavated in 1960 but yielded no archaeological material (Salo 1960).

No other Late Stone Age settlement sites are known in the immediate surroundings. However, approximately 1 km northeast of Kirkkokangas IV lies the Lähdepuro findspot, where bark-made fishing net floats were discovered in 1950 during the excavation of a sewer trench (Fig. 2). Subsequent archaeological investigations recovered over 800 pine bark floats, fragments of nets, fish vertebrae, and seal bones. Radiocarbon dat-

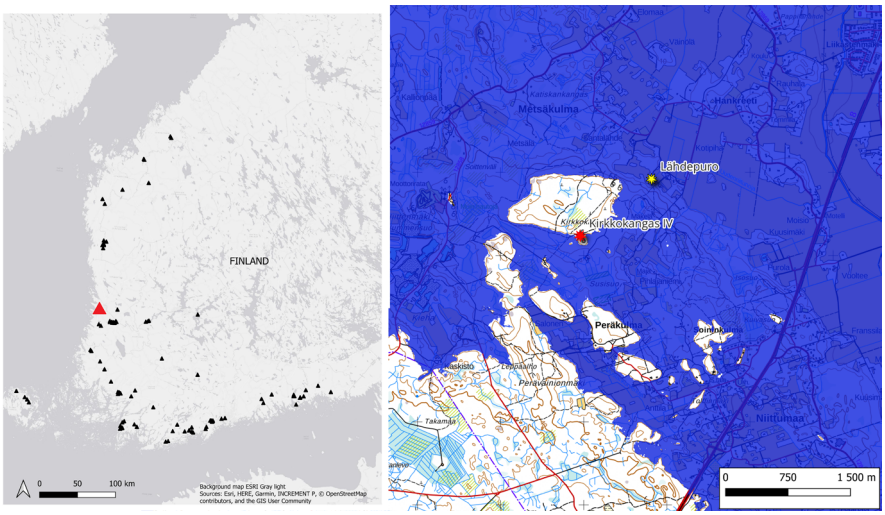

Fig. 2. The location of the Kirkkokangas settlement site in relation to other known Kiukainen culture settlement sites (left), and in relation to the nearby Lähdepuro findspot. The sea is visualised at 30 m a.s.l., illustrating the sea level during the habitation of the Kirkkokangas IV site. Source: ESRI, modified by J. Roiha (left); National Land Survey of Finland, modified by T. Väisänen (right).

ing places the assemblage within the Kiukainen culture period, around 1900 BC (Huurre 1991: 248).

Research in 2021–2023

Between 2021 and 2023, archaeological investigations at Kirkkokangas IV were carried out as part of a community archaeology project organised by the Satakunta Museum in cooperation with the Pori adult education centre (Soisalo & Väisänen 2021, 2022, 2025). The primary aims were to define the spatial extent of the settlement and to establish its chronology through radiocarbon dating.

During the trial excavation of the first year, one 20 m² excavation area was opened on the west side of the sand pit, along with 1–4 m² trial excavation areas and test pits in various parts of the settlement site (Fig. 3). The first-year excavation was conducted in level spits with a uniform layer thickness of 10 cm. The excavation area and test pits were divided into one-square-metre units, each assigned a coordinate system. All elevation measurements were taken using a levelling instrument, and the excavation layers were documented through both photography and

drawing. Finds were recovered stratigraphically from both the excavation area and the test pits, with spatial accuracy to one square metre, and all excavated soil was sieved to ensure that all finds were recovered.

In the following years, 2022–2023, all measurements at the excavation site were carried out using a total station, allowing the coordinate system used in the previous year to be discarded. Excavation layers were now 5 cm thick, and the levels continued to be documented through both photography and drawings. All finds were collected individually, and their exact discovery locations were recorded with a total station to an accuracy of a few centimetres. This enabled the creation of a precise distribution map of the finds.

While the initial excavation area contained a modest amount of Stone Age finds, the actual centre of the settlement site was located with test pits further south from the 1999 trial excavation site. There, a test pit revealed remains of a hearth. As the area surrounding the fireplace presented an interesting opportunity to study the relatively unexplored Kiukainen culture, it was decided to continue the investigations. The excavations resumed the following years, when an excavation area (56 m² in total) was placed around the hearth. Including test pits and test trenches, a total of 90.5 m² was excavated between the years 2021 and 2023 (Fig. 3).

Features and find material

During the excavation, it was observed that the settlement site had been well preserved, as there were no indications of contamination by historic or modern land use other than the small sand pit and gravel road crossing the site. In otherwise undisturbed soil layers, only disturbances caused by windthrows were observed.

The distance between the test pits containing finds was approximately 100 metres in the north–south direction and 50 metres in the east–west direction, following the southern peninsula of the Kirkkokangas island, as it existed during the Stone Age. However, the number of finds in the areas further from the fireplace was lower and clustered, not forming a coherent find distribution.

The excavations revealed a single fireplace, but no further structures were observed, nor could decomposed structures be identified based on

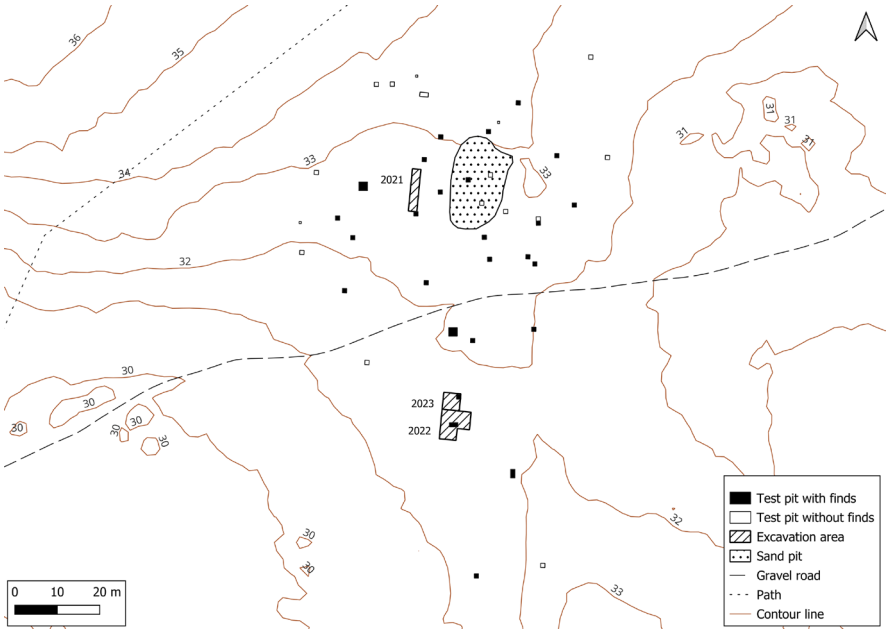

Fig. 3. Test pits and excavation areas from 1999 and 2021–2023 are located on both sides of the gravel road that bisects the settlement site. Image: Modifications by T. Väisänen based on open geospatial data provided by the National Land Survey of Finland.

the find scatter measured with a total station. The fireplace was split up, and only a few stones remained together. The observations suggest that the area has been under the influence of coastal forces. This phenomenon is explained by the fact that the settlement site is located near the beach and in a low-lying area, where the sea level can significantly fluctuate due to the wind and wave conditions.

The research resulted in a total of 3,896 finds typical of a Stone Age settlement. The finds comprise predominantly quartz flakes, burnt bone, and pottery, which are discussed in detail in the following sections. See Table 1.

Lithic material

The lithic assemblage from Kirkkokangas consists of artefacts manufactured from various rock types. The largest find categories are small chisels, quartz scrapers, and whetstones. In addition, the material includes two fully bifacially retouched flint arrowheads (Fig. 4). One of the arrow-

Table 1. Quantitative composition of all archaeological finds recovered from the Kirkkokangas IV settlement site, including surface finds from the 1996 survey, material from the 1999 trial excavation, and finds from the excavations conducted in 2021–2023.

	Quantity (pcs)	**Weight (g)**
Quartz tools		
- Scrapers	9	98
- Burins	1	13
- Blades	1	1
Quartz flakes	1,066	4,960
Flint tools		
- Arrowheads	2	6
- Scrapers	1	7
Flint flakes	1	1
Porphyrite tools		
- Scrapers	2	47
Porphyrite flakes	196	3,071
Stone tools of other raw materials		
- Chisels	11	169
- Whetstones	7	7,663
- Stone discs	1	123
- Cuboid stones	1	175
- Net sinkers	1	62
- Unidentified fragments	10	226
Flakes of other raw materials	137	2,150
Pottery	2,506	16,137
Fired clay	3	7
Clay objects	1	3
Burnt bone	518	145
Hazelnut shells	3	3

heads (KM 44393:185) is made of Scandinavian flint. It was likely fashioned locally from a broken arrowhead and finished with coarse, partial-edge knapping and edge retouching.

The other, so-called even-based arrowhead (KM 44393:467), made from eastern flint, was retouched with percussion and pressure techniques. This artefact type is generally dated to the Bronze Age, although its use began already in the Late Stone Age, as evidenced by the find from Kirkkokangas (Holm 1991; Lavento 2015). In addition to flint, even-based arrowheads were manufactured from quartzite and quartz. The type has not been clearly associated with any specific ceramic tradition; rather, its distribution is concentrated in northern Scandinavia, where quartzite was particularly favoured as a raw material. In the area south of the Oulujoki River, such arrowheads are considerably rarer and are primarily made of flint, which does not occur naturally in the area; however, it was accessible through trade networks (Lavento 2015: 185). At least two even-based arrowheads have previously been documented from the mouth of the Kokemäenjoki River (Meinander 1954: 11; Huurre 1991: 239; Lavento 2015: 186).

A more detailed lithic technology analysis was conducted on the material from the excavations performed in 2022–2023, examining the knapping methods and the stone types used at the settlement site (Eranti 2024). The material consisted of 1,195 pieces, most of them being unmodified quartz flakes. In addition to quartz material, the site yielded various rock types with differing knapping properties, such as lava-based schists, quartzite, porphyrite, and diabase.

Based on the material, the prevailing knapping technique at the site is platform knapping, whereas bipolar technique was mainly used as a secondary technique for shaping pieces. Retouch was identified on 69 quartz implements. However, there are relatively few retouched blades in the material, and the blade modifications are relatively rough or omitted altogether.

The preference for platform knapping at the Kirkkokangas dwelling site differs from the typical Neolithic Stone Age assemblage, in which bipolar percussion is the most common flaking technique (Rankama et al. 2006). The frequent use of bipolar reduction has been explained by the fact that quartz appears to be particularly well suited to this technique. Furthermore, it has been suggested that bipolar percussion was used

when the available raw material was to be utilised as economically as possible (Andrefsky 1998).

While the working methods at sites dating to the Kiukainen culture have not yet been examined in detail, the only comparable site, Kraakanmäki 3 in Harjavalta, is dominated by material produced using the bipolar technique, thus differing from Kirkkokangas (Eranti 2022). Similarly, Kirkkokangas and Kraakanmäki differ in terms of tool finishing. While the material from Kirkkokangas is largely unrefined, the assemblage from Kraakanmäki contains a considerable number of retouched flakes, indicating that retouching at the site was precise. However, broader interpretations of lithic working methods characteristic of the Kiukainen culture would require comparable technological analyses from a wider range of settlement sites.

Fig. 4. Flint arrowheads (top row), net sinker, and chisels from Kirkkokangas IV. Photos: T. Väisänen.

Pottery

All the pottery found at Kirkkokangas is Kiukainen Ware. Altogether, 2,506 sherds with a total weight of 16,137 grams have been recovered from the site up to this point. The pottery has been well preserved in the sandy, soft soil, and the finds include rim fragments from at least 13 different vessels. Combined with the relatively short usage period of the dwelling site, conclusions about the decoration of Kiukainen Ware at the very end of the Stone Age can be drawn from the pottery finds. The ceramics are carefully made, their decoration is diverse, and all the vessels are decorated in different ways (Fig. 5).

In Kiukainen Ware, the decoration is almost always limited to the upper part of the vessel, and the decoration is horizontal (Meinander 1954: 140–148). Decorative elements found in the ceramics from Kirkkokangas IV include pits, lines, dotted lines, comb imprints, twisted cord, and imitated twisted cord imprints. The surface of the vessels is finished with a smooth slip. While the textile imprint is quite common in Kiukainen Ware (Meinander 1954: 138–139), it has not been observed in Kirkkokangas IV material. By contrast, the mat-like textile impression frequently seen on the bases of Kiukainen Ware is present on a single base sherd (KM 44393:91).

The clay mixture used for the vessels contains quartz and stone particles, which create a hard and durable structure for the pottery. No organic mixture is present in the Kirkkokangas pottery. All but one vessel are decorated with pits, either alone or in combination with other decorative elements.

The size of the vessels varies, with the largest holding around 10 litres. Most of the vessels have been a few litres in size. However, there are also smaller vessels, including at least one beaker (KM 44393:450). Interestingly, this beaker imitates the cord decoration seen commonly in Corded Ware beakers. However, no true cord decoration is used; instead, the impression is achieved by imitating cord imprints. Furthermore, the decoration lacks the pits, the typical decorative features of Kiukainen Ware.

Compared to the four other dwelling sites excavated in Satakunta during the 2000s — Harjavalta Kraakanmäki 1–3 and Eurajoki Etukämppä — the ceramics recovered from Kirkkokangas IV display a

greater diversity of decorative techniques. At the other sites, decoration has been simple and modest in character, although pits constitute the most common decorative element there as well. (Lehtonen 2005; Pesonen 2014a, 2014b; Laulumaa 2021.)

It is likely that the ceramic vessels were needed at hunting and fishing sites like Kirkkokangas IV for storing, transporting, and preparing food. Some vessels contained charred food residue, indicating heating processes. In the large vessel fragments, such as KM 44393:767, thick charred residue could possibly originate from a seal blubber. Melting seal blubber at a hunting settlement would make sense, as transporting it to mainland settlements would take up less space, and melting would be more practical for preservation. However, this interpretation remains tentative and would require confirmation through lipid residue analysis. Based on the distribution of the finds, it is difficult to determine the exact use of the vessels. The only statement that can be made is that ceramics are concentrated in an area where other finds are also abundant.

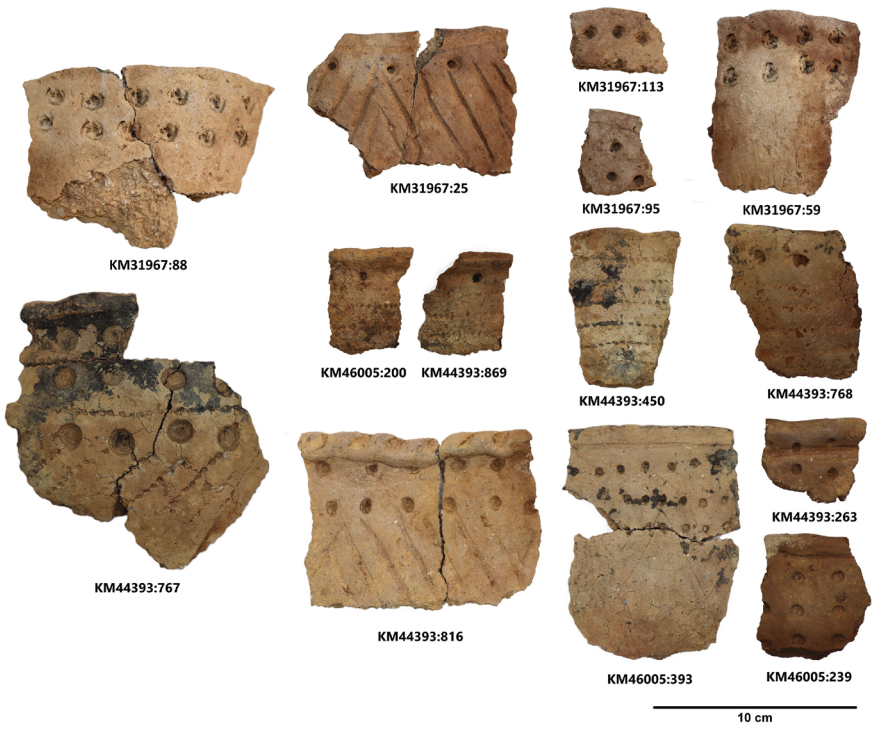

Fig. 5. Kiukainen pottery from Kirkkokangas IV. Photos: T. Väisänen.

Bones

The majority of bone fragments from the settlement site could not be identified within any taxon. However, 68 fragments were identified as seals (Phocidae), two as harp seals, more specifically (*Pagophilus groenlandicus*). Fish bone fragments were identified as cyprinids (Cyprinidae) and salmonids (*Salmonidae*), six as common whitefish, more specifically, *Coregonus lavaretus*). (Nurminen 2021, 2023, 2024).

Dating

One radiocarbon dating sample was taken from the hazelnut shells found from the northern side of the settlement site, while other samples were taken from burnt bone and charred crust of a pottery piece found from the southern side. Furthermore, one charcoal sample from the fireplace was dated, but the Iron Age date indicates later contamination from tree roots seeking the nutrient-rich soil of the hearth.

It should be noted that there are various potential sources of error in radiocarbon dating. The dating of a sample may always be subject to a degree of laboratory error. All samples from Kirkkokangas were analysed in the same laboratory, and therefore, inter-laboratory variation does not affect these results.

The greatest potential sources of error lie in the dated materials themselves. In this regard, the most reliable result is provided by the date obtained from a fragment of charred hazelnut shell. This reliability is based on the annual yield of hazelnut trees: the dated material represents the year of harvesting. People at the site most likely used the nuts as food, and the shells subsequently came into contact with fire. The European hazel (*Corylus avellana*) grows in fertile deciduous woodlands (Väre et al. 2021). Therefore, the hazelnuts must have been brought to Kirkkokangas IV from elsewhere, as the local soil and environmental conditions have always been poor and unsuited for the species.

One sample was obtained from burnt seal bone associated with human activity at the site. The results may be affected by the so-called 'old wood effect', which can make the radiocarbon ages appear older than the actual event. In practice, burnt bone reflects the age of the firewood used in the hearth, since the carbon within the bone is replaced by carbon derived from the burning wood during combustion (Hüls et al. 2010; Van

Strydonck et al. 2010; Olsen et al. 2012). Old firewood may, in principle, cause an apparent age offset of several hundred years. The exact magnitude of this effect is impossible to determine on a case-by-case basis, but in light of the other dates obtained from the site, the old wood effect is not particularly significant in this case.

The dating sample obtained from the carbonised residue on the pottery vessel reflects the period of the vessel's use and may contain carbon derived from multiple sources. It may also include a marine carbon component (Marine Reservoir Effect, MRE) if the vessel was used to process marine products. This could result in an apparently older radiocarbon age; however, the extent of the MRE can be assessed based on the $\delta^{13}C$ value. This value reflects the aquatic composition of the charred food crust, and the terrestrial/marine limit is set to –26 ± 1‰ (Fischer & Heinemeier 2003). In this sample, the magnitude of the (MRE) is likely small and has no significant impact on the dating result.

Acknowledging the potential sources of error, the use of the Kirkkokangas IV site can be dated to approximately 2000–1800 BC. This conclusion is further supported by the shoreline displacement chronology, which is discussed in the following chapter.

Table 2. Radiocarbon dates of the Kirkkokangas IV site. Radiocarbon dates are calibrated with software program IOSACal: v0.4.0 using the IntCal20 atmospheric curve (Reimer et al. 2020).

Lab index	**14C age BP**	**Dated material**	**Species**	**cal BC 95.4 %**	**$\delta^{13}C$**	**Context**	**Collection no. (KM)**
Ua-72798	3514±31	Hazelnut shell	*Corylus avellana*	1926–1746	-25.6	Cultural layer	-
Ua-72799	3671±34	Burnt bone	Phocidae	2190–1948	-25	Cultural layer	43325:148
Ua-77270	3582±31	Charred crust		2035–1775	-25.7	Pottery	44393:450
Ua-77271	2191±29	Charcoal		364–168	-25.7	Hearth	-

Land uplift and palaeoenvironment

The topography of the Kirkkokangas settlement site is gentle and shaped by coastal forces. The finds at the site are located between 33.5 and 31 metres in elevation. The highest find locations are on the crest of a beach terrace to the west of the sandpit, while the lowest finds are from the excavation area of 2022–2023, situated very close to the ancient shoreline of the latest phase of settlement. When the sea level dropped to about 30.5–29.5 metres and lower, the shoreline retreated due to the flatness of the terrain, moving approximately 100 metres to the west and south. Furthermore, while test pits were created at lower levels during excavations, there is no evidence of the settlement following the shoreline, indicating that the site was no longer in use when the shore retreated. No finds were found above the settlement site on the slope, although the same sandy soil extends up to at least 38 metres in elevation.

In the Pori region, the annual variation in sea level due to atmospheric pressure and winds is currently about ± 1 metre (Ilmatieteenlaitos 2025). Therefore, this variation must be accounted for the effect of wave action when estimating the highest annual water level. The rate of land uplift in the area is currently 70 cm per century; however, it was more rapid at the end of the Stone Age – potentially 80–90 cm per century (Taipale & Saarnisto 1991: 416; Hakonen 2025). During the approximate 200 years of settlement use (2000–1800 BC), the average sea level would have dropped by about 1.7 metres. The lower limit for the average sea level would have been about 30.5 metres in 1800 BC, with the upper limit around 32 metres in 2000 BC. During this time, even the highest parts of the settlement might have been occasionally washed by the sea during southwest storms, as indicated by evidence found on the site.

The water level was lower compared to that of Eurajoki Etukämppä site, where finds were located at elevations between 37 and 32 metres (Lehtonen 2005). Based on this calculation, Kirkkokangas IV appears to date to a slightly later period. Etukämppä is situated in an area where the rate of land uplift is slower to a degree, but this does not alter the overall interpretation. Two carbon datings from this site were older than those recovered from Kirkkokangas, with a 95.4% probability between 2410–2030 BC, which fits well within the expected timeframe.

Another comparison for estimating land uplift in the area comes from studies of the Kraakanmäki 1–3 sites (Fig. 6). The Kraakanmäki settlements were located at around 32–35 metres above sea level (Pesonen 2014a, 2014b; Laulumaa 2021), and Harjavalta is a region with slower land uplift than Pori. Dating from the Kraakanmäki 1–2 sites showed considerable variation, but Kraakanmäki 3 appeared to date around 200–300 years older than Kirkkokangas, with a 95.4% probability between 2453–2030 BC (Laulumaa 2021). Based on the rate of land uplift, the elevations of the dwelling sites, and the available carbon datings, the Kraakanmäki sites would thus represent settlements older than Kirkkokangas IV.

Kirkkokangas IV as a base for seal hunting

The Kirkkokangas IV site was located on the southern shore of an ancient island, approximately 30 km northwest of the mouth of the Kokemäenjoki River. Several Kiukainen culture settlements were situated in and around the river delta, some of which were extensive and

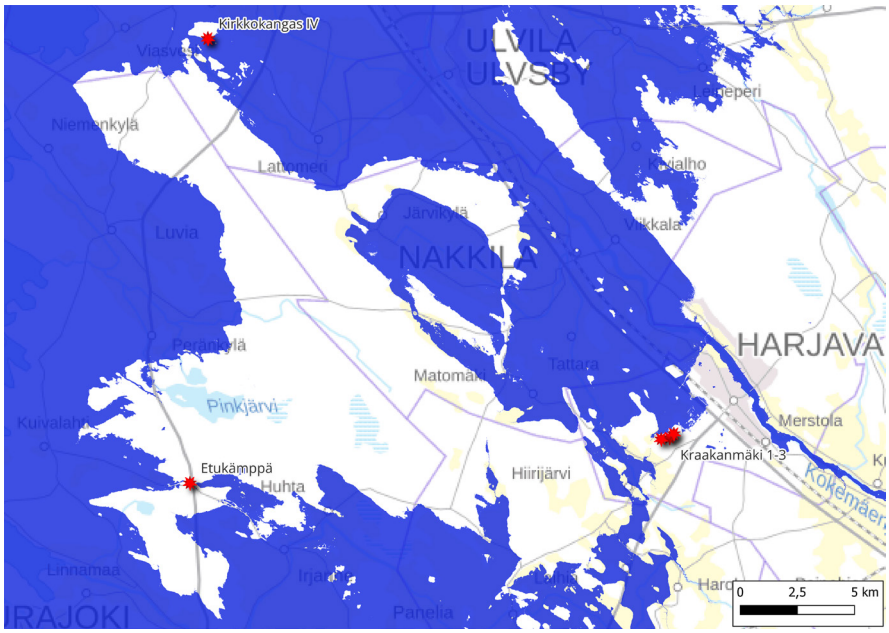

Fig. 6. The locations of Kirkkokangas IV and other known nearby Kiukainen culture sites of Etukämppä and Kraakanmäki 1–3. The sea is visualised at 30 m a.s.l, illustrating the sea level during the habitation of Kirkkokangas IV site. Map: National Land Survey of Finland, modified by T. Väisänen.

occupied over long periods, including the well-documented sites of Uotinmäki and Kaunismäki (Ailio 1909: 71–84; Meinander 1954: 7–25). It is likely that the people living in the river delta also utilised Kirkkokangas IV during seasonal hunting expeditions. The fertile river delta and the wide brackish bay opening were rich in fish resources, and the Kokemäenjoki River supported migratory species such as salmon, whitefish and lamprey. In addition, the delta would have offered favourable conditions for other fishes and waterfowl hunting. These factors suggest that visits to the more distant Kirkkokangas IV site were primarily related to seal hunting.

Kirkkokangas IV lay on an island exposed to the open sea, with smaller islands to the south and southeast forming a small archipelago within otherwise open shores. The site was situated near the centre of this small archipelago, providing shelter from most prevailing winds. Access to freshwater further enhanced the suitability of the location, as a small stream flows approximately 100 m west of the site. From an ecological perspective, the setting was well suited for seal hunting. Harp seals (*Pagophilus groenlandicus*) inhabit marine environments and give birth to their pups on ice floes during late winter and early spring (Lavigne 2009) when pups can be hunted directly from the ice under still wintry conditions. The discovery of a net at Lähdepuro may also be connected with seal-hunting activities conducted at or near the site.

In terms of environmental setting, Kirkkokangas IV is comparable to nearby Kiukainen culture sites, such as Etukämppä in Eurajoki and Kraakanmäki 1–3 in Harjavalta. All sites were located in coastal environments, although the Kraakanmäki sites were situated on the mainland, while Etukämppä was located on a larger island south of Kirkkokangas.

Although subsistence at all sites appears to have a strong orientation towards seal hunting, the faunal assemblages from Kraakanmäki and Etukämppä indicate a broader range of hunted species than at Kirkkokangas IV. At the Kraakanmäki sites, most identified bone fragments belong to seals, including two specimens identified as harp seal, alongside remains of moose (*Alces alces*) and Eurasian beaver (*Castor fiber*). Identified fish species include perch (*Perca fluviatilis*), pike (*Esox lucius*), common bream (*Abramis brama*), and cyprinids (Nurminen 2014, 2015, 2022). No bird bones were identified, but bird-feather barbules observed

on quartz artefacts suggest that bird carcasses were processed at the site (Kirkinen et al. 2023: 68).

In a similar manner at Etukämppä, seal remains dominate the assemblage, with three specimens identified as harp seal. Other mammal species include moose, Eurasian beaver, and European pine marten (*Martes martes*). Identified fish species include pike, perch, whitefishes (Coregonus spp.), cyprinids, Atlantic cod (*Gadus morhua*), and burbot (*Lota lota*). Bird bones were present but could not be linked to a specific species: the current interpretation suggests that the bones belonged to waterfowls (Lehtonen 2005: 13).

Based on its location, osteological material and associated finds, Kirkkokangas IV appears to have functioned primarily as a specialised site focused on seal hunting and fishing. Situated approximately a day's journey from larger settlement centres, the site may have served as a location for the initial processing of catches prior to their transport to more permanent settlements. Occupation was likely seasonal; in particular, winter conditions would have posed challenges to year-round habitation due to exposure to the open sea.

Conclusions

The osteological assemblage and environmental setting suggest that Kirkkokangas IV was a specialised site focused on the exploitation of marine resources, especially seal hunting and fishing. Its location within a sheltered micro-archipelago, while remaining closely connected to the open sea, supports an interpretation of the site as a temporary, task-specific occupation rather than a permanent settlement.

Radiocarbon dates, together with reconstructions of the ancient landscape, place the main phase of occupation between 2000 and 1800 BC. This chronology corresponds well with the typological characteristics of the ceramic assemblage and lithic technology, both of which are consistent with the Kiukainen culture. The presence of both Scandinavian and Eastern flint arrowheads, alongside a variety of quartz and other lithic raw materials, may indicate wide-ranging exchange networks or a high degree of mobility among the communities utilising the site.

These results highlight the significance of peripheral maritime sites within the broader settlement system of the Kiukainen culture. Further comparative studies of contemporaneous sites in the Satakunta region will be important for refining interpretations of mobility, subsistence strategies, and cultural interaction during the transition from the Neolithic to the Early Metal Age in southern Finland.

Acknowledgements

This research has received funding from the Migration Institute of Finland, Archaeological Society of Satakunta, and Satakunnan Museon ystävät ry. The research was conducted in cooperation with Satakunta Museum and Pori adult education centre.

Teemu Väisänen *is a Doctoral Researcher in the Degree Programme in Digital Culture, Landscape, and Cultural Heritage at the University of Turku. teemu.t.vaisanen@utu.fi*

Janne Soisalo *is a Doctoral Researcher in the Degree Programme in History and Cultural Heritage at the University of Helsinki. janne.soisalo@helsinki.fi*

References

Ailio, J. 1909. *Die Steinzeitlichen Wohnplatzfunde in Finland*. Helsinki: Kommission bei der Akademischen Buchhandlung.

Alenius, T. 2008. The palaeoecological study of three mires on the island Kemiönsaari, SW Finland. Appendix 2. H. Asplund *Kimittae. Sites, centrality and long-term settlement change in the Kemiönsaari region in SW Finland*: 565–584. Doctoral Dissertation, University of Turku, Finland.

Andrefsky, W. 1998. *Lithics. Macroscopic approaches to analysis*. Cambridge: Cambridge University Press.

Bläuer, A. & Kantanen, J. 2013. Transition from hunting to animal husbandry in Southern, Western and Eastern Finland: New dated osteological evidence. *Journal of Archaeological Science* 40: 1646–1666. https://doi.org/10.1016/j.jas.2012.10.033

Edgren, T. 1984. Kivikausi. *Suomen historia I*: 10–97. Espoo: Weilin & Göös.

Eranti, O. 2022. Harjavalta Kraakanmäki 3:n arkeologisen mineraali- ja kivilajiaineiston kiviteknologinen analyysi. 15.3.2022. Research report. Appendix in V. Laulumaa 2021. Harjavalta Kraakanmäki 3 ja Kortteenrapakko. Kivikautisen asuinpaikan kaivaus ja koekaivaus. Excavation report.
Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Eranti, O. 2024. Pori Kirkkokangas 4:n arkeologisen mineraali- ja kivilajiaineiston kiviteknologinen analyysi. 15.2.2024. Research report. Archive of the Satakunta Museum, Pori.

Fischer, A. & Heinemeier, J. 2003. Freshwater reservoir effect in 14C dates of food residue on pottery. *Radiocarbon* 45(3): 449–466.

Hakonen, A. 2025. Introducing the post-glacial land adjustment regenerator (GLARE) for simulating the final Pleistocene/Holocene geographic change in North Europe. *Journal of Archaeological Science* 181: 106298. https://doi.org/10.1016/j.jas.2025.106298

Hallgren, F. 2008. *Identitet i praktik. Lokala, regionala och överregionala sociala sammanhang inom nordlig trattbägarkultur*. Coast to Coast-books 17. Doktorsavhandling i arkeologi. Uppsala: Uppsala universitet.

Holm, L. 1991. The use of stone and hunting of reindeer: a study of stone tool manufacture and hunting of large mammals in the Central Scandes c. 6000–1 BC. *Archaeology and Environment* 12. Umeå: Umeå University.

Huurre, M. 1991. Satakunnan kivikausi. P. Alhonen & M. Huurre (eds.) *Satakunnan historia I,1.* Rauma: Satakunnan maakuntaliitto r.y. & Satakuntaliitto.

Hüls, C. M., Nadeau, M. J., Grootes, P. M., Erlenkeuser, H. & Andersen, N. 2010. Experimental study on the origin of cremated bone apatite carbon. *Radiocarbon* 52(2): 587–599. https://doi.org/10.1017/S0033822200045628

Ilmatieteenlaitos 2025. Vedenkorkeustilastot. https://www.ilmatieteenlaitos.fi/vedenkorkeustilastot (Accessed April 9, 2025)

Kirkinen, T., Juhola, T., Eranti, O., Väisänen, T., Seppä, J. & Laulumaa, V. 2023. Combining residue and macroscopic use-wear analysis of quartz objects in Kraakanmäki 3 Late Neolithic settlement site, Western Finland. *Fennoscandia archaeologica* XL: 57–78. https://doi.org/10.61258/fa.130079

Laukkanen, E. 1996. Porin esihistorialliset muinaisjäännökset. Kertomus v. 1996 tapahtuneesta inventoinnista. Research report, Satakunta Museum, Pori. Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Laulumaa, V. 2021. Harjavalta Kraakanmäki 3 ja Kortteenrapakko. Kivikautisen asuinpaikan kaivaus ja koekaivaus. Excavation report. Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Lavento, M. 2015. Pronssi- ja varhaismetallikausi. G. Haggrén, P. Halinen, M. Lavento, S. Raninen & A. Wessman (eds.) *Muinaisuutemme jäljet. Suomen esi- ja varhaishistoria kivikaudelta varhaiskeskiajalle*: 125–212. Helsinki: Gaudeamus.

Lavigne, D. 2009. Harp Seal: Pagophilus groenlandicus. W. Perrin, B. Würsig & J. G. M. Thewissen (eds.) *Encyclopedia of Marine Mammals* (Second Edition): 542–546. London: Academic Press. https://doi.org/10.1016/B978-0-12-373553-9.00127-9

Lehtonen, K. 2005. Eurajoen Etukämppä – hylkeenpyytäjien ja kalastajien tukikohta muinaisen Panelianlahden rannalla. H. Ranta (ed.) *Kentältä poimittua 6. Kirjoitelmia arkeologian alalta*: 5–18. Helsinki: Museovirasto.

Lempiäinen-Avci, M., Pukkila, J., Bläuer, A., Pääkkönen, M. & Asplund, H. 2024. New evidence of late Neolithic and early Metal Period agriculture in Turku, southwest Finland. *Vegetation History and Archaeobotany*. https://doi.org/10.1007/s00334-024-01008-5

Meinander, C. F. 1954. *Die Kiukaiskultur*. Suomen Muinaismuistoyhdistyksen Aikakauskirja 53. Helsinki: Finnish Antiquarian Society.

Nurminen, K. 2014. Harjavalta Kraakanmäki 2014. Osteologinen analyysi kivikautisen asuinpaikan kaivauksen luista. 4.8.2014. Research report. Appendix in P. Pesonen 2014b. Harjavalta Kraakanmäki 2. Kivikautisen asuinpaikan arkeologinen kaivaus 5.5.–4.6.2014. Excavation report.
Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Nurminen, K. 2015. Harjavalta Kraakanmäki 1 2014. Osteologinen analyysi kivikautisen asuinpaikan kaivauksen luista. KM 40296. 6.1.2015. Research report. Appendix in P. Pesonen 2014a. Harjavalta Kraakanmäki 1. Kivikautisen asuinpaikan arkeologinen kaivaus 18.8.–19.9.2014. Excavation report.
Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Nurminen, K. 2021. Pori Kirkkokangas IV 2021. 12.11.2021. Osteologinen analyysi kivikautisen asuinpaikan kaivauksen luista. Research report. Appendix in J. Soisalo & T. Väisänen 2021. Pori Kirkkokangas IV. Arkeologinen koekaivaus 2021. Excavation report. Available at https://asiat.museovirasto.fi/

Nurminen, K. 2022. Harjavalta Kraakanmäki 3. Osteologinen analyysi kivikautisen asuinpaikan kaivauksen luista. 9.2.2022. Research report. Appendix in V. Laulumaa 2021. Harjavalta Kraakanmäki 3 ja Kortteenrapakko. Kivikautisen asuinpaikan kaivaus ja koekaivaus. Excavation report.
Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Nurminen, K. 2023. Pori Kirkkokangas IV 2022. 25.1.2023. Osteologinen analyysi arkeologisen kaivauksen luista. Research report. Appendix in J. Soisalo & T. Väisänen 2022. Pori Kirkkokangas IV. Arkeologinen koekaivaus 2022. Excavation report. Available at https://asiat.museovirasto.fi/

Nurminen, K. 2024. Pori Kirkkokangas IV 2023. 6.2.2024. Osteologinen analyysi arkeologisen kaivauksen luista. Research report. Appendix in J. Soisalo & T. Väisänen 2025. Pori Kirkkokangas IV. Arkeologinen kaivaus 2023. Excavation report. Available at https://asiat.museovirasto.fi/

Olsen, J., Heinemeier, J., Horsnstrup, K. M., Bennike, P. & Thrane, H. 2012. 'Old wood' effect in radiocarbon dating of prehistoric, cremated bones? *Journal of Archaeological Science* 40: 30–34. https://doi.org/10.1016/j.jas.2012.05.034

Pesonen, P. 2014a. Harjavalta Kraakanmäki 1. Kivikautisen asuinpaikan arkeologinen kaivaus 18.8.–19.9.2014. Excavation report.
Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Pesonen, P. 2014b. Harjavalta Kraakanmäki 2. Kivikautisen asuinpaikan arkeologinen kaivaus 5.5.–4.6.2014. Excavation report.
Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Rankama, T., Manninen, M. Hertell, E. & Tallavaara, M. 2006. Simple production and social strategies: do they meet? Social dimensions in Eastern Fennoscandian quartz technologies. J. Apel & K. Knutsson (eds) *Skilled Production and Social Reproduction. Aspects of Traditional Stone-Tool Technologies*: 245–261. Uppsala: Societas Archaeologica Upsaliensis.

Reimer, P., Austin, W., Bard, E., Bayliss, A., Blackwell, P., Bronk Ramsey, C., Butzin, M., Cheng, H., Edwards, R., Friedrich, M., Grootes, P., Guilderson, T., Hajdas, I., Heaton, T., Hogg, A., Hughen, K., Kromer, B., Manning, S., Muscheler, R., Palmer, J., Pearson,

C., van der Plicht, J., Reimer, R., Richards, D., Scott, E., Southon, J., Turney, C., Wacker, L., Adolphi, F., Büntgen, U., Capano, M., Fahrni, S., Fogtmann-Schulz, A., Friedrich, R., Köhler, P., Kudsk, S., Miyake, F., Olsen, J., Reinig, F., Sakamoto, M., Sookdeo, A. & Talamo, S. 2020. The IntCal20 Northern Hemisphere radiocarbon age calibration curve (0–55 cal kBP). *Radiocarbon* 62(4): 725–757. https://doi.org/10.1017/RDC.2020.41

Salo, U. 1960. Kertomus kolmen kiviröykkiöhaudan tutkimisesta Porin mlk:n Tuorsniemessä 20.6.–28.6.1960. Research report, Satakunta Museum, Pori. Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Salo, U. 1981. *Satakunnan historia I,2. Satakunnan pronssikausi.* Rauma: Satakunnan Maakuntaliitto r.y.

Salo, U. 2004. *Sastamalan historia* 1,1. Esihistoria. Hämeenlinna: Karisto Oy.

Soisalo, J. & Roiha, J. 2022. Kiukainen Culture Site Locations – Reflections from the Coastal Lifestyle at the End of the Stone Age. *Land* 2022 11(9): 1606. https://doi.org/10.3390/land11091606

Soisalo, J. & Väisänen, T. 2021. Pori Kirkkokangas IV. Arkeologinen koekaivaus 2021. Research report, Satakunta Museum, Pori. Available at https://asiat.museovirasto.fi/

Soisalo, J. & Väisänen, T. 2022. Pori Kirkkokangas IV. Arkeologinen koekaivaus 2022. Research report, Satakunta Museum, Pori. Available at https://asiat.museovirasto.fi/

Soisalo, J. & Väisänen, T. 2025. Pori Kirkkokangas IV. Arkeologinen kaivaus 2023. Research report, Satakunta Museum, Pori. Available at https://asiat.museovirasto.fi/

Soisalo, J. 2025. The chronology of the Pyheensilta group and Kiukainen culture in Finland based on radiocarbon dating. *Fennoscandia archaeologica* XLII: 28–46. https://doi.org/10.61258/fa.160868

Storå, J. 2000. Sealing and animal husbandry in the Ålandic Middle and Late Neotithic. *Fennoscandia archaeologica* XVII: 57–81.

Taipale, K. ja Saarnisto, M. 1991. *Tulivuorista jääkausiin*. Helsinki: WSOY.

Ukkonen, P. 2002. The early history of seals in the northern Baltic. *Annales Zoologici Fennici 39*: 187–207.

Vanhatalo, S. 1999. Pori 83 Kirkkokangas IV. Kivi-varhaismetallikautisen asuinpaikan koekaivaus. Research report, Finnish Heritage Agency, Helsinki. Available at https://www.kyppi.fi/palveluikkuna/raportti/read/asp/r_default.aspx

Van Strydonck, M., Boudin, M. & De Mulder, G. 2010. The carbon origin of structural carbonate in bone apatite of cremated bones. *Radiocarbon* 52(2): 578–586. https://doi.org/10.1017/S0033822200045616

Väre, H., Saarinen, J., Kurtto, A. & Hämet Ahti, L. 2021. *Suomen puu- ja pensaskasvio.* Helsinki: Finnish Dendrological Society.