

How Humans Engineered Possibilities of Landscape: Baskets and Basketry Materials in İnönü Cave

F. Gülden Ekmen

Zonguldak Bülent Ecevit University

Hamza Ekmen

hamzaekmen@hotmail.com

Zonguldak Bülent Ecevit University

Alan Crivellaro

Università degli Studi di Torino

Barbaros Yaman

Bartın University

Research Article

Keywords: Basketry, İnönü Cave, Late Bronze Age, Plaiting, *Taxus baccata* L., *Acer campestre* L

Posted Date: September 12th, 2024

DOI: <https://doi.org/10.21203/rs.3.rs-4917835/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at Archaeological and Anthropological Sciences on December 23rd, 2024. See the published version at <https://doi.org/10.1007/s12520-024-02139-6>.

Abstract

Wood and bark are among the most significant raw materials prehistoric and early historical human communities used to produce tools and goods that shaped their daily life. Since special conditions are required to preserve objects made with these materials until today, we have limited information about how often or how this basic raw material was used. Here, we report evidence of how wood and bark were used in basket crafting and compare them with modern-day uses.

On the northwestern coast of Türkiye, Zonguldak-Karadeniz Ereğli İnönü Cave has special conditions for the preservation of wood and other organic materials. In the Late Bronze Age Level III of the cave (1436 – 1123 Cal BC), baskets and evidence of basketry were found among water-filled puddles. These records are valuable for understanding how the environment surrounding archaeological sites was used by its settlers. Analyses carried out to understand which types of trees in the environment are preferred for basket production highlighted European yew (*Taxus baccata* L.) and field maple (cf *Acer campestre* L.) species. Production techniques and species analyses of basket remains show the knowledge and level of specialization in basket production of the Late Bronze Age settlers of İnönü Cave.

1. Introduction

Basketmaking transforms fibrous and flexible plant materials such as twigs, wood, and barks into three-dimensional objects by bending, knitting, or wrapping. All items falling within this scope are hand-knitted without a loom or fixed system and are technically considered a type of textile class (Adovasio 2010). Basket making is classified according to three main weaving methods: plaiting, coiling, and twining. Plaited baskets are produced by passing the strips prepared for knitting over or under each other at an angle of approximately 90 degrees. Coiled baskets are produced by a method that involves sewing or attaching fixed horizontal elements and movable vertical elements to each other. Twined baskets are formed by passing horizontal weaving elements, called weft, around fixed weaving elements, called warp (Weltfish 1930). There are many variations under these main groups.

For baskets from prehistoric or early historical periods to be recovered intact, the area where they are found must have special conditions. Fillings that are dry, cold, or water-filled may allow them to survive. Many basketry products, such as sturdy baskets, mats, and bags, were found in suitable environments in North America (Adovasio 1980). The Near East is not considered very suitable for baskets or plant-based artifacts to survive to the present day. However, evidence has been reported from partial charring and silica skeletal traces on floors or pottery (Wendrich and Ryan 2012). The best-preserved three-dimensional baskets are the coiled and twined baskets made of esparto grass from the Mesolithic (c. 7500 BC) and Neolithic (c. 5100 BC) Age, found in Cueva de los Murciélagos in Spain (Martínez-Sevilla et al. 2023).

Here, we investigate Late Bronze Age plant-based technologies by analyzing a plaited basket and basketry products produced with tree barks from the İnönü Cave in the Zonguldak province of Türkiye. This cave was used for living, sheltering, and production for many people in prehistoric and early

historical periods. Level III, within the stratigraphic sequence of the cave extending from the Chalcolithic Age to the Middle Ages, was inhabited in the Late Bronze Age (1436 – 1123 Cal BC). During the excavations on this level, wooden floors of four large and two small buildings were unearthed (Yaman & Ekmen 2023). Baskets and basketry remains preserved on and around these floors, allowing us to examine these organic items' technologies, types, and contexts rarely preserved in the archaeological record. These plaited baskets and their evidence of basketry, which are unique in that they are produced with tree bark, are introduced according to their typological characteristics, and their contexts, types, and absolute dates are presented here with current examples.

2. İnönü Cave

2.1. Environmental Data

İnönü Cave (Karadeniz Ereğli, Zonguldak) is a volcanic cave located 25 km from the Black Sea coastline of Türkiye and 2 km from the village of Alacabük (Fig. 1). Its large entrance, which provides direct access to the cave, faces west. The cave developed in several stages and took its current form during the volcanic arc formed by the migration of magma to the surface resulting from the northward subduction of the Northern Neo-Tethys Ocean (Ekmen et al. 2021a, 26–27) (Fig. 2). It is 235 m above sea level in the Kızlar Creek valley, one of the branches of the Güllüç River that empties into the Black Sea. It still has a drinkable water source today. The cave's width reaches approximately 25 m in the interior, and its height is 10 m. It starts in an oval shape at the entrance and ends with 3 chambers at the bottom, named A, B, and C by the excavation team (Fig. 1). Surroundings, *Quercus petraea* (Matt.) Liebl. (sessile oak), *Quercus cerris* L. (Türkiye oak), *Fagus orientalis* Lipsky (Eastern beech), *Carpinus betulus* L. (common hornbeam), *Alnus glutinosa* (L.) Gaertn. (common alder), *Acer campestre* L. (field maple), *Pinus nigra* Arnold subsp *pallasiana* (Black pine) and *Corylus avellana* L. (common hazel). It was chosen as a living space by people in prehistoric and early historical periods due to its dominant agricultural areas, forest products with a broad perspective, and potentially suitable for hunting and animal husbandry activities (Ekmen et al. 2020a, 114–115).

The local people used the cave as a sheepfold for sheep farming for about 70–80 years after the prehistoric settlers. Within the scope of archaeological research, it was first visited by Düring and Karauğuz, and pottery pieces collected from the surface were introduced (Karauğuz-Düring 2009). Archaeologists have identified five cultural layers in the cave, where systematic excavations have been carried out since 2017. The dates reached by analogical analysis of the archaeological material found in these levels were confirmed by calibrated radiocarbon analyses performed on 30 samples (Table 1). Archaeologically, the earliest settlement begins with the Chalcolithic Age and extends to the Middle Ages.

Table 1
Stratigraphy of İnönü Cave.

Levels	Ages	Calibrated Dates
I	Medieval Age	-
II	Early Iron Age	1231 – 979 Cal. BC
III	Late Bronze Age	1436 – 1123 Cal. BC
IV	Early Bronze Age	3126 – 2133 Cal. BC
V	Chalcolithic Age	4260 – 3976 Cal. BC

2. 2. Level III: Late Bronze Age (1436 – 1123 Cal. BC)

Level III, just below level II of the Early Iron Age of İnönü Cave, was inhabited in the Late Bronze Age. Four separate wooden floors were unearthed during the excavations in chamber C o (A, B, C, and D). The tree stems used in the construction of the floor were well-preserved thanks to the mud filling created by the spring waters leaking through the cave (Ekmen et al. 2021b) (Fig. 3). Wood identification analyzes performed on a large number of samples have shown that Oak (*Quercus* from white oak group), Pine (*Pinus nigra* or *P. sylvestris*), *Alnus glutinosa* (common alder) and *Acer* sp (maple) woods are preferred for building bases (Yaman & Ekmen 2023). Late Bronze Age residents built these floors to transform the sloping and wet floor of the cave into a flat and dry living area. Thanks to meticulous studies, evidence shows that the floors were plastered with a thin clay plaster.

Pottery pieces and small finds made of terracotta and metal were unearthed on the wooden floors mentioned. These findings provided vital information to explain the settlement history of level III and the character of the settlement. Most of the bronze items recovered from floors A and B consist of weapons and needles of different sizes. A clay human figurine head was found on the northwest of floor C, and a metal bull figurine was found on the base of floor D (Fig. 4). Analogical analysis of these finds shows their connection with Central Anatolian Hittite Age artifacts. Although the small finds unearthed on floors C and D were fewer than those on floors A and B, it was noteworthy that they were mainly related to beliefs and rituals (Ekmen et al. 2021b).

The pottery of level III shows a very original and largely indigenous character. Handmade, coarse paste and mostly finger-print decoration on relief bands, the pottery shows similarities with Early Iron Age (Level II) Coarse Ware pottery in decorations and vessel forms (Ekmen et al. 2020b). This shows that the ceramic tradition continues to a large extent throughout Levels III and II.

The findings of İnönü Cave are essential because they were obtained during systematic excavations in the Western Black Sea Region and found in defined levels depending on the context. Analysis of nine carbon samples taken from the wooden floors found in level III of the cave dates back to 1431 – 1285 Cal. BC to 1295 – 1123 Cal BC. (Fig. 5). Analogical analysis of the findings is also compatible with these

dates. This information shows that İnönü Cave was a small Late Bronze Age settlement on the Western Black Sea coast, northwest of the Hittite core region.

2. 3. Baskets and Basketry

The baskets unearthed in level III of İnönü Cave in close positions are three, two of which are body parts belonging to different baskets, and one of which is a preserved basket with its handles and bases (Table 2). This article focuses on the sturdy basket with a handle and two bases (B01-I/8), dated by radiocarbon analysis and examined in detail regarding type, and technology.

Table 2
Code and types of basket and
basket fragments.

Object Code	Object Type
B01-I/8	Basket
BF01-I/7	Basket Fragment
BF02-I/7	Basket Fragment

BF01-I/7 was found on floor B, south of trench I/7. The best-preserved parts of the fragment belonging to the body of a plaited basket measure 13.5 x 12.5 cm. It is plaited in a checkered with tree bark strips with widths varying between 0.7–1 cm (Fig. 6).

BF02-I/7 was found north of trench I/7. It is woven in a checkered pattern with bark strips varying in width between 1 and 1.5 cm (Fig. 7). The fact that the strips are wider than BF01-I/7 shows at first glance that it belongs to a larger basket. The preserved dimensions of this piece, which has an oval bottom and an oval-like body, are 17 x 13 cm.

B01-I/8 was found in trench I/8 at the southeast corner of floor A (Figs. 8–11). The basket rises on a two-piece base and has a closed mouth and only a short spout. Its two bases, made of wood, were wrapped with tree bark and attached to the basket body (Fig. 9). Its single handle, made of wood, was attached to the closed mouth of the basket and then wrapped with shells to attach it to the body. The wrapped shells on the handle prove that the entire handle was wrapped in shells when used (Fig. 9). B01-I/8 is produced by the checker plaiting method. This method involves passing the weft over and under the warp element. Each weft alternates over and under in checkered plaiting, creating a checkered effect (Weltfish 1930).

B01-I/8 was documented with ultrasonography in order to see the inside of the basket after the necessary documentation work was carried out inside the cave and in the excavation laboratory (Fig. 11). Radiocarbon analysis performed on a piece of the body of the basket yielded dates of 1213 – 1044 Cal BC (Fig. 12). Afterwards, the basket numbered B01-I/8 was sent to Ankara Restoration and Conservation Regional Laboratory for cleaning, stabilizing and drying processes.

Many strips of rolled tree bark were found around the baskets and basket parts detailed above. These bark strips are of various widths and various lengths and shows that the area where the baskets in question were unearthed was also the place of production. Some of the bark strips recovered are wastes generated during peeling, and some are pre-prepared bark strips for basket production (Fig. 13).

3. Material and Method

The basket found in İnönü Cave is made of plant-based material and consists of three parts. The body of the basket is made of strips of cut and woven tree bark, while the handle and base are made of wood. The basket has been preserved in the damp mud environment of the cave for approximately 3400 years. Therefore, the materials composing the basket exhibit characteristics of water-saturated wood and bark (waterlogged wood and bark). Thin sections of 2–3 mm length were taken from the materials constituting the handle and body of the basket using a razor blade. However, a thin piece of wood, less than 1 mm in size, about to break off at the base of the basket, was removed with a scalpel under a stereo microscope. These thin anatomical sections were placed into glycerine droplets on slides without preprocessing and then covered with coverslips before examination under a light microscope (Gärtner & Schweingruber 2013). To determine the wood species used in the construction of the handle and base of the basket, as well as the bark used in the body, comparison materials from the Wood Anatomy and Dendrochronology Laboratory of Bartın University Faculty of Forestry, along with written atlases on wood and bark anatomy, were utilized (Akkemik & Yaman 2012, IAWA Committee 1989 & 2004, Crivellaro & Schweingruber 2013, Schweingruber et al. 2019). In addition, the INSIDEWOOD (ref) website was also used for wood identification.

4. Results

We analyzed the anatomical features of thin sections observed under a transmitted light microscope to identify the plant material collected from the baskets.

4. 1. The anatomical traits of the wood comprising the handle of the basket (B01-I/8)

The basket handle, a single branch containing the pith and approximately 1.2 cm in diameter, was obtained by bending a shoot or thin branch into a curved shape. The observation of longitudinal thin sections revealed features related to a conifer wood. We observed distinct growth ring boundaries (Fig. 14a) and a gradual transition from earlywood to latewood. The double-wall thickness of longitudinal tracheids in latewood was greater than their radial lumen diameter. Helical thickenings (HTs) were present in the longitudinal tracheids cell walls (Fig. 14b), throughout the growth ring. The coils of HTs were single, and their number was under 120 per mm (widely spaced). Ray tracheids were absent. Rays were exclusively uniseriate (Fig. 14b), and their average height was medium. All these observed features point to *Taxus baccata* (European yew) wood.

4. 2. The anatomical traits of the wood comprising the base of the basket (B01-I/8)

The analyzed piece of wood is less than 1 mm in size was examined under a light microscope (Figs. 15a-15b), and HTs were detected in the tracheid cells (Fig. 15b). Among living Gymnosperms in Türkiye, European yew (*Taxus baccata*) is the only species with HTs in its tracheids.

4. 3. The anatomical traits of the bark comprising the body of the basket (B01-I/8)

The anatomical investigations on the basket's body revealed the structure of the outermost, dead part of the bark of a tree, called the rhytidome. The rhytidome generally consists of polygonal-shaped cells that formerly belonged to the phloem but were pushed towards the stem's periphery by radial growth. Only a small portion of the rhytidome can be seen in the cross-section of the bark taken from the basket (Figs. 16a-16b). After examining the cross-sections of fresh bark samples from different species around the İnönü Cave, it has been concluded that the cells of bark sample taken from the basket resemble the cells in the periderm tissue of the field maple (*Acer campestre*) bark (Fig. 16c).

5. Discussion

Basketry is a rural craft, and many people around the world produce baskets using a wide variety of methods. Remains of rope, baskets, and various fabric types have been unearthed since the Paleolithic Age in the Near East, North Africa, and Europe (Bender Jørgensen et al. 2023).

One of the oldest evidence of basketry, one of the most widespread crafts in human history, was found in Europe, in Dolní Věstonice I and II and Pavlov I in Moravia, Czech Republic (Adovasio et al. 1996). These are evidence of ropes and nets in the form of negative marks on clay dating back to the 28th Millennium BC (Cal. BP). The earliest evidence of mats or basketry products produced with perishable fibers is found at Ohalo II in Israel (21,000 Cal. BC), Abu Huraira in Syria (11,220 Cal. BC), Wadi Murrabba'at in Israel (10,767–9612 Cal. BC), and the Shanidar Cave in Iraq (9650 Cal. BC) can be counted (Bender Jørgensen 2023). Apart from these, various textile, matting, cordage, and flexible fabric residues were reported by Bender Jørgensen and his colleagues (Bender Jørgensen et al. 2023). Among these examples, coiling is the most common knitting method (Schick 2010, Solazzo et al. 2016).

When we look at the settled life history of Anatolia dating back to 12,000 BC., traces of basket making and matting can be found in Neolithic Age settlements such as Körtik Tepe PPNA (Erdal 2015), Çayönü, Çatalhöyük, Ulucak Höyük (Çilingiroğlu et al. 2012) and Ilıpınar X(c. 6400 – 6000 BC) (Roodenberg and Roodenberg 2008; Ertuğ 2006a).

Çatalhöyük ruins are essential in terms of containing plaiting material. Researchers have classified these remains as phytoliths, in situ basket traces, and basketry traces on clay objects (Wendrich and Ryan

2012). The majority of coiled baskets unearthed in Çatalhöyük were found in graves, and researchers interpreted these baskets as grave containers (Bender Jørgensen et al. 2021). Coiled samples were produced from wild grasses (most commonly a wild panicoid grass, with one example of *Agropyron* sp.), sedges (*Cyperaceae*), and one example from straw cereal. Plaited materials are plant-based mats usually found on the floors of shrines. These mats were made from sedges and occasionally from common reeds (*Phragmites australis*).

A few examples of baskets have been preserved in three dimensions, such as the İnönü Cave baskets. Coiled and twined baskets made of esparto herb from the Mesolithic (c. 7500 BC) and Neolithic (c. 5100 BC) period recovered from Cueva de los Murciélagos in Spain are remarkably well preserved (Martínez-Sevilla et al.). 2023). A coiled basket (7600 Cal. BC) filled with pistachio was found in the Beidha settlement in Jordan (Bender Jørgensen et al. 2023). It is a twined basket made of willow found in Noyen Sur-Seine in France (7190 – 6450 Cal. BC). Those found at Tell Kashkashok in Syria are twined and coiled baskets (6500 – 6000 Cal. BC). The basket found in Umm Dabaghiyah in Iraq (6200 – 5750 Cal. BC) and the basket found in Grotta Santa Croce in Italy (5300 – 4900 Cal. BC) were also knitted with the coiling method. The oldest basket found in Egypt was found in Fayum. This coiled basket, dating from the Neolithic Age (c. 5900 – 4000 BC), was made of coarse straw (Wendrick 2016). The coiled basket remains found in the Gelidonya shipwreck (Yalçinkaya 1958) are also made of reed and, like the baskets from İnönü Cave, belong to the Late Bronze Age. When all these baskets, mats, or basketry remains are examined, it is seen that the standard method is coiling and twining.

The plaiting method, which draws attention in İnönü Cave basketry, does not require any tools. Traces of baskets and mats produced from reeds using this method can be found in Epipaleolithic and Early Neolithic levels in Abu Hureyra in Syria (11,220 and 7760 Cal. BC), in Proto-Neolithic tombs in Shanidar Cave in Iraq (9650 Cal. BC), the Epipaleolithic site was found at M'lefaat in Iraq, (9660 – 8840 Cal. BC) and the Khan Afuda Cave in Libya (8000 Cal. BC) (Bender Jørgensen et al. 2023). In the American continent, evidence of the plaiting method was found in Nevada, Spirit Cave, Grimes Burial Shelter, Crypt Cave, Chimney Cave, Hidden Cave, and Elephant Mountain Cave. These are dated between 11000 – 9600 Cal BP (Connolly et al. 2016). The traces preserved on clays related to the plaited basket weaving technology detected in Jarmo in Mesopotamia are dated between 7000 – 6000 BC (Adovasio 1975–1977).

When we look at the prehistoric records regarding basketry, we see that the raw materials preferred in production, such as reeds, were perishable. The fact that the İnönü Cave baskets are woven with bark is essential as it shows how the Late Bronze Age inhabitants of the cave used the natural environmental opportunities. The earliest find produced using bark as raw material is the rope unearthed in Lascaux in France (19,000 Cal. BC). (Bender Jørgensen et al. 2023).

Ethnographic records provide information about plaited baskets' recent and present uses (Ertuğ 2006a). Basket weaving remains a rural craft in the Black Sea Region, where İnönü Cave is located. Today, extracts obtained from species such as *Corylus avellana* L. (hazel), *Corylus maxima* Miller (hazelnut),

Castanea sativa Miller (chestnut), *Zea mays* L. (corn), *Ulmus minor* Miller (elm) are used in basket weaving (Ertuğ 2006a). Small-sized baskets woven with bark, called *Gıdık* or *Çöte*, are still used today to collect hazelnuts or various forest fruits (Baş 1996) (Fig. 17).

6. Conclusions

Since the Pre-Pottery Neolithic Age in Anatolia, baskets and basketry products have been woven with various perishable materials using coiling, twining, and plaiting methods and used for various purposes (Ertuğ 2006b). The İnönü Cave baskets introduced here show that basketry was one of the crafts of the early historical communities of the Western Black Sea Region. These baskets are vital as they show how the human communities that lived on the northwestern coast of Anatolia in the Late Bronze Age integrated the natural landscape into their daily lives and how they interacted with their environment. In other words, the baskets detailed here show how the natural environment affects human action and how these natural environmental resources turn into objects affected by human action. The fact that baskets of similar types and sizes woven with tree bark are still used in the Black Sea Region, where İnönü Cave is located, shows the contribution of the early artisans of the region to today's handicraft culture.

The wooden floors identified in level III of İnönü Cave and some wooden items found on these floors reveal the high level of knowledge and experience that the Late Bronze Age residents had in woodworking. Production techniques and species analysis of the well-preserved basket show that the Late Bronze Age inhabitants specialized in basketry. The fact that the handle and bases of the basket are made of *Taxus baccata* (yew) and the body is made of *Acer campestre* (maple) indicates that the tree species to be used for different parts of the basket craftsmanship were carefully selected in the forest conditions around the cave.

When looking at the choice of raw materials in wood processing, the first weak signs are calcium oxalate crystals from *Acacia* wood found on hand axes and stone fragments dating back 1.6 million years in the Tanzania-Peninj region (Dominguez-Rodrigo et al. 2001). The oldest known evidence of wood use is found at the 780,000-year-old Gesher Benot Yaaqov archaeological site in Israel (Goren-Inbar et al., 2004; Werker, 2006; Lev-Yadun, 2007). Based on studies conducted at the Kalambo Falls archaeological site in Zambia, the earliest indications of wood's structural use date back roughly 476,000 years (Barham et al. 2023). The handle and base of the İnönü cave basket are made of *Taxus baccata* wood. It is one of the hardest softwoods but has remarkable elasticity, making it ideal for products that require elasticity, such as bows and bow-shaped tools. The elastic modulus is remarkably low, considering the high density of *Taxus baccata* wood (Keunecke et al. 2007). When it comes to the use of this species throughout human cultural history, a spearhead made of *Taxus baccata* wood (its age 450,000 years), discovered in 1911 at Clacton-on-Sea, in Essex, UK, is among the oldest surviving wooden artifacts in the world (Allington-Jones 2015). To our knowledge, the 3500-year-old *Taxus baccata* wood used to make the handle and base parts of the İnönü cave basket is probably the oldest use of this tree species in Türkiye. *Taxus baccata* is an evergreen poisonous tree in the Taxaceae family, native to Western Europe, Central Europe, Southern Europe, Northwest Africa, Türkiye, Northern Iran, and Southwest Asia (Benham et al. 2016). The

closest 2000-year-old yew tree to İnönü Cave is located in the Gümeli Forests, approximately 19 km southwest of the cave (Akkemik et al. 2018). In addition, in the eastern beech forests near Gökgöl at the entrance to Zonguldak, there are monumental yew trees that are between 1000 and 1300 years old, as well as numerous yew trees that are less than 1000 years old (Yaman & Zaman 2022). All these massive and ancient trees near İnönü Cave indicate that thousands of years ago, there were extensive forests where *Taxus baccata* also contributed to the species composition. The inhabitants of İnönü Cave used *Taxus baccata* wood for their daily tool-making 3,500 years ago. The flexibility of this species' wood, allowing easy bending, notably facilitated its preference for making half-circle-shaped basket handles. Indeed, the bow of Ötzi, the 5300-year-old ice mummy found in the Alps, was also made from *Taxus baccata* wood (Junkmanns et al. 2019; Oeggl 2009). The basket's body is made from the bark of the field maple. Historically, the removal of bark sheets or slabs for roofing, shelters, canoes, and baskets has been applied in Anatolia (Turner et al. 2009). Among these species are *Pinus sylvestris*, *Corylus avellana*, *Corylus colurna*, *Castanea sativa*, *Fagus orientalis*, and various species of *Salix*. Analysis of the basket found in İnönü Cave has shown that field maple was among the species used in Anatolia.

Declarations

Author Contribution

Authors Contributions of the manuscript titled " How Humans Engineered Possibilities of Landscape: Baskets and Basketry Materials in İnönü Cave" F. Gül den Ekmen: Conceptualization, methodology, writing - original draft. Hamza Ekmen: Review and editing, perform visualization, project administration. Alan Crivellaro: Formal analysis, review and editing. Barbaros Yaman: Conceptualization, methodology, formal analysis, writing - original draft. All authors declare no competing interests.

Acknowledgment

Republic of Türkiye Ministry of Culture and Tourism, Zonguldak Governorship, Karadeniz Ereğli Municipality, Karadeniz Ereğli District Governorate, and Zonguldak - Bülent Ecevit University provided financial and institutional support to the İnönü Cave excavations. The findings related to baskets and basket craftsmanship in this study were unearthed by the meticulous works of the İnönü Cave excavation team. Tomography images of basket no. B01-I/8 were created at Zonguldak Level Hospital, with the support and assistance of Dr. Murat Koca, radiologist Dr. Sumru Tanju Şen, and radiology technician Ayşe Karademir. We would like to thank all individuals and organizations who supported the study.

References

1. Adovasio JM (1975–1977) The Textile And Basketry Impressions from Jarmo. *Paléorient*, 3: 223–230

2. Adovasio JM (1980) Prehistoric Basketry of Western North America and Mexico. In: Browman DL (ed) Early Native Americans: Prehistoric Demography, Economy, and Technology. De Gruyter Mouton, Berlin, New York, pp 341–362
3. Adovasio JM (2010) Basketry Technology, A Guide to Identification and Analysis. Routledge, New York
4. Adovasio JM, Olga S, Bohuslav K (1996) Upper Paleolithic Fiber Technology: Interlaced Woven Finds from Pavlov I, Czech Republic, c. 26,000 Years Ago. *Antiquity* 70(269):526–534
5. Akkemik Ü, Yaman B (2012) Wood Anatomy of Eastern Mediterranean Species. Kessel Publishing House, Remagen-Oberwinter, Germany, p 310
6. Akkemik Ü, Demirtaş A, Köse N, Usta S, ve Güner HT (2018) Zonguldak-Alaplı'daki anıt porsuk (*Taxus baccata* L.) ağacı gerçekten 4.112 yaşında mı? Orman ve Av, Mart-Nisan, sayı:2, cilt: 96.
7. Allington-Jones L (2015) The Clacton Spear: The Last One Hundred Years. *Archaeol J* 172(2):273–296
8. Barham L, Duller GAT, Candy I, Scott C, Cartwright CR, Peterson JR, Kabukcu C, Chapot MS, Melia F, Rots V, George N, Taipale N, Gethin P, Nkombwe P (2023) Evidence for the earliest structural use of wood at least 476,000 years ago. *Nature* 622(7981):107–111
9. Baş A (1996) Karadeniz Bölgesinde fındık hasadına bağlı olarak gelişen el sanatları, In Türk Halk Kültüründen Derlemeler. Kültür Bakanlığı, Ankara, pp 18–252
10. Bender Jørgensen L, Rast-Eicher A, Wendrich W (2021) Textiles, Cordage and Basketry from Çatalhöyük. In: Hodder I (ed) The matter of Çatalhöyük: reports from the 2009–2017 seasons. The British Institute at Ankara, London
11. Bender Jørgensen L, Rast-Eicher A, and et, Wendrich W (2023) Earliest Evidence for Textile Technologies. *Paléorient*, 49 – 1, pp 213–228
12. Benham SE, Durrant H, Caudullo T, de Rigo G, D (2016) *Taxus baccata* in Europe: distribution, habitat, usage and threats. In: San-Miguel-Ayaz J, de Rigo D, Caudullo G, Durrant H, Mauri T, A. (eds) European Atlas of Forest Tree Species. Publ. Off. EU, Luxembourg, p e015921
13. Connolly TJ, Barker P, Fowler CS, Hattori EM, D. J., and William J. C (2016) Getting Beyond the Point: Textiles of the Terminal Pleistocene/Early Holocene in the Northwestern Great Basin. *Am Antiq* 81(3):490–514
14. Crivellaro A, Schweingruber FH (2013) Stem anatomical features of dicotyledons. Xylem, phloem, cortex and periderm characteristics for ecological and taxonomical analyses. Kessel Publishing House
15. Çilingiröglü A, Çevik Ö, Çilingiröglü Ç (2012) Ulucak Höyük: Towards Understanding the Early Farming Communities of Middle West Anatolia: The Contribution of Ulucak. In: Özdoğan M, Başgelen N, Kuniholm P (eds) The Neolithic in Turkey, vol 4. Arkeoloji ve Sanat Yayınları, İstanbul, pp 139–175
16. Dominguez- Rodrigo M, Serrallonga J, Juan-Tresserras J, Alcalá L, Luque L (2001) Woodworking activities by early humans: a plant residue analysis on Acheulian stone tools from Peninj (Tanzania).

17. Ekmen H, Diker C, Ekmen FG, Tunoğlu C (2020a) New Evidence of Chalcolithic Age Steatite Beads From İnönü Cave: Typology and Technology Aspects With Archaeometric Techniques. *Mediterranean Archaeology and Archaeometry* 20 – 2: 113–129
18. Ekmen H, Ekmen FG, Güney A (2020b) İnönü Cave: New Results of the Early Iron Age Culture in the Western Black Sea Region. *Olba XXVIII*: 35–56
19. Ekmen H, Ekmen FG, Güney A, Arbuckle BS, Mustafaoğlu G, Tunoğlu C, Diker C, Oktan E (2021a) A New Prehistoric Settlement near Heraclea Pontica on the Western Black Sea Coast, İnönü Cave. 1–XXVI:23–46 *Arkeoloji Dergisi* 2021/
20. Ekmen FG, Ekmen H, Seçer Fidan S (2021b)) Hititlerin Batı Karadeniz Bölgesi'nde Yaşayan Komşuları Hakkında Yeni Bulgular. *Archivum Anatolicum* 15 – 1: 59–96
21. Erdal YS (2015) Bone or Flesh: Defleshing and Post-Depositional Treatments at Körtik Tepe Southeastern Anatolia PPNA Period. *Eur J Archaeol* 18 – 1 : 4–32
22. Ertuğ F (2006a) An overview of the plaited crafts of Turkey (Anatolia and Thrace). In Ertuğ, F. (ed.), *Proceedings of the IVth International Congress of Ethnobotany*, Ege Yayınları, İstanbul, pp. 297–306
23. Ertuğ F (2006b) Turkey. In: Novellino D. and Ertuğ, F. (eds.), 'Baskets of the World' The Social Significance of Plaited Crafts, IVth International Congress of Ethnobotany. Ege Yayınları, İstanbul, 673–679
24. Gärtner H, Schweingruber FH (2013) *Microscopic Preparation Techniques for Plant Stem Analysis*. Verlag Dr. Kessel, Remagen, p 78
25. Goren-Inbar N, Alperson N, Kislev ME, Simchoni O, Melamed Y, Ben-Nun A, Werker E (2004) Evidence of hominin control of fire at Gesher Benot Ya'akov. *Isr Sci* 304:725–727
26. IAWA Committee (1989) IAWA List of microscobic feature for hard wood identification. *IAWA J* 10(3):1–69
27. IAWA Committee (2004) IAWA List of microscobic feature for soft wood identification. *IAWA J* 25(1):1–70
28. Junkmanns J, Klügl G, Schoch W, Di Pietro G, Hafner A (2019) Neolithic and Bronze Age Archery Equipment from Alpine Ice-Patches: A Review on Components, Construction Techniques and Functionality. *JNA* 21, 283–314
29. Karauğuz G, Düring B (2009) A Note on the Prehistory of the Devrek Region, Northern Turkey. *Anatolica XXXV*: 153–165
30. Keunecke D, Märki C, Niemz P (2007) Structural and mechanical properties of yew wood. *Wood Res* 52(2):23–38
31. Lev-Yadun S (2007) Wood remains from archaeological excavations: A review with a Near Eastern perspective. *Isr J Earth Sci* 56:139–162
32. Martínez-Sevilla F, Herrero-Otal M, Martín-Seijo M, Santana-Cabrera J, Lozano Rodríguez JA, Maicas R, Cubas M, Homs A, Martínez Sánchez RM, Bertin I, Barroso Bermejo R, Bueno Ramírez P, De Balbin

- Behrmann R, Palomo Pérez A, Álvarez-Valero AM, Peña-Chocarro L, Murillo-Barroso M, Fernández E, Altamirano García M, Pardo R, Iriarte Cela M, Rus C, Giner JLA, C., and, Piqué Huerta R (2023) The Earliest Basketry in Southern Europe: Hunter-gatherer and Farmer Plant-based Technology in Cueva de los Murciélagos (Albuñol). *Sci Adv* 9:1–18
33. Oeggl K (2009) The significance of the Tyrolean Iceman for the archaeobotany of Central Europe. *Veget Hist Archaeobot* 18:1–11
 34. Roodenberg J, Roodenberg SA (eds) (2008) *Life and Death in a Prehistoric Settlement in Northwest Anatolia The Ilipinar Excavations Volume III With contributions on Hacılartep and Menteşe*. Nederlands Instituut voor het Nabije Oosten, Leiden
 35. Schick T (2010) Basketry Finds from Gilgal I. In: Bar-Yosef O, Goring-Morris AN, Gopher A (eds) *Gilgal: Early Neolithic Sites in the Lower Jordan Valley. The Excavations of Tamar Noy, Oxbow*, Oxford, pp 245–249
 36. Schweingruber FH, Steiger P, Börner A (2019) *Bark Anatomy of Trees and Shrubs in the Temperate Northern Hemisphere*. Springer, p 394
 37. Solazzo C, Courel B, Connan J, Van Dongen BE, Barden H, Penkman K, Taylor S, Demarchi B, Adam P, Schaeffer P, Bar-Yosef NA O. and, Buckley M (2016) Identification of the earliest collagen- and plant-based coatings from Neolithic artefacts (Nahal Hemar cave, Israel). *Sci Rep* 6:31053 [online]
 38. Turner NJ, Arı Y, Berkes F, Davidson-Hunt I, Ertuğ ZF, Miller A (2009) Cultural management of living trees: an international perspective. *J Ethnobiol* 29(2):237–270
 39. Werker E (2006) 780,000-year-old wood from Gesher Benot Ya’aqov, Israel. *Isr J Plant Sci* 54:291–300
 40. Weltfish G (1930) Prehistoric North American Basketry Techniques and Modern Distributions. *Am Anthropol* 32:454–495
 41. Wendrich W (2016) Basketry in Ancient Egypt. In: Selin H (ed) *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures*. Springer, Dordrecht, pp 6–8
 42. Wendrich W, Ryan P (2012) Phytoliths and Basketry Materials at Çatalhöyük (Turkey): Timelines of Growth, Harvest and Objects Life Histories. *Paléorient* 38:55–63
 43. Yalçinkaya H (1958) *Bodrum Müzesi Eserleri*. Kültür Bakanlığı Yayınları, Ankara
 44. Yaman B, Zaman E (2022) Monumental Traits of European Yew Trees near to Gökgöl Cave in Zonguldak. *J Bartın Fac Forestry* 24(1):32–41
 45. Yaman B, Ekmen H (2023) Waterlogged Wood Remains Found in a Late Bronze Age Settlement (İnönü Cave) on the Western Black Sea Coast of Türkiye. *J Archaeol Science: Rep* 52:1–12

Figures

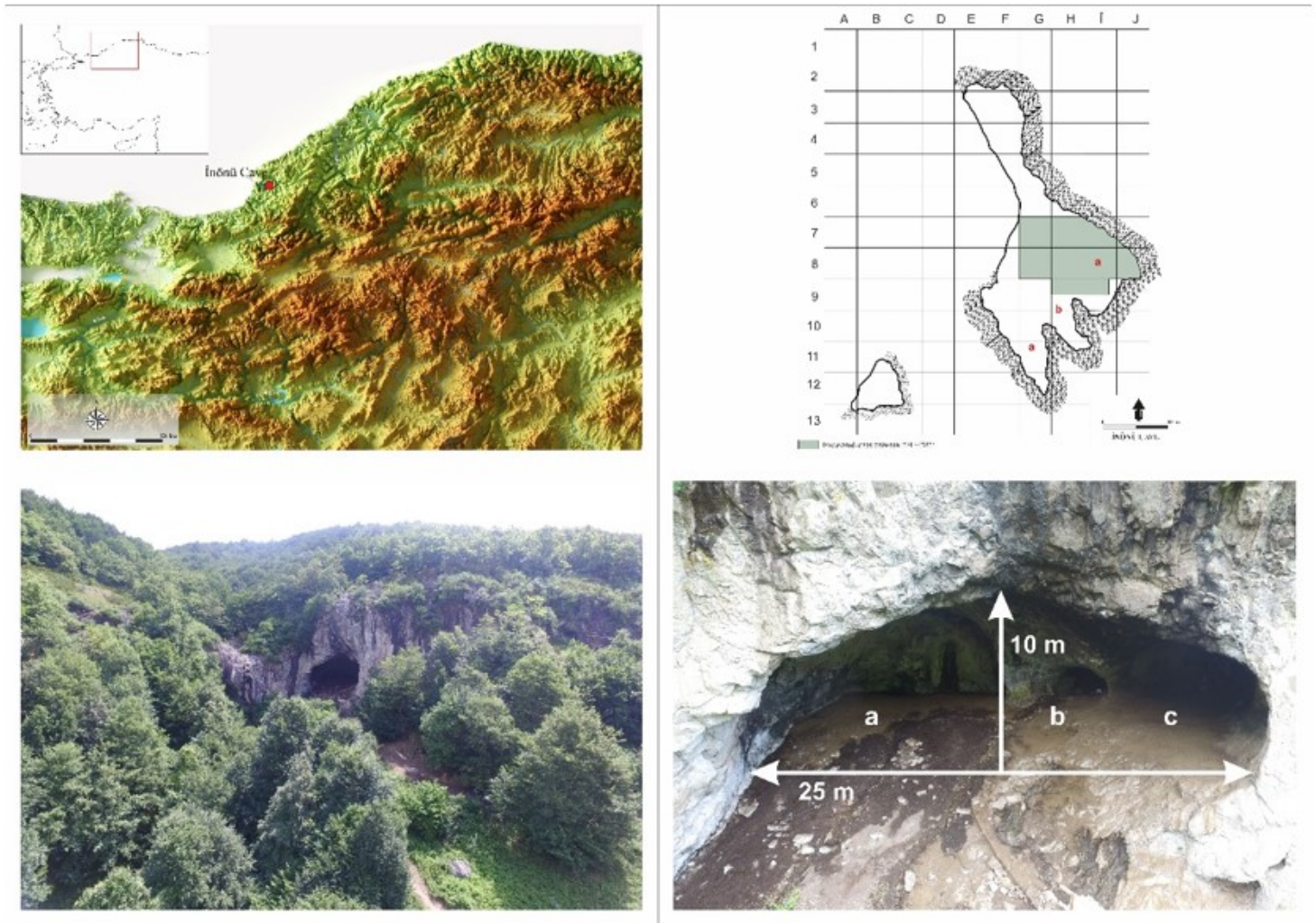


Figure 1

Location, dimensions, plan, and southwestern view of İnönü Cave (©İnönü Cave Project).

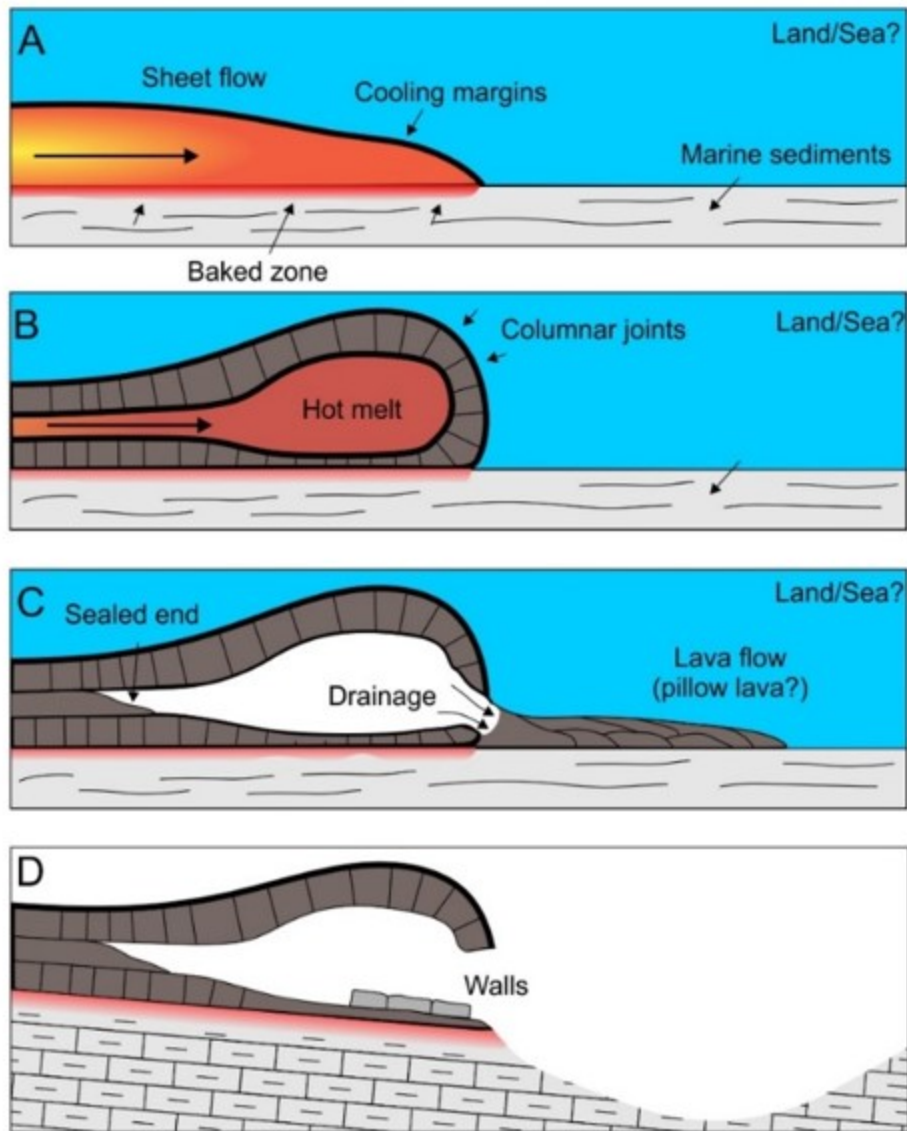


Figure 2

Development of İnönü cave in four stages (Ekmen et al. 2021a, fig. 4).

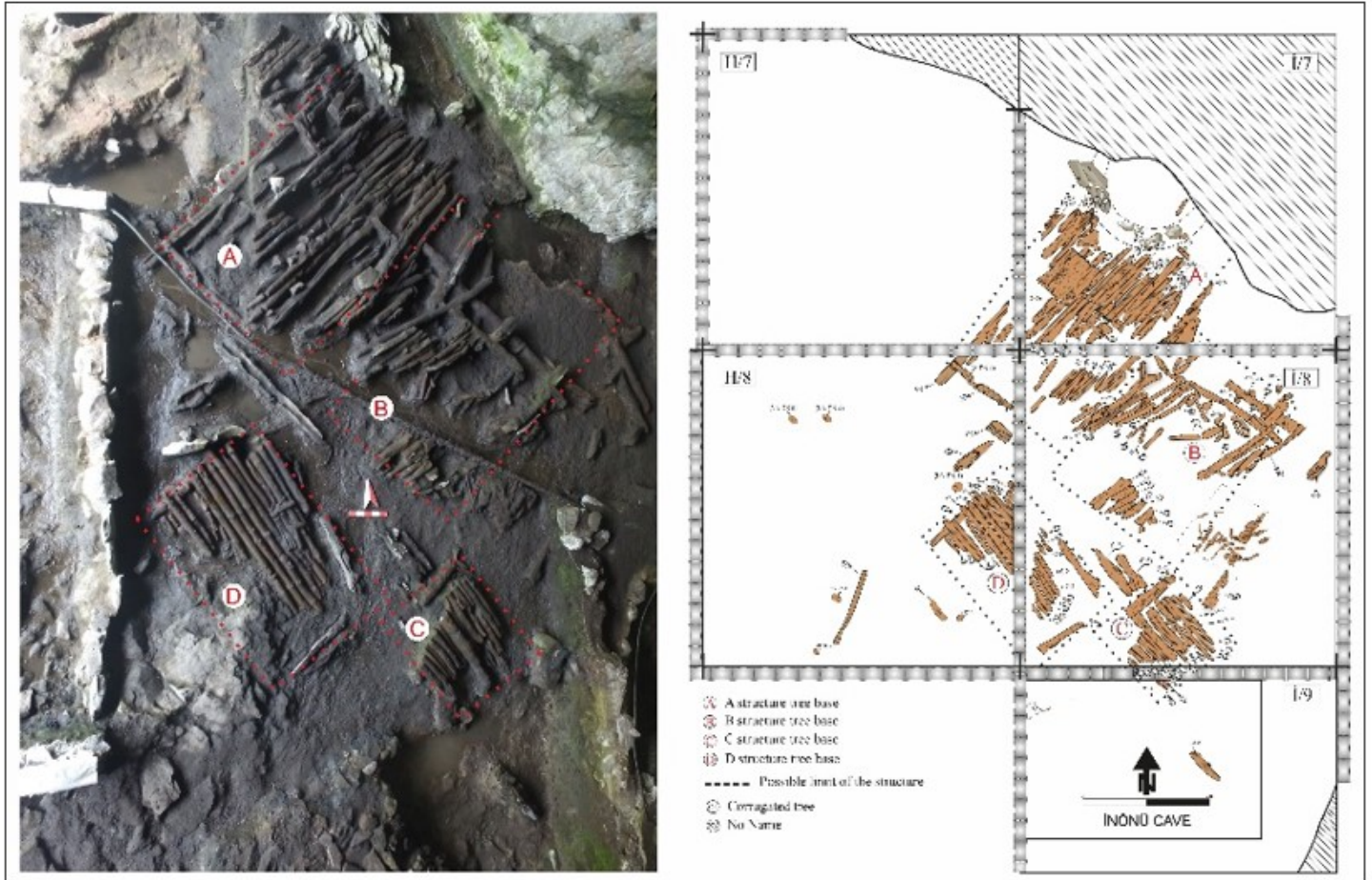


Figure 3

General view and plan of the level III wooden floor (©Inönü Cave Project).



Figure 4

Clay human figurine head and a metal bull figurine of level III (©İnönü Cave Project).

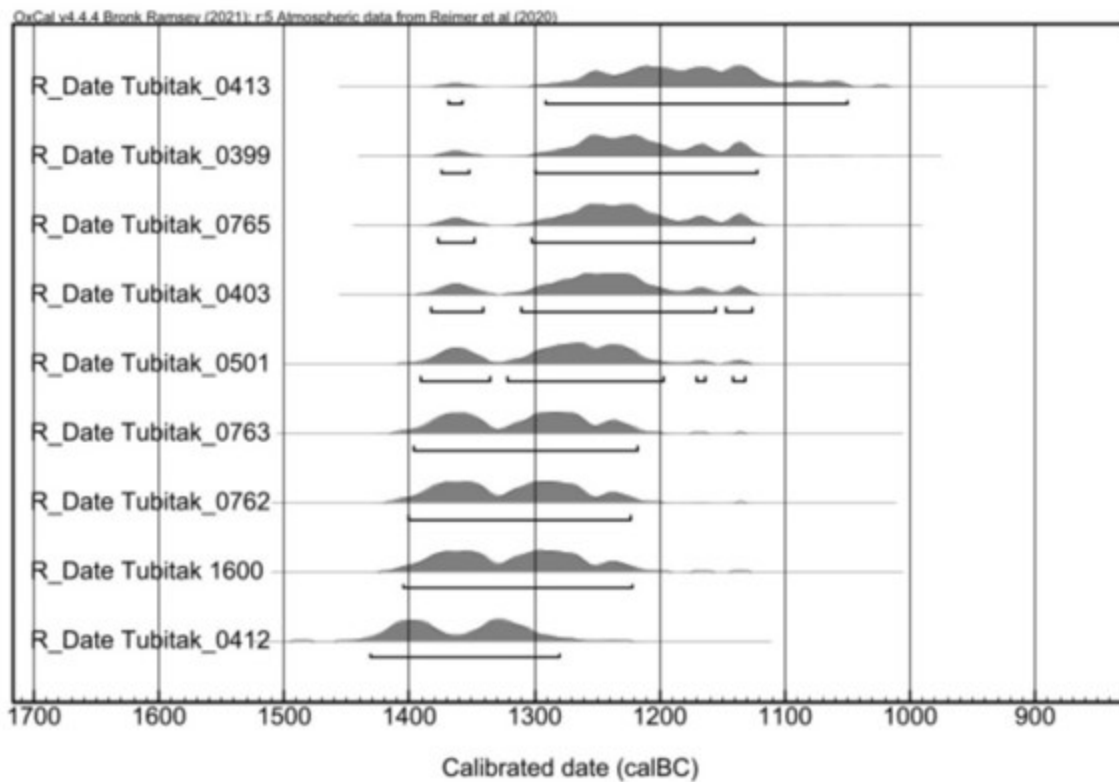


Figure 5

Calibrated dates of Level III.



Figure 6

BF01-I/7(©İnönü Cave Project).



Figure 7

BF02-I/7 (©İnönü Cave Project).



Figure 8

Location of B01-I/8 (©Inönü Cave Project).



Figure 9

Details of B01-I/8 (©İnönü Cave Project).



Figure 10

B01-I/8 (©İnönü Cave Project).

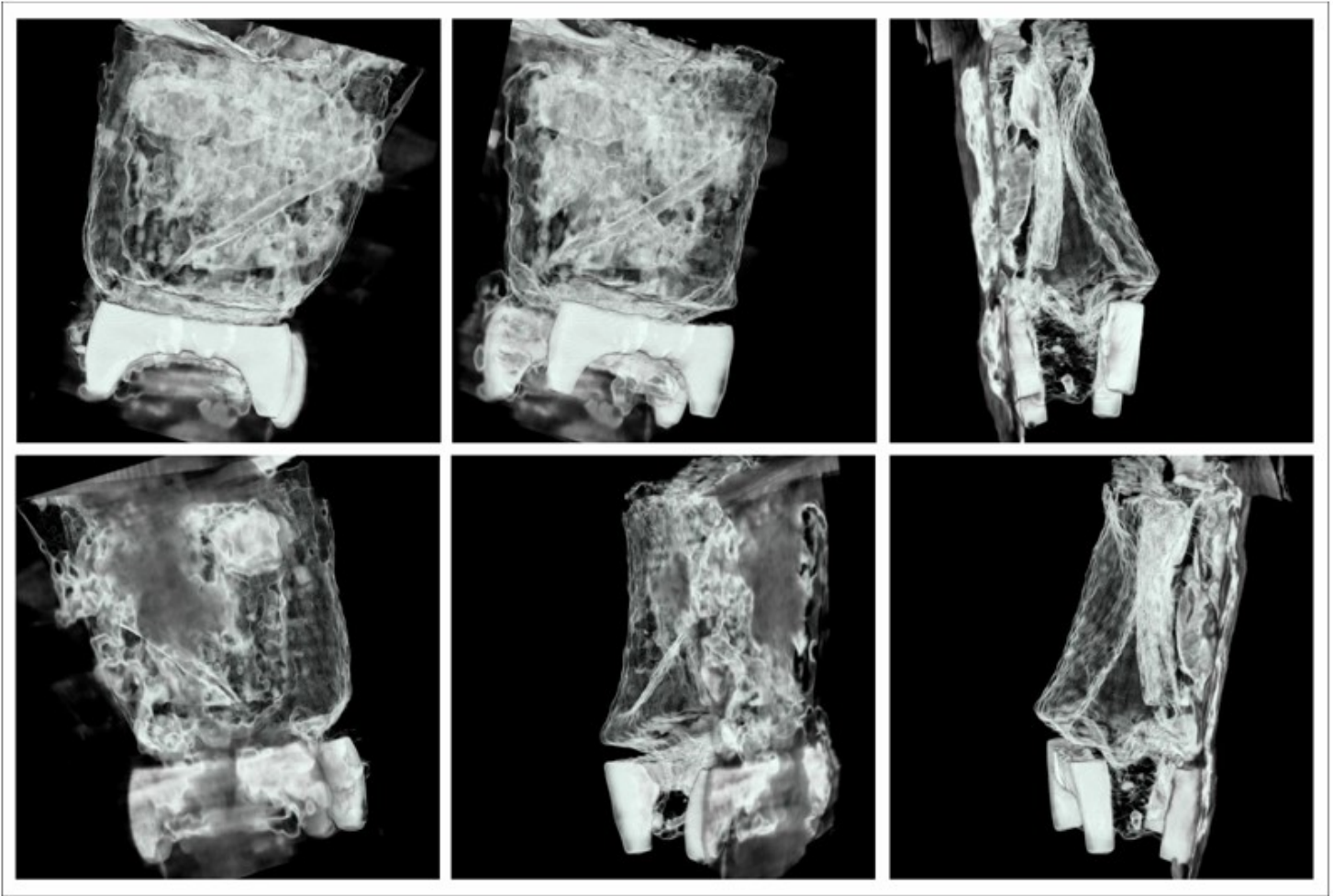


Figure 11

Ultrasonography images of B01-I/8 (©İnönü Cave Project).

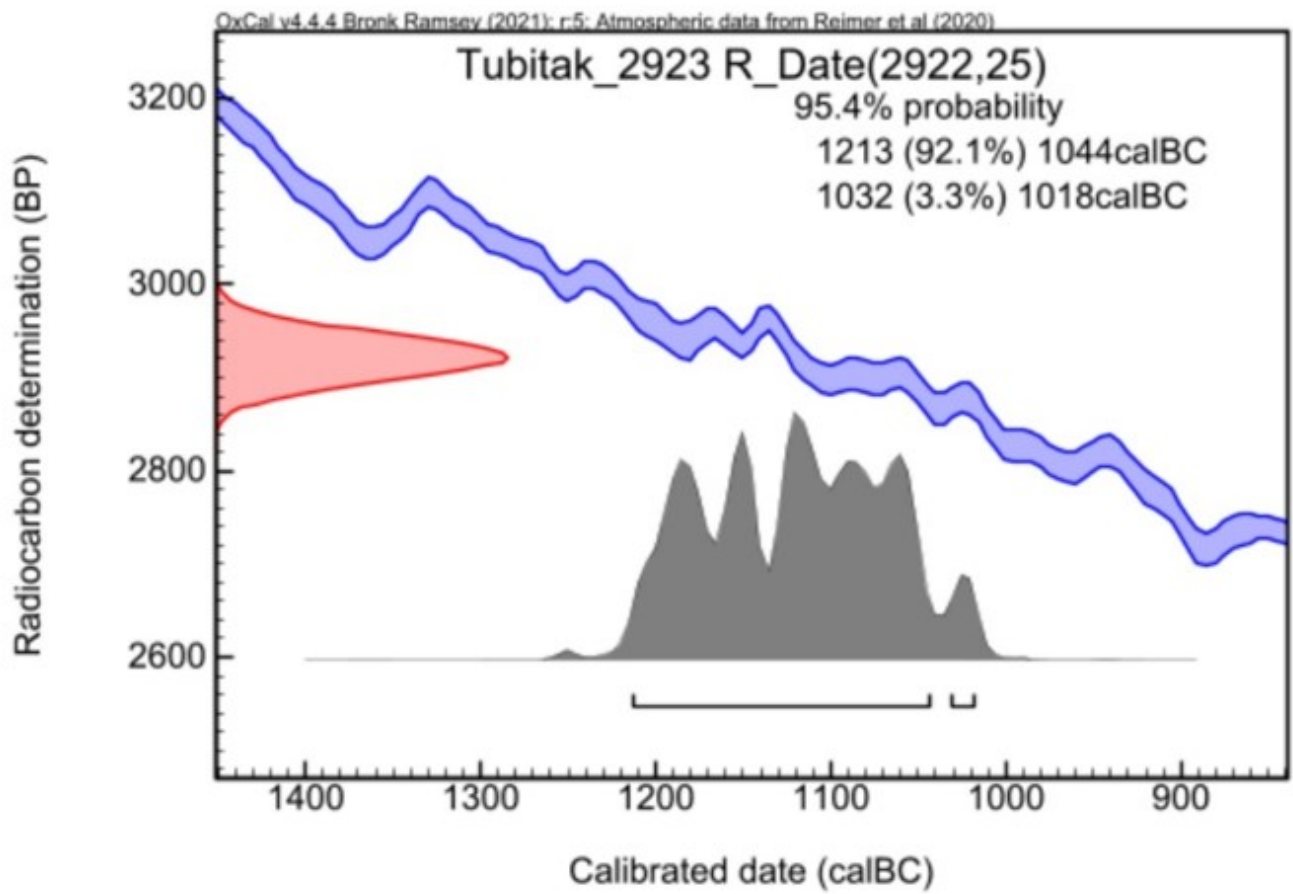


Figure 12

Calibrated date of B01-I/8.

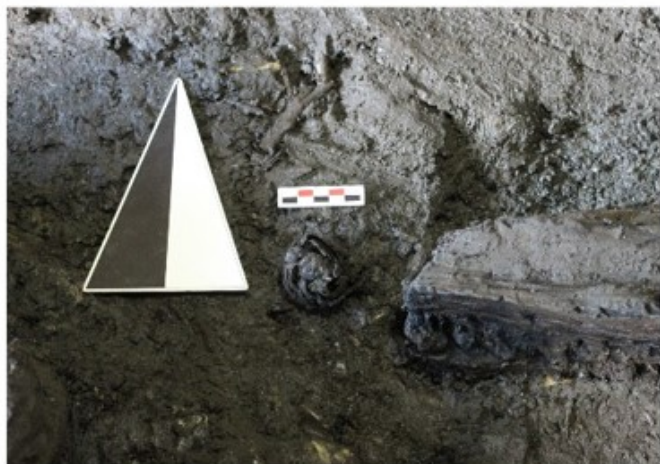


Figure 13

Strips, rolls, and waste from basket production (©İnönü Cave Project).

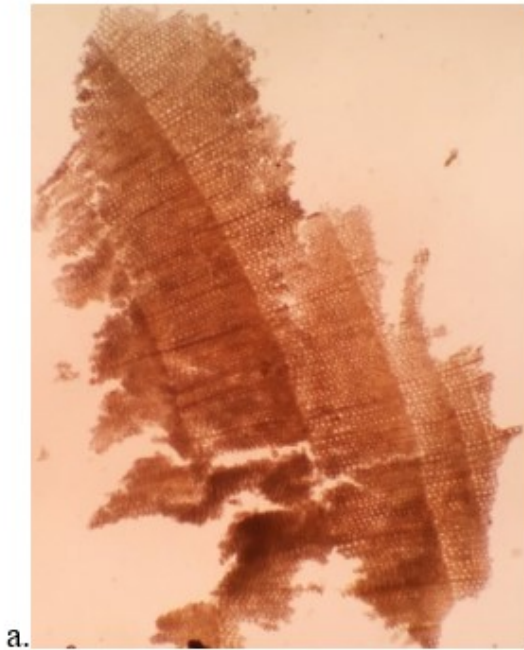


Figure 14

Transverse section: growth rings (a), tangential section: tracheids with helical thickenings and uni-seriate rays (b) (*the wood taken from the handle of the basket*) (©İnönü Cave Project).



Figure 15

Transverse section: the radial files of tracheids (a), tangential section: helical thickenings on the tracheid wall) (b) (*the wood taken from the bottom of the basket*) (©İnönü Cave Project).

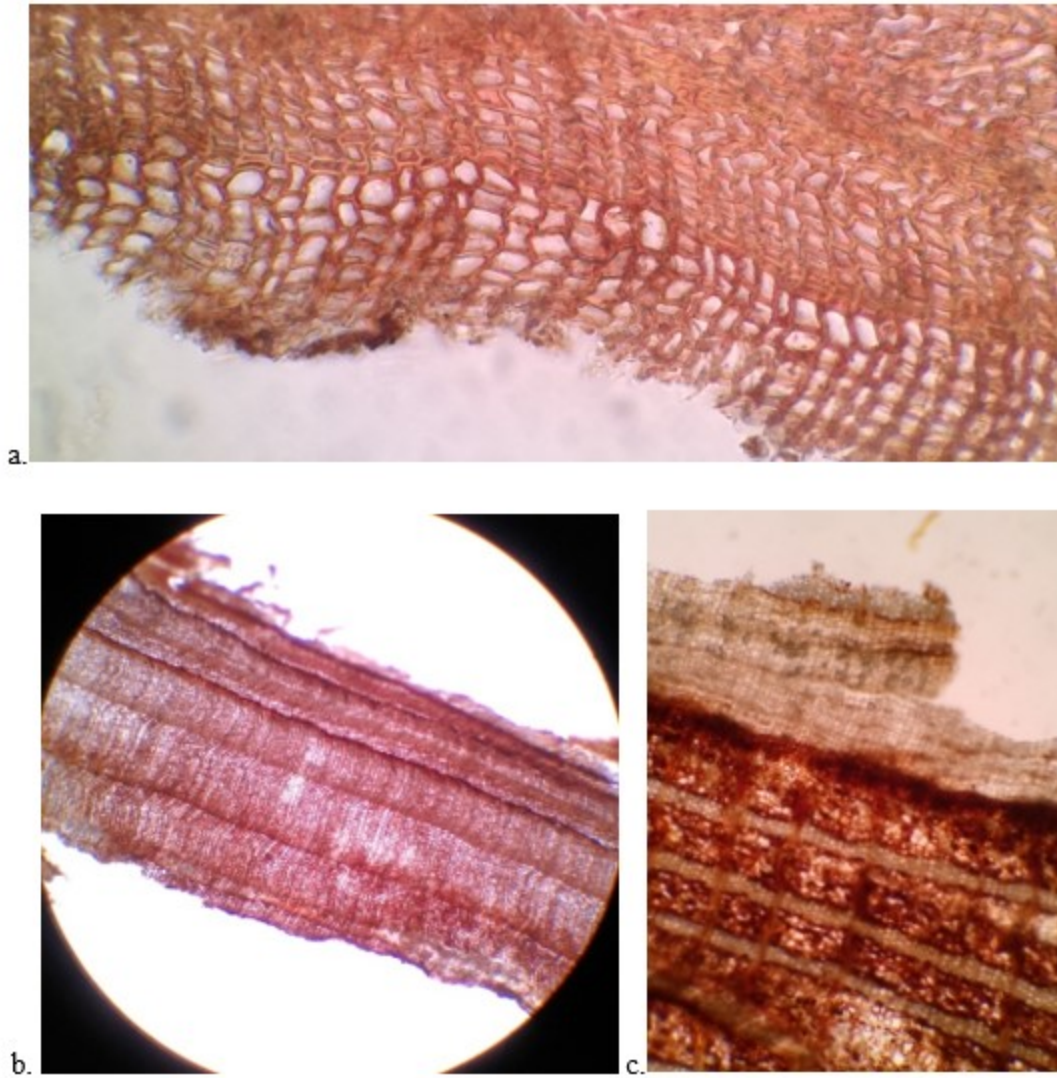


Figure 16

Transverse section: the phellem of bark taken from the basket (a), the sequent phellem of bark taken from the basket (b), the sequent phellem of *Acer campestre* fresh bark (c) (©İnönü Cave Project).



Figure 17

Plaited bark basket, called 'gıdık' or 'çöte', is used today in the Black Sea Region of Türkiye (©İnönü Cave Project).