A METAL TOOL HOARD FROM ALEXANDREIA TROAS

ALEKSANDREIA TROAS'DAN BİR METAL ALET TOPLULUĞU

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Abstract

This study investigates a collection of metal tools that were fortuitously discovered in 2018 within the rural area of Alexandria Troas, a prominent coastal city in the region of Troad. The assemblage comprises 32 metal artifacts, including 29 tools and three iron ingots. Among the tools are agricultural and everyday implements such as sickles, scythes, hammers, double-bladed axes, pitchforks, hoes, and plowshares. The iron tools exhibit characteristics similar to those found in hoards previously unearthed in Asia Minor. This study describes and compares the artifacts, evaluating their functions through both excavated parallels and depictions preserved in various genres of Byzantine art. The forms of the artifacts are particularly noteworthy, as they illustrate the continuity of hand tools used in agricultural life from the Roman to the Late Byzantine periods. This continuity implies that neither agricultural practices nor related craft traditions underwent significant changes during this era. In this context, the study contributes to the cultural history of the region by documenting the production tools utilized during the Byzantine period, specifically within Troas. Based on analogical analysis, these tools are suggested to date to the late Middle Byzantine and early Late Byzantine periods.

Keywords: Alexandria Troas, Metal Tools, Hoard, Craftsmanship

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Özet

Bu makale, Troas bölgesindeki önemli bir kıyı kenti olan Alexandria Troas'ın kırsal alanında 2018 yılında tesadüfen keşfedilen bir metal alet topluluğunu incelemektedir. Buluntu topluluğu 32 metal eserden oluşmaktadır: 29 alet ve üç demir külçe. Aletler arasında oraklar, tırpanlar, çekiçler, çift ağızlı baltalar, dirgenler, çapalar ve saban demirleri gibi tarımsal ve gündelik kullanım gereçleri yer almaktadır. Demir aletler, Anadolu'da daha önce ortaya çıkarılmış topluluklar ile karşılaştırılabilir özellikler sergilemektedir. Bu çalışma, eserleri tanımlamış ve karşılaştırmış; işlevlerini ise hem kazılardan elde edilen benzer buluntular hem de Bizans sanatının çeşitli türlerinde korunmuş tasvirler aracılığıyla değerlendirmiştir. Eserlerin biçimleri özellikle önemlidir; zira Roma döneminden Geç Bizans dönemine kadar tarımsal yaşamda kullanılan el aletlerinin sürekliliğini ortaya koymaktadır. Bu süreklilik, söz konusu dönemde ne tarımsal uygulamalarda ne de ilgili zanaat geleneklerinde önemli bir değişim yaşanmadığını göstermektedir. Bu bağlamda çalışma, özellikle Troas bölgesinde Bizans döneminde kullanılan üretim araçlarını belgelemesiyle bölgenin kültürel tarihine katkı sağlamaktadır. Karşılaştırmalı analizlere dayanarak, söz konusu aletlerin Orta Bizans döneminin sonları ile Geç Bizans döneminin başlarına tarihlendirilebileceği önerilmektedir.

Anahtar Kelimeler: Alexandria Troas, Metal Aletler, İstif, Zanaatkârlık

Metal artifacts serve as tangible evidence of daily life in societies, illuminating the production practices and sociocultural characteristics of the civilizations to which they belonged. Excluding luxurious materials such as gold and silver, metal objects crafted for everyday use remain relatively underrepresented in Anatolian archaeology. This is primarily attributed to the rapid corrosion of metals, their susceptibility to displacement due to their small size, their frequent recovery from contexts with uncertain or debated stratigraphy, and the typological similarities of tools serving the same function across different periods, particularly between the Classical and Modern eras. Ancient authors provide limited narratives that might help bridge the gaps caused by these challenges, often showing little interest in synthesizing scattered references. In contrast, various descriptive and literary sources from the Middle Ages that document metalworking offer researchers valuable insights and enable more informed assessments of the role of metals in agricultural production. Within this framework, the scientific reflections of production technologies contributing to the material culture of settlements have been interpreted by scholars such as Giovanna Derenzini and Carlo Maccagni (Derenzini & Maccagni, 1970, pp. 65-93; Derenzini, 1978, pp. 1-11; Derenzini, 1995, pp. 447-454), and Anthony Bryer (Bryer, 1986, pp. 45-80; Bryer, 2002, p. 104), Alan Harvey (Harvey, 1989, pp. 122-125), Michel Kaplan (Kaplan, 1992, pp. 46-52), Andrea Paribeni (Paribeni, 1995, pp. 411-434), and Angeliki Liveri (Λιβέρη, 2000, pp. 275-286), drawing on descriptions found in manuscripts, paintings, archival records, and hagiographic sources. These interpretations continue to serve as important references for researchers studying ancient technology. These studies, drawing on sources from the second half of the Middle Ages, offer valuable insights into the tools and equipment used by Middle and Late Byzantine farmers in agricultural practices. They provide evidence for the continuity of agricultural traditions (Derenzini, 1995). Among them, works that examine the medieval adaptations of certain tools mentioned in Works and Days of Hesiod further support this continuity, highlighting how agricultural implements were shaped by enduring concerns and shared practices spanning antiquity to the pre-industrial era.

Terminology-based studies conducted in the Balkans, where archaeological discoveries exceed those in Anatolia and Greece, illuminate the continuity of tool forms and functions across various types (Ostuni 1986). Assemblages originating from the Balkans, typically characterized as hoards created for diverse purposes, reveal the presence of remarkably similar equipment in terms of variety, purpose, and type during both the Early and Late Byzantine periods (Cholakov, 2010). Research conducted in the Danube and Serbia further corroborates that Byzantine tools did not significantly differ from Roman tools (Popović 1986-1988). Variations in tool forms and functions, well-documented in numerous Ancient Greek and Latin sources, are also depicted on Anatolian tombs and votive stelae of the Roman Imperial period, indicating that tools were not impervious to change. Moreover, metal finds from the Roman and subsequent periods support this perspective, demonstrating that tools evolved gradually, retaining their early stylistic core while enhancing their usability and efficiency. An example of this is the partial transformation of simple hand sickles into scythes.

Notably, assemblages of agricultural production tools, which may be classified as hoards, have yet to be documented in Anatolia. In the limited extant studies, these tools are typically categorized under the broad classification of “metal finds,” with various proposed functions. This underscores the importance of the discoveries made in Alexandria Troas, which constitute the focus of this study. In 2018, archaeological excavations in the city revealed a rare assemblage of metal tools that had been carefully deposited within a pithos. Upon the discovery of a pithos—its opening previously disturbed by treasure hunters in an olive grove approximately 2 km northwest of the ancient city center—the excavation team undertook systematic work at the site. They uncovered a well-preserved pithos measuring 1.15 m in height and 2.9 m in diameter, containing 32 stacked metal tools at a depth of 1.9 m below the ground surface. The assemblage included one pruning sickle, two reaping sickles, two vinedresser’s knives, one scythe, one saw, one pitchfork, two hand hoes, one two-tined hoe, one hammer, two double-bladed axes, one carpenter’s plane, two plowshares, one plowshare scraper, two hoes, two perforated stakes, two looped stakes, one ring, one wedge, one hook, one pan, one circular object, and three iron ingots (Fig. 1-2). While these tools appear primarily designed for agricultural purposes, the inclusion of tools suitable for other crafts, such as carpentry and forestry, suggests the foresight of a craftsman from Alexandria

Troas in maintaining essential equipment for daily life and production. The assemblage also illustrates that nearly all tasks relied on muscle power, while the diversity of tools indicates a distinction between human and animal labor. Significantly, the assemblage consisted entirely of iron tools, likely reflecting the practicality of the material: iron tools could be repaired, sharpened, re-handled, repurposed, or even refashioned into new tools when worn or broken.

Figure 1

Pithos Containing the Metal Assemblage (Top Left), Interior View of Pithos During the Excavation (Top Right), and Group Photograph During the Restoration Work / *Pithos'un Metal Topluluğunu İçeren Görünümü (Sol Üst), Kazı Sırasındaki Pithos'un İç Görünümü (Sağ Üst) ve Restorasyon Çalışmaları Sırasındaki Grup Fotoğrafı*

Figure 2
Iron Ingots (Organized in Descending Order of Weight) / *Demir Külçeleri (Ağırlığa Göre Azalan Düzende Sıralanmış)*

Historical and Archaeological Framework of Alexandria Troas

Alexandria Troas is situated in proximity to Dalyan Village within the Ezine district of Çanakkale, approximately 58 kilometers from the provincial center and 22 kilometers from Ezine. It was among the most extensive ancient settlements in northwestern Anatolia, strategically located amidst neighboring sites such as Troy to the north, Neandria, Kebren, and Skepsis to the east, Kolonai, Larisa, Smintheion, and Assos to the south, and the Aegean Sea with Tenedos to the west (Cook, 1973, p. 198). The city spanned from the Dalyan shoreline to the Kestanbol hot springs, with its early fortification wall encompassing an area of approximately 4 square kilometers.

The establishment of the city can be traced back to 311 BC, when Antigonos Monophthalmos founded Antigoneia through *synoikismos*, consolidating populations from adjacent communities (Cohen, 1995, p. 145; Diodorus Siculus, *Bibliotheca Historica* 19.56.2; Pliny, *Naturalis Historia* V.124). In 301 BCE, Lysimachos renamed it Alexandria Troas and enhanced its fortifications (Strabo, *Geographika* 13.1.26). The city flourished due to its advantageous harbor and developed connections with Rome; Julius Caesar visited and was honored there (Suetonius, *Divus Julius* 79). By 12 BC, the settlement had evolved into a Roman colony. Under Augustus, veterans from *Legio V* and *VII Macedonica,* and *Legio XXX Classica* settled in the city, which was granted tax exemptions and the *ius italicum*—privileges that elevated its economic and legal standing (Levick, 1967, pp. 29–41). Subsequently, it became known as *Colonia Augusta Troas* or *Colonia Augusta Troadensis* (Öztepe, 2012, p. 302; Schwertheim, 2006, p. 8; 2008, pp. 173-179).

In the 1st century AD, the Apostle Paul visited during his missionary journeys, departing from the harbor for Macedonia on his initial visit and subsequently residing for seven days in the city during his third journey (*Acta Apostolorum* 16.8–12; 20.5–12). The second century CE represented a period of prosperity, highlighted by Hadrian's visit in 124 CE, which established him as the colony's most significant benefactor following Augustus. He facilitated the construction of an aqueduct that supplied fresh water, while Herodes Atticus funded the development of monumental baths and a grand fountain (Halfmann, 1986, pp. 191–192, 199, 204–205).

In the early 4th century CE, Emperor Constantine contemplated Alexandria Troas or Ilion as potential sites for the new imperial capital; however, he ultimately selected Byzantion (Zosimos, *Historia Nova* II.30.1). For several centuries, the port functioned as a significant export center for monolithic granite columns (*Marmor Troadense*) sourced from Mount Çığrı. Nevertheless, due to evolving trade routes and declining demand, its significance waned (Ponti, 1995, p. 292).

From the mid-5th century AD onwards, ecclesiastical records indicate the city's diminished status as a bishopric. The city is referenced under various names: in 451 as *Pionius Troadensis* (Council of Chalcedon, Acta, 451), in 458 as *Pionius Troadis* (Letter to Leo I), and in 787 as Leontius Troados (Council of Nicaea II, 787). These references substantiate its continued existence under Byzantine rule, albeit in a weakened state (Ramsay, 1960, pp. 165–175).

From the 18th to the early 20th centuries, European travelers and scholars, including de Clairac, Pococke, Cassas, Le Chevalier, Cockerell, Rascynski, Texier, Leaf, and Cook, visited and documented the ruins. De Clairac and Cassas produced the earliest plans, and Western cartographers incorporated the site into their maps.

Systematic research on this subject commenced only in the late 20th century. The initial campaigns (1993–1995) were led by Coşkun Özgünel. Surveys and documentation (1997–1999) were conducted by the Çanakkale Archaeology Museum and the Asia Minor Research Institute of Münster University. Excavations directed by Münster University, initially under Hans Wiegartz and subsequently Elmar Schwertheim, continued until 2010. Since 2011, investigations have been overseen by Erhan Öztepe (Ankara University) with a multidisciplinary team from Türkiye and Germany; these ongoing campaigns continue to illuminate the city's rich history.

Methodology

The study of the metal tool assemblage from Alexandria Troas was primarily conducted through comparative and analogical analyses. The artifacts were examined within their archaeological context and compared with similar tools unearthed in other settlements across Anatolia, the Balkans, and the broader Mediterranean region. Typological classification was employed to define functional categories and identify parallels with established artifact traditions in the region. Particular attention was placed on the manufacturing techniques and physical characteristics of the tools, which served as the basis for interpreting their potential functions in the past. Medieval drawings depicting similar implements were analyzed to provide additional comparative evidence and enrich the contextual framework. This approach facilitates the interpretation of the assemblage in relation to a broader spectrum of functional and cultural analogies. However, no metallurgical analysis was conducted in this study; thus, the interpretations presented here primarily rely on typological, technological, and contextual comparisons with better-documented examples.

Metal Tools

1. Pruning Sickle (Fig. 3, No. 1)

A single example of this type of sickle is characterised by a thick, socketed handle attachment. The broken and missing blade should have been narrowly and curvedly extended from its partly preserved lower part. Technique: Casting and forging. Preserved Length: 11.7 cm, Width: 3.5 cm, Thickness: 0.6 cm, Handle attachment socket: 2 cm. Weight: 120 g.

2. Reaping Sickle (Fig. 3, No. 2)

The hoard contains two examples reflecting the sickle type with a wide blade curving from a thin, socketed handle attachment. In the largest preserved example, the blade deviates slightly to the right from the end of the handle attachment before forming a relatively sharp angle. The curved, sharp blade, now broken and partly missing, would originally have maintained nearly the same width and extended in a broader curve. Technique: Casting and forging. Preserved length: 14 cm, Width: 2.5 cm, Thickness: 0.7 cm, Handle attachment socket: 2.5 cm. Weight: 70 g.

3. Reaping sickle (Fig. 3, No. 3)

This specimen displays more or less the same features with No. 2 in terms of typology and preservation status. Preserved length: 36 cm, Width: 4.1 cm, Thickness: 0.5 cm, Handle attachment socket: 3.8 cm. Weight: 440 g.

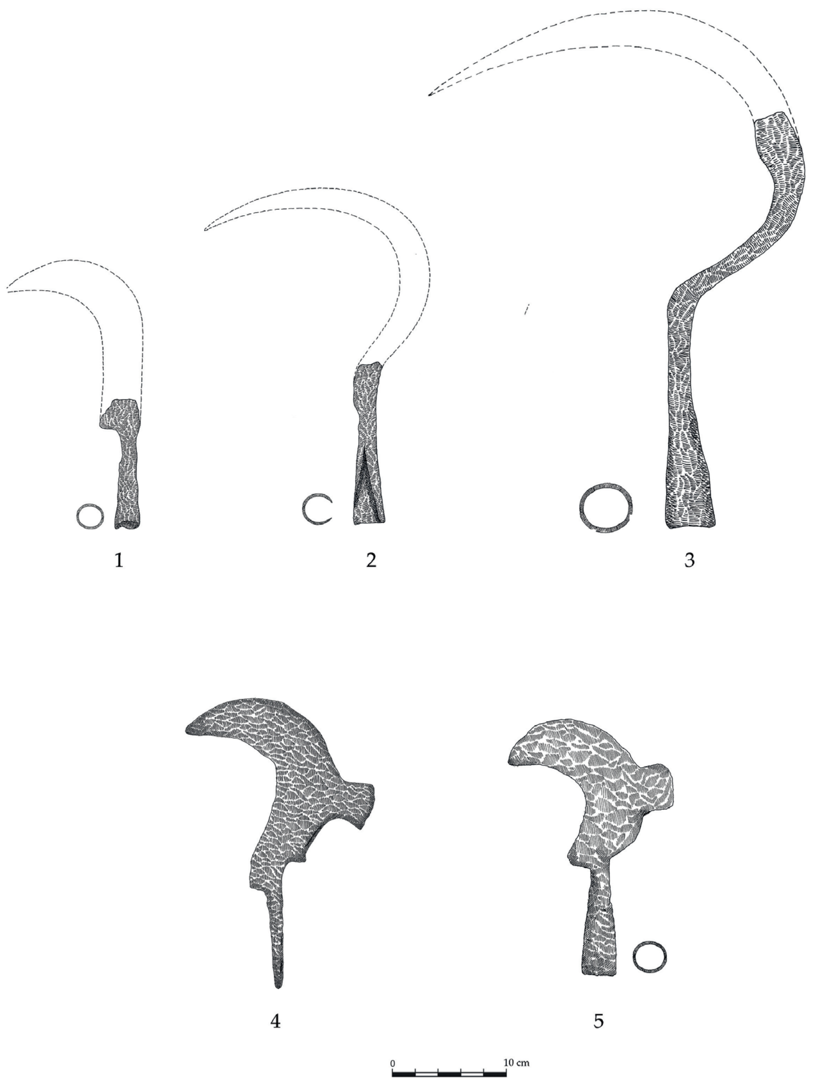
4. Vinedresser's knife (Fig. 3, No. 4)

This billhook corresponds to the form of the *falx vinitoria*. Variations occur only in the handle attachments and body shapes. In the first example, the curved blade runs from the tip to the handle at a near-perpendicular angle, terminating in the tang. The hatchet (*securis*) points downward, while the tang aligns with the body, allowing the wooden haft to be fitted on both sides, enabling the use of both the wide blade and hatchet. Technique: Casting and forging. Length: 24.5 cm, Width: 8.5 cm, Thickness: 0.2 cm, Weight: 220 g.

5. Vinedresser's knife (Fig. 3, No. 5)

The second example features a broad, upward-pointing hatchet, a semi-crescent-shaped blade, and a circular-sectioned handle. The socketed handle allows attaching a haft to form a wooden handle. Technique: Casting and forging. Length: 22.7 cm, Width: 7.5 cm, Thickness: 0.2 cm, Handle attachment socket: 2.3 cm, Weight: 255 g.

Figure 3
Drawings of Metal Tools Nos. 1-5 (Pruning and Reaping Sickles) / *Metal Alet Çizimleri No. 1–5 (Budama ve Biçme Orakları)*



6. Double-bladed axe (Fig. 4, No. 6)

The axes display two types. The first type features a shaft hole forming triangular spurs at the upper and lower edges, narrowing toward the blade and terminating in a flat striking face. The acute-angled blades, designed for dual-edge use, extend slightly obliquely into the shaft hole, providing additional strength in use. Such a form was well-suited for cutting and uprooting thick shoots both above and below ground, applicable to woodworking and agriculture alike. Technique: Casting and forging. Length: 27 cm, Width: 16 cm, Thickness: 1.5 cm, Shaft hole: 4 cm, Weight: 960 g.

7. Double-bladed axe (Fig. 4, No. 7)

Similar to the previous example, this type also has triangular spurs at the shaft hole, though it is shorter. Its broader, sharp blade curves inward from the lower part of the shaft hole, forming a wide arc that extends into a long, flat striking face. The height of the blade's striking face suggests primary use in woodworking, while the narrower blade's striking face on the opposite side offers an alternative cutting function. Technique: Casting and forging. Length: 28 cm, Width: 15.7 cm, Thickness: 2.2 cm, Shaft hole: 4 cm, Weight: 1220 g.

8. Carpenter's plane (Fig. 4, No. 8)

This carpenter's tool consists of a metal base and a wooden upper section, designed to smooth and refine a wooden surface by means of a thin iron plate with a pointed blade, which projects from the base and is set obliquely at its centre. The pressure required to achieve the desired effect on the wood is applied through grooves cut into the head and back of the wooden part, enabling the tool to be grasped and operated manually. The iron base, featuring straight projections that extend upward from its corners, forms the cavity into which the wooden body is precisely fitted. The wooden body, carefully shaped to correspond to the base, is secured by two tabs, which likely have rounded or flattened tops. The plane of the blade, where it is mounted within the tool, is set at an angle of approximately 60°. Technique: Casting and forging. Length: 19.5 cm, Width: 5.4 cm, Thickness: 1 cm. Weight: 490 g.

9. Spud (Fig. 4, No. 9)

The round-sectioned body forms a conical shape. The blade widens and slightly sharpens towards the tip. This tool, used as a spud (βουκέντρον), removes debris from plowshares and allows the sharp blade to break through the soil. The handle attachment socket indicates manual operation. Though this example is narrow-bladed and slightly flattened in form, types exist with conical, wider or flaring blades. Technique: Casting and forging. Length: 14.5 cm, Width: 6 cm, Thickness: 0.7 cm, Handle attachment socket: 3 cm. Weight: 260 g.

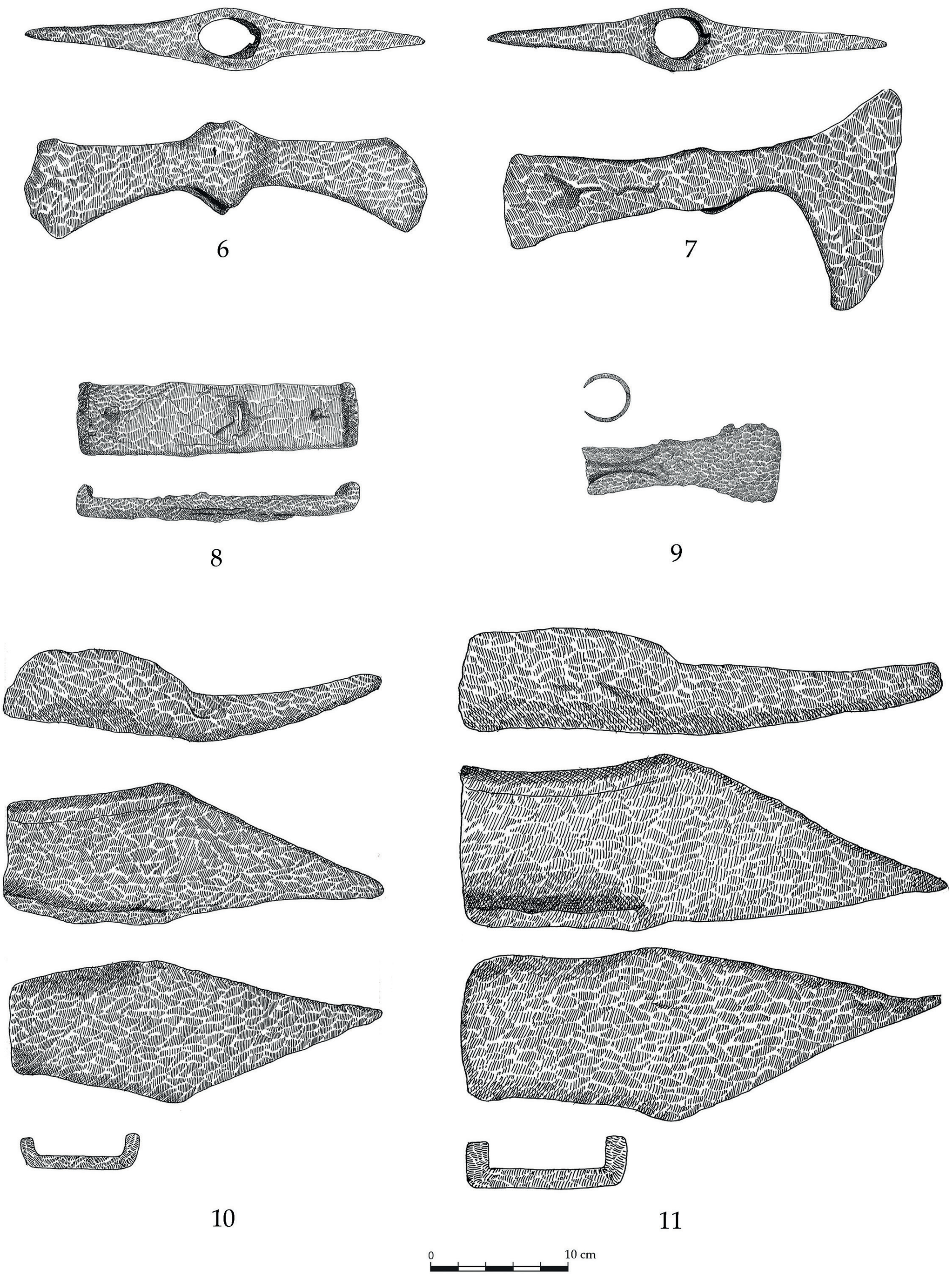
10. Plowshare (Fig. 4, No. 10)

There are two plowshares of differing dimensions. The examples have triangular blades, straight bodies, and an open socket formed by the bending of the sides of a tapering blade. The rear section of the blade is raised, with its edges forming a U-shape that gives the section a distinctly concave appearance. The socket and scraper tip are asymmetrical in the examples of fine quality. The scraper tip is positioned to form a plane parallel to the soil surface. It is mounted on the wooden projection either horizontally or with a slight incline, creating a shallow asymmetric angle that facilitates breaking the soil while minimising wear. Technique: Casting and forging. Length: 2.7 cm, Width: 9.5 cm, Thickness: 2.7 cm, Weight: 2890 g.

11. Plowshare (Fig. 4, No. 11)

Although otherwise identical to the other plowshare, the variation in dimensions in this example suggests that iron implements could be produced in various sizes without necessarily serving a specific functional purpose. Technique: Casting and forging. Length: 33 cm, Width: 11.5 cm, Thickness: 3 cm, Weight: 4745 g.

Figure 4
Drawings of Metal Tools Nos. 6-11 (Double-Bladed Axe, Carpenter's Plane, Spud, and Plowshares) / *Metal Alet Çizimleri No. 6–11 (Çift Ağızlı Balta, Marangoz Rendesi, Spatula ve Saban Demirleri)*



12. Hoe (Fig. 5, No. 12)

The hoes in the assemblage fall into three distinct types according to their form: trapezoidal, convex, and two-tined. The trapezoidal type, with one wing broken and missing, extends straight from the round shaft hole and terminates in a flat blade with an oblique shape towards the tip. The angle between the shaft hole and the flat blade in these forms is suitable for levelling and spreading soil or for clearing pebbles. Technique: Casting and forging. Length: 22 cm, Preserved Width: 16.5 cm, Thickness: 0.1 cm, Shaft hole: 3 cm, Weight: 875 g.

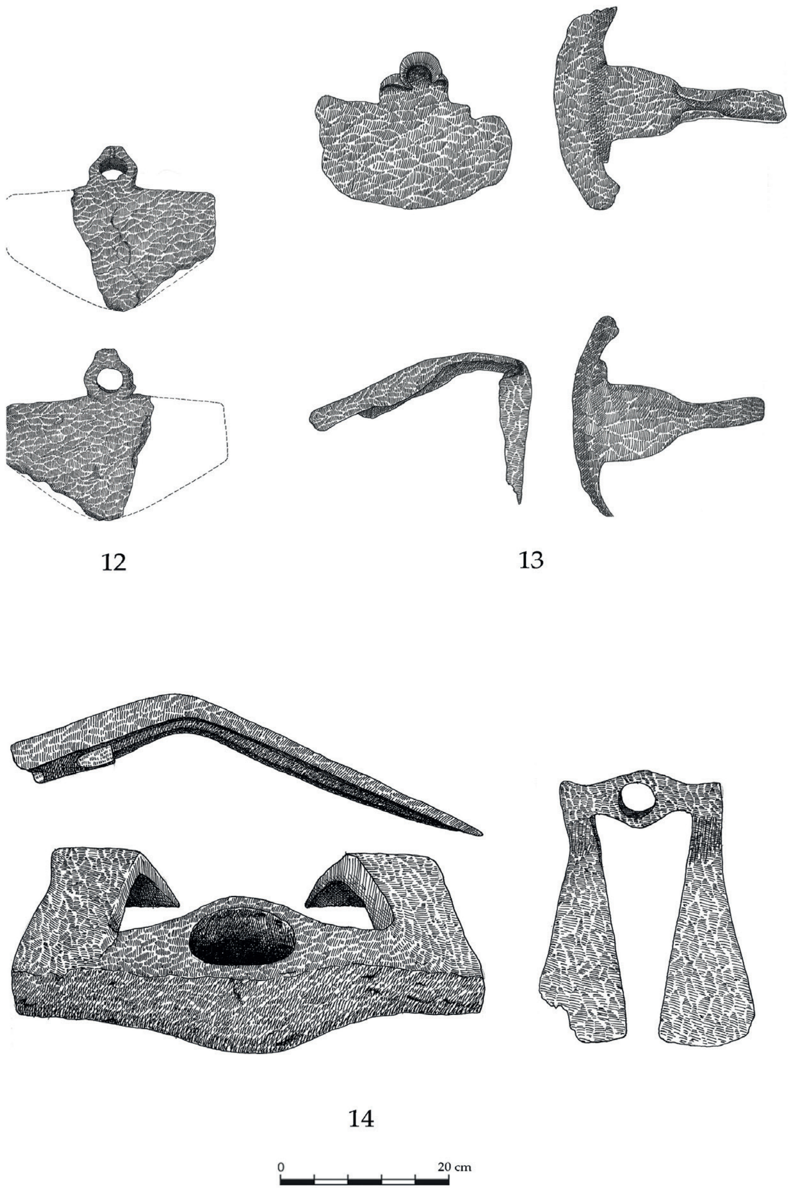
13. Hoe (Fig. 5, No. 13)

The second type of hoe has a shaft that extends straight up to the wing, then bends slightly forward. After the inclined section, it terminates in a scraper set at a 90° oblique angle, with slightly incurved corners and a convex exterior. Technique: Casting and forging. Length: 27 cm, Width: 23 cm, Thickness: 0.5 cm, Shaft hole: 2 cm, Weight: 1405 g.

14. Two-Tined Hoe (Fig. 5, No. 14)

This example, consisting of two parallel longitudinal blades joined to the shaft in an inverted U-shape, is—apart from the break and missing portion on the corner of the right tine—the best-preserved example in terms of its type within the category of ancient agricultural tools of Anatolia. The shaft ends are slightly curved; the tips are flat, while the tines extend symmetrically, angled forward at the centre. Distinguished from the other types by its size, weight, quality, and form, this example was likely designed for hard soil types. The angular extension of the body and tines indicates the application of considerable striking force; this form facilitated the loosening and overturning of the soil, thereby enabling the clearance of old plants with dense roots. Technique: Casting and forging. Length: 30 cm, Width: 24 cm, Thickness: 2 cm, Shaft hole: 4 cm, Weight: 3640 g.

Figure 5
Drawings of Metal Tools Nos. 12-14 (Hoes) / *Metal Alet Çizimleri No. 12–14 (Çapalar)*



15. Perforated Stake (Fig. 6, No. 15)

This example, square-sectioned with a rounded body, one end shaped as a rounded head and the other slightly flattened, perforated in the centre, differ only in length. Both the relatively flat and rounded head and the slender body with a perforated end suggest that the tool was used not as a chisel but rather for fastening the components of a multipart implement. The flattened, perforated end must have allowed the stake to be secured with a clip, providing the necessary resistance to the component. Considering the context, the object likely belonged to a plow. Therefore, it must have been employed to join the plow body to the beam, or the beam to the yoke. Technique: Casting and forging. Length: 32 cm, Width: 4.2 cm, Thickness: 1.5 cm, Weight: 455 g.

16. Perforated Stake (Fig. 6, No. 16)

This example is almost identical with No. 15 in terms typology. Length: 35 cm, Width: 4 cm, Thickness: 1.7 cm, Weight: 530 g.

17. Looped Stake (Fig. 6, No. 17)

Looped stakes could be fixed into a wall, the ground, or an object in order to hang or fasten something. The examples in the assemblage are square in section, with a rounded body and pointed end; the larger example also has a flattened, perforated opening. Among this group, the comparatively larger piece bears a rounded projection just behind its pointed tip. This projection served to secure the stake up to a certain point. After the loop was inserted into the perforated, rounded back section, it was riveted in place. As with stakes without loops, the perforated end was intended for fastening the object with a clip. The piece must have functioned as the component by which the plow beam was attached to the yoke, being set upside down into the centre of the yoke and stabilised at the top with a clip. Technique: Casting and forging. Length: 37 cm, Width: 7 cm, Thickness: 2 cm, Loop diameter: 13 cm. Weight: 1655 g.

18. Looped Stake (Fig. 6, No. 18)

This example terminates in a pointed end as in the previous one; however, it lacks a perforation. The tapering and deformation observed on the pointed tip, resulting from use, indicate that the object was employed on hard ground. Technique: Casting and forging. Length: 22 cm, Width: 4 cm, Thickness: 1 cm, Loop diameter: 9 cm. Weight: 535 g.

19. Ring (Fig. 6, No. 19)

Its length is greater than its width, while the body is rounded. The object was most likely used for fastening or joining two components together. Technique: Casting and forging. Length: 6.2 cm, Thickness: 1 cm, Diameter: 11 cm, Weight: 1115 g.

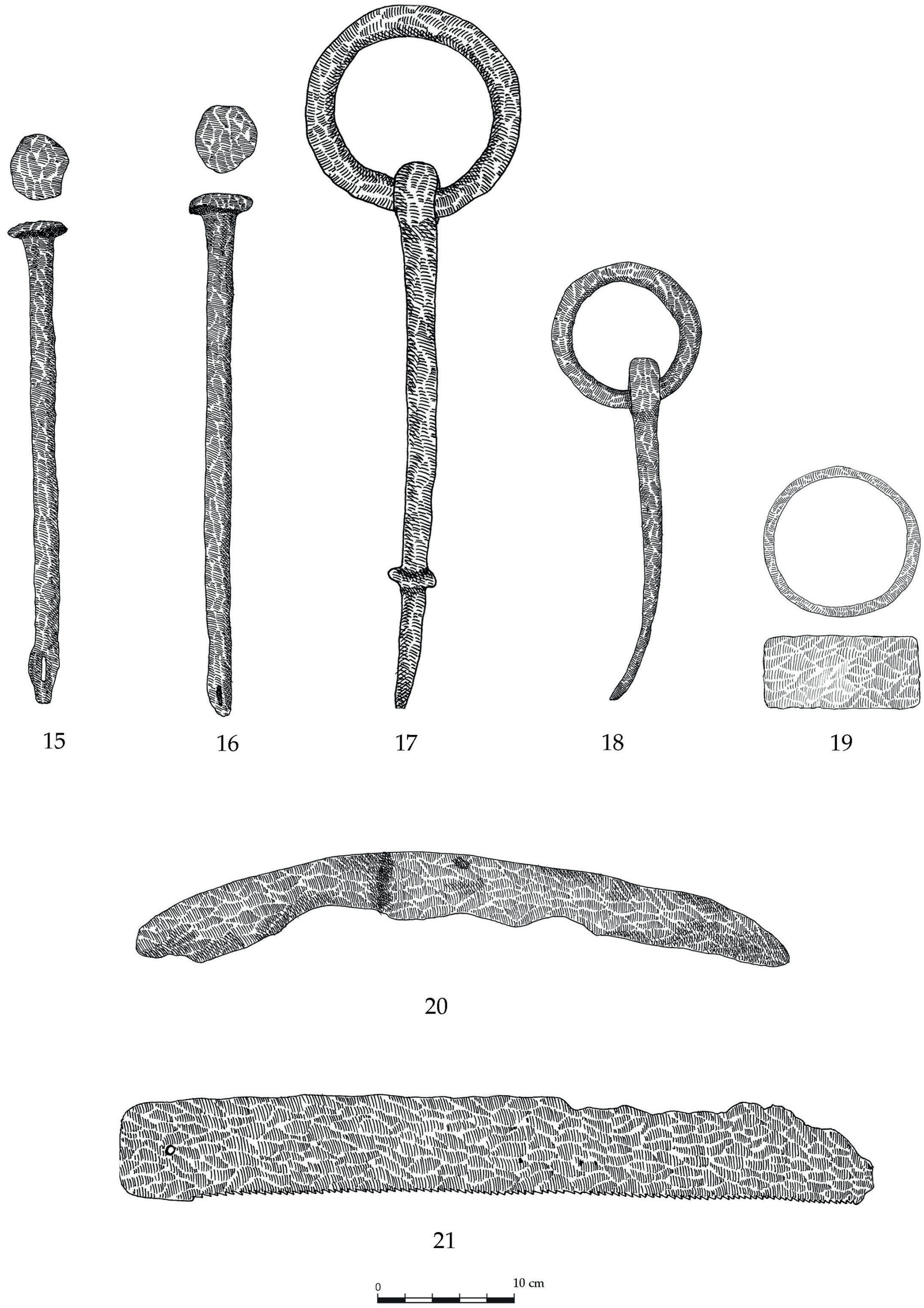
20. Scythe (Fig. 6, No. 20)

The back is slightly convex, and the sharp blade extends in a slightly concave line, curving toward the tip into a pointed form; the narrow rear section extends obliquely. The break and missing part of this section suggest that the overall form of the tool may have originally continued either as a cutting blade with an extended edge terminating in a narrow, curved socket, or with a hole to secure a long wooden shaft. Technique: Casting and forging. Length: 42 cm, Width: 5.5 cm, Thickness: 0.3 cm, Weight: 375 g.

21. Saw (Fig. 6, No. 21)

This single example within the assemblage has a blade inclined to the left -except for the broad head part- bearing a dense row of teeth. The centre of the head part is perforated by a nail hole for securing a wooden handle. The preserved body tapers from this section toward the blade, indicating that the implement was single-handed. Technique: Casting, forging, and cutting. Length: 57 cm, Width: 7.6 cm, Thickness: 0.1 cm, Weight: 525 g.

Figure 6
Drawings of Metal Tools Nos. 15-21 / *Metal Alet Çizimleri No. 15–21*



22. Pickaxe (Fig. 7, No. 22)

As preserved, the two tools consist of one square and flat blade, and the other tapering to a point and presenting an oblique profile. Both were used with a centrally positioned, circular shaft hole. This example's flatly extending blade is suitable for scraping or carving. Technique: Casting and forging. Length: 21 cm, Width: 2 cm, Thickness: 1 cm, Shaft hole: 1.8 cm, Weight: 135 g.

23. Pickaxe (Fig. 7, No. 23)

The example, tapering from the body toward the tip into a narrow and pointed form, could have been used either for perforating wood or for carving a type of moderately soft stone. Technique: Casting and forging. Length: 29 cm, Width: 3.5 cm, Thickness: 1 cm, Shaft hole: 2 cm, Weight: 305 g.

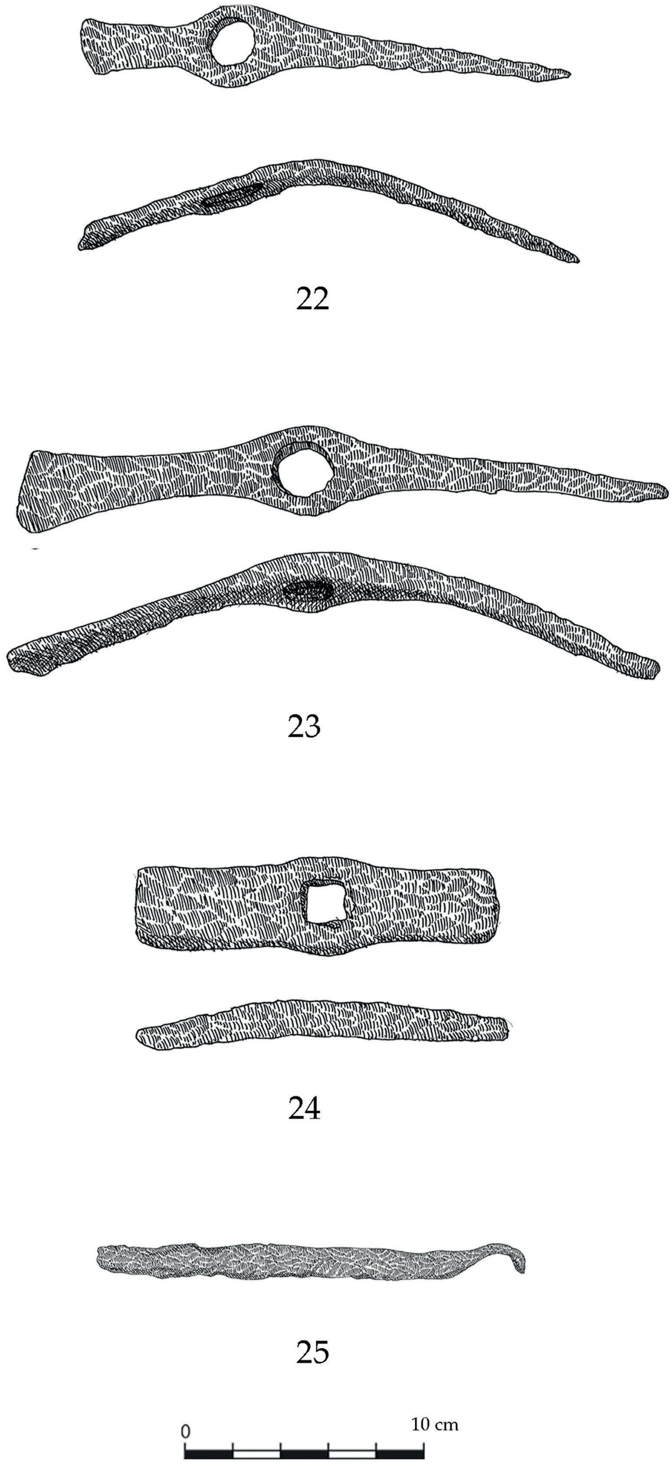
24. Hammer (Fig. 7, No. 24)

The hammer, starting from the square-shaped shaft hole with projecting edges, has a transverse and square-shaped section. Technique: Casting and forging Length: 15 cm, Width: 3.4 cm, Thickness: 1 cm, Shaft hole: 2.2 cm, Weight: 365 g.

25. Hook (Fig. 7, No. 25)

The rectangular-sectioned and flat-bodied tool terminates in an acute-angled hook at the tip. Technique: Casting and forging. Length: 15 cm, Width: 4 cm, Thickness: 1 cm, Weight: 55 g.

Figure 7
Drawings of Metal Tools Nos. 22-25 / *Metal Alet Çizimleri No. 22–25*



26. Pitchfork (Fig. 8, No. 26)

The tool, in its overall form, consists of an elongated body with a shaft hole and, unlike the customary three-tined type, terminates in four tines. The body tapers toward the tined section and first curves at an oblique angle. Onto this part, arms extending outward at a narrow angle from the centre were riveted. Since this section of the tool is thinner than the shaft, it has become heavily deformed. The object may have been used as a pitchfork (dirgen) or *anadut*. From an ethnoarchaeological perspective, however, its function may also be compared to the *hart kapanı*, a multi-tined tool employed for fruit gathering in various regions of Anatolia. Nevertheless, considering its form and material, the object could equally be interpreted as a hearth stirrer. Technique: Casting and forging. Length: 41 cm, Thickness: 1 cm, Shaft hole: 3.8 cm, Weight: 595 g.

27. Wedge (Fig. 8, No. 27)

The wedge, taking an L form from the profile, gradually widens toward the tip and terminates in a slightly flattened, rectangular projection set at a right angle of 90 degrees. The beginning section of this example tapers and bends, a feature that suggests it was set directly into a hard surface and employed for suspension. The alternative possibility that this section was fitted with a wooden handle and used as a separating tool does not appear to represent a practical application, considering the inherently fragile nature of such a handle. Technique: Casting and forging. Length: 27 cm, Width: 3.8 cm, Thickness: 1 cm. Weight: 290 g.

28. Circular Tool of Uncertain Function (Fig. 8, No. 28)

It was produced by bending and joining an iron plate measuring 1.5 cm in thickness and 10 cm in height into a circular form. The object was formed by riveting another thick plate, 3-4 cm in width and 2-3 cm in thickness, with a curved rim on one side. Given its form and preserved weight, this piece most likely belonged to a tool requiring considerable durability. Technique: Casting and forging. Length: 32 cm, Height: 13 cm, Projecting rim: 5.5 cm, Upper diameter excluding rim: 22 cm, Lower diameter: 20 cm, Weight: 8055 g.

29. Melting Pan (Fig. 8, No. 29)

The rectangular-shaped pan with a slightly flaring rim has an iron handle, rounded in form for hanging, riveted to its short side. Lead residues are observed on the pan's base, while its exterior surface bears a thick soot layer. Therefore, it may be suggested that the piece was used for lead smelting. Technique: Casting and forging. Length: 35 cm, Width: 30 cm, Height: 4 cm, Thickness: 0.6 cm, Handle length: 38 cm, Weight: 1655 g.

30. Iron Ingot (Fig. 2)

These examples, trapezoidal-rectangular in form, differ in their weight and size. They have not been slag, but probably raw material stored in the *pithos* for toolmaking or repair. Length: 25 cm, Width: 10 cm, Weight: 5740 g.

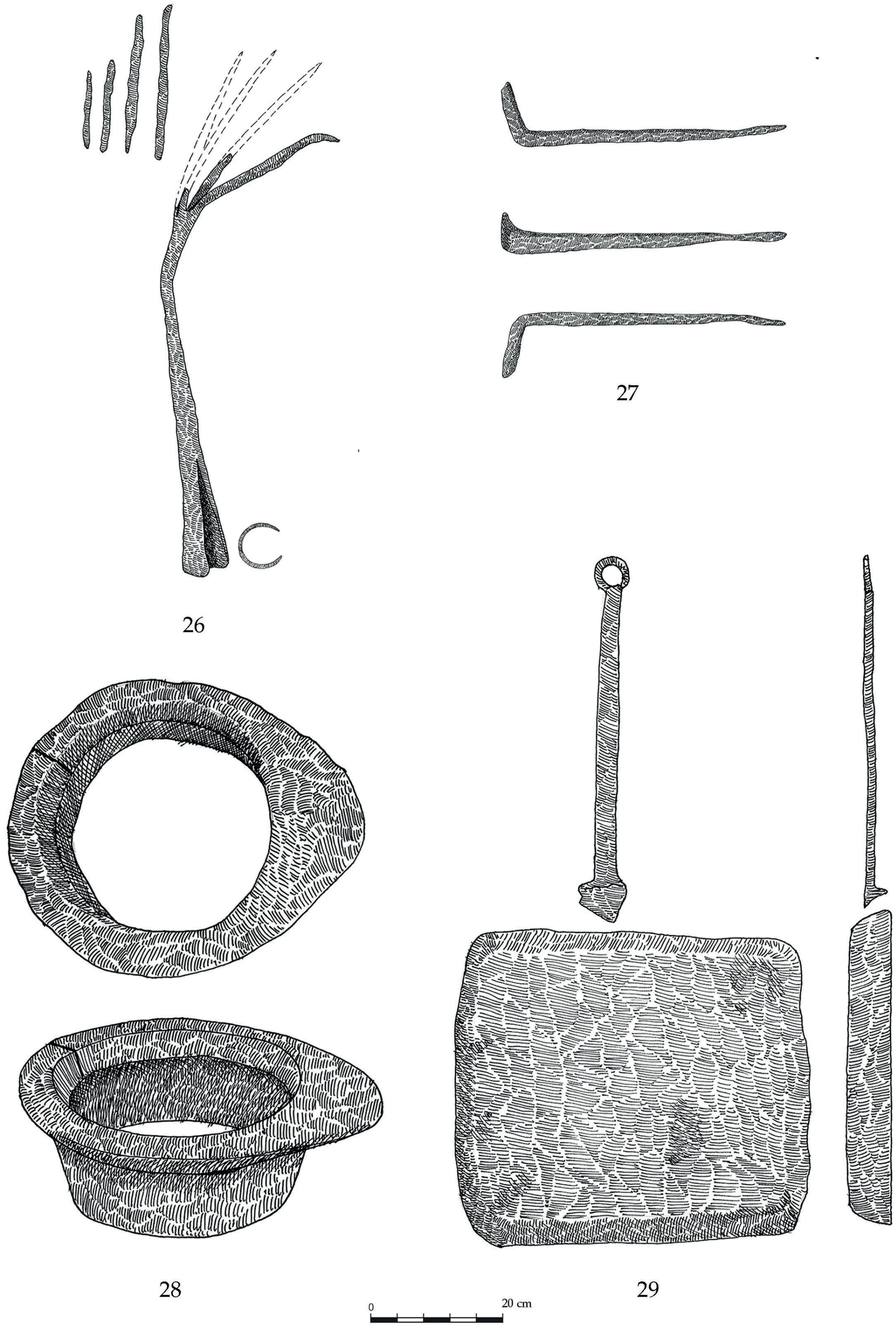
31. Iron Ingot

This trapezoidal–rectangular example varies in size and weight; it is not slag, but was likely a piece of raw material stored in the pithos for toolmaking or repair. Length: 25 cm, Width: 4 cm, Weight: 4120 g.

32. Iron Ingot

This piece, trapezoidal to rectangular in shape, shows variation in weight and dimensions. It is not slag but was likely stored in the pithos as raw material for producing or repairing tools. Length: 18 cm, Width: 5 cm, Weight: 1920 g.

Figure 8
Drawings of metal tools nos. 26-29 / *Metal Alet Çizimleri No. 26–29*



Discussion and Conclusion

Research on the Byzantine period suggests that the Troad was an early adopter of Byzantine culture following the Roman Empire's religious transformation (Cook, 1999, pp. 368-74). This evidence substantiates the assertion that Alexandria Troas was among the cities in the region that underwent this transformation. The assemblage should be considered significant cultural material for assessing the socioeconomic identity and technological advancement of the respective periods to which the hoards belong. Consequently, they are meaningful and interpretable artifacts that reflect the craftsmanship of their era. The artifacts, preserved with their functional integrity, imply that their find spot may have functioned as a workshop or storage area near the city center, rather than a cluster of rural, village-like structures. If the find spot of the pithos and its surroundings served as a production area, this practice would align with the principle noted by Konstantinos Armenopoulos (*Hexabiblos* 2.4, 19), which stipulated that blacksmith workshops, due to the constant risk of smoke and fire, should be located away from the city. This association provides insights into the Byzantine settlement archaeology of this city. Investigations in the forum area, the city's center during the Roman Imperial period, indicate that the forum lost its function in the late Byzantine period, as evidenced by the poor-quality architectural remains surrounding it, coins of the period, and anthropological analyses of preserved skeletons. The types and varieties of tools suggest the hoard owner's expertise in wood and metalworking, particularly in farming. Simultaneously, the limited number of tools indicates that the cultivated land and production volume were not extensive. This, in turn, suggests a relative decline in the population within the city walls, a sparse settlement pattern, and a shift in settlement characteristics compared to the Roman Imperial era. It also underscores the necessity to evaluate the artifacts discussed here within their Byzantine historical context.

Archaeological excavations and research have significantly advanced the identification of both tangible and intangible cultural assets from historical periods. In this context, the metal tool hoard from Alexandria Troas provides valuable insights into the implements used in agriculture and daily production during the Byzantine period, thereby enhancing our understanding of the evolution of metal agricultural tools across classical periods. The assemblage, an isolated example from a small trench, lacks associated numismatic or ceramic materials. Questions regarding the nature of the complex in which these artifacts, discovered in a privately owned olive grove, were found can only be addressed through more extensive excavation. Currently, dating is reliant solely on analogies. Dating the pithos that contained the metal artifacts is challenging, as establishing the chronology of Byzantine pithoi poses several difficulties. This is primarily due to the limited research on the subject and the prolonged use of similar pithos types over time. While some artifacts in the hoard retained consistent form and function over extended periods, others permit a more precise chronological assessment. These include plowshares, double-bladed axes, two-tined hoes, and vinedresser knives.

The plow, referred to in Ancient Greek as Αρατρον and in Latin as Aratrum, emerged shortly after the agricultural revolution and remained in use until the early 20th century for soil preparation (White, 1967, p. 123; Özdizbay, 2004, p. 4). The iron components of ancient plows, which have persisted to the present day, were known since the time of Virgil and were termed *vomer* or *vomis* (Aitken, 1956, p. 97 ff.; Gow, 1914, p. 249 ff.; Virgilius, *Georgies* I, 46, 162; White, 1967, p. 123 ff.). Plowshares, widely utilized, appear as consistent elements of agricultural practice into later periods, although modifications in their structures are observable (Henning, 1987, pp. 48-61 Types A-C). The plowshares in the assemblage (Fig. 4, nos. 10–11), which exhibit identical forms, suggest that the craftsmen of Alexandria Troas may have internalized a shared soil-cultivation tradition and adopted a standardized tool culture. Consequently, there is no evidence of the introduction of a new plowshare type in the region. As Lefort notes, the absence of region-specific forms demonstrates the successful adaptation of iron tools to varying environmental conditions (Lefort, 2002, p. 235). Furthermore, the recommendation in the *Geoponica* to 'use a heavier plowshare so that the soil's richness can be deeply cultivated and turned over' indicates that tool production developed within established practical guidelines (Geoponika B.23.14). The heavy and robust structures of the examples studied here may reflect adaptation to the clayey, sandy, and partly stony soils of the region. Early plowshares typically featured a pointed tip, flat bodies, and extensions consisting of a small hook and an independent ring (Waldbaum 1974, pl. 9, 104–105). By the beginning of the Byzantine period, however, these extensions gradually disappeared, while the flat body became integrated with the ring (Völling, 2002, Fig. 3-4; Hjohlman, 2005, Fig. 93). Simple iron tools with triangular blades and flat bodies, known since the Iron Age (Aberg 1957, p.175, Fig.4), continued to be used and were further developed toward the end of the period (Henning 2007, pl. 7, nos. 72, 73, 74). Plowshares have been identified in the Balkans, resembling examples from Alexandria Troas, and likewise dating to the second half of the 1st millennium AD (5th-7th centuries AD) (Vyazov & Salova, 2023, p.95 ff.) display typological characteristics consistent with the plowshares from Pergamon, whose find contexts are dated to the Late Byzantine period. The open-socketed plowshares identified at Pergamon and in Balkan settlements generally terminate in a pointed tip, although some examples end in a rounded tip (see. Gaitzsch, 2005, taf. 40, 41, PF6–12). Several finds from Byzantine Thrace, generally dated to the 11th-12th centuries AD by coins or stratigraphy, display pointed or slightly pointed tips (Papanikola-Bakirtzi, 2002, p.127, no.128; Murdzhev, 2021, Fig. 4. nos.1-3; Fig. 5.6; Fig. 9.28). These stylistic features suggest that the Alexandria Troas plowshares were produced in this period.

The double-bladed axes feature a broad, rounded blade on one side and a comparatively short, flat, and asymmetrical blade on the opposite side, whereas those with striking faces on both sides are symmetrical (Fig. 4, nos. 6-7). Their designs, including shaft holes with triangular spurs, align with types from the Early and Late Byzantine periods (Gaitzsch, op. cit., abb. 17; taf. 5, BA3–5).

Hoes utilized in the cultivation of fields and orchards are agricultural implements that have been employed with minimal modifications throughout history (White, 1967, p.45 ff.). The earliest representation of a two-tined hoe from the Early Byzantine period is found in the mosaic repertoire of the Great Palace complex in Istanbul, dating to the 5th-6th centuries AD. The agricultural tool depicted in this scene, characterized by a long, straight-profiled head, a round shaft hole, and pointed scrapers curving from the body toward the tip, provides insight into the Early Byzantine form of the two-tined hoe. The specimen unearthed at Assos, believed to date to the 6th-7th centuries AD, exhibits typological similarities to the depiction in the mosaic of the Great Palace Complex.[1] In contrast, the example from Pergamon, attributed to the Late Byzantine period and featuring a straight body with vertically set, spaced tines, produced with simpler execution, confirms the existence of variant forms of this type. The type examined in this study is notable for its form, quality, and execution (Fig. 5.14). This suggests that the tool reflects advanced manufacturing skills and was produced without constraints on raw material use, in response to the functional requirements of its intended purpose. The archaeological metal example, previously undocumented in the literature but morphologically identical to Triclinius' drawing (Fig. 9), indicates that the tool was conceived as an evolution of an established type rather than a transformation into a fundamentally different implement. Therefore, the design should be regarded as an integrated reflection of the practical outcomes of earlier practices from preceding periods.

Vinedresser's knives (Fig. 3. Nos. 4-5), distinguished by a hatchet on the reverse side, are depicted on tombstones and votive stelae from the Roman Imperial period. Early instances of these knives exhibit relatively narrow curved blades (Takaoğlu, 2021, pp. 373-376; Pfuhl – Möbius, Grabreliefs II, 1979, pl.171,1137-38,1159). Specimens discovered as hoards in the Balkans, dating from the 5th to the 7th centuries AD, demonstrate a broadening of the blade's curve (Henning, 1987, taf. 37). In contrast, some examples from the first half of the 11th century AD feature semi-crescent-shaped blades (Henning, 2007, taf.8, no.89), akin to the sickles found in the Alexandria Troas assemblage.

The carpenter's plane (Fig. 4.8), exemplifying the multifunctional nature of the tools within the hoard, is unequivocally consistent in technical characteristics with specimens from the Roman period. Although Greek examples have yet to be documented in the archaeological literature, analogous tools have been identified at the well-preserved sites of Verulamium, Goodmanham, and Calleva, dating to approximately the 4th century AD (Ulrich, 2007, pp. 41-45). Similar to the specimen from Alexandria Troas, these planes comprise an iron base with a wooden body affixed by pins. The socket for the wooden component on the iron base, along with the projections on both short sides of the base that support the blade socket, not only attest to the durability of this type but also indicate a deliberate effort to enhance its structural integrity. A contemporary iconographic source illustrating the uninterrupted continuation of both the typology and its functional principle into the 5th century AD is found in the mosaic repertoire of the Huqoq Synagogue in an ancient Jewish village in Galilee (israel), specifically in the panel depicting the Construction of the Tower of Babel (Magness, et al. 2018, Fig. 37). The evaluated typological features thus indicate that the example from Alexandria Troas reflects the design tradition of the 4th-5th centuries AD.

1 We thank Nurettin Arslan for sharing information on the Assos hoe, including the example recovered from the site, and for enabling the examination of the artifact. We also thank İlhan Akşit and Hasan Özsu for providing access to the photographs prepared for the forthcoming publication of the Great Palace Mosaics in Istanbul.

Figure 9
Drawings of Agricultural Tools and Equipment Belonging to Triclinius / *Triclinius'a Ait Tarımsal Alet ve Araç, Gereç Çizimleri* (Marc. gr. Z.464, fol. 34r)

It remains uncertain whether the tools were stored in the pithos nearly a millennium ago as a precaution against extraordinary events or as part of a workshop. Nonetheless, their specialized design and consistent manufacturing techniques indicate that these implements were utilized over extended chronological periods with minimal need for typological modification. The production traditions of civilizations are directly proportional to their level of advancement. These traditions, capable of being transmitted as a legacy from generation to generation, can be defined as the outcome of both learned and tested practice. This is particularly evident in tool technologies, which facilitate the performance of desired tasks more efficiently and practically using metal. It is posited that equipment designed to operate through muscular power has been based on the same principles from Classical Antiquity to the present day. Excavated finds, along with iconographic evidence from funerary and votive stelae, confirm this pattern of continuity (Amouretti, 1986, pp. 108–110; Nouschi, 2006, pp. 18–19). The agricultural and carpentry tools employed by Byzantine farmers also provide chronological support for this generalization.

The assessment of tools through their iconographic parallels and archaeological findings suggests that they predominantly represent agricultural activities, such as plowing, digging, pruning, harvesting, gathering, cutting, and smoothing wood, as well as the refurbishment or repair of worn tools. Similarly, both the depictions and analogical parallels of excavated artifacts corroborate the hypothesis that the assemblage of metal tools from Alexandria Troas was deposited in a pithos during the transition from the late Middle Byzantine to the early Late Byzantine periods.

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