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What were they for? A Study of the Uses of Pyramidal Lead Weights from Metropolis (Ionia) and Interpretations in Light of their Archaeological Contexts

Amaçları Neydi? Metropolis'teki (Ionia) Piramidal Formlu Kurşun Ağırlıkların Kullanım Alanları ve Arkeolojik Kontekst Bulgularıyla Yorumlanması Üzerine Bir Çalışma

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Abstract

The purpose of this study is to examine the possible uses of pyramidal lead weights unearthed in Metropolis. By comparing the artifacts with analogous examples found in different archaeological contexts, we hope to shed new light on their purpose and significance. Pyramidal weights unearthed during archaeological excavations across ancient Metropolis are analyzed and interpreted within their specific archaeological contexts. These interpretations are not limited to classifying the artifacts by their form, weight, or chronology; they also explore their potential purpose and uses as manufactured objects. Additional attention is likewise given to markings (monograms and symbols) found on some weights. Consideration is given as to what these markings were used for, whether or not there is a production-process connection between markings and weights, and whether or not the markings had any functional purpose. This study also takes into account the ongoing debate surrounding the possible

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applications of these weights with an attempt being made to analyze the potential uses of the Metropolis finds. All the weights discussed in the study are also presented in detail in the accompanying catalogue table. The twenty pyramidal lead weights unearthed at Metropolis were discovered in different parts of the city and in a variety of built contexts ranging from civilian dwellings to public buildings.

Keywords: Metropolis, Ionia, Pyramidal Lead Weight, Fishing Sinker, Lead Loom Weight.

Öz

Çalışmanın amacı, Metropolis'teki buluntular üzerinden piramidal formlu kurşun ağırlıkların kullanım alanlarının tartışılması, farklı arkeolojik araştırmalarda bulunan benzer örneklerle karşılaştırılarak yeni bakış açılarının değerlendirilmesidir. Bu bağlamda Metropolis Antik Kenti'nde farklı sektörlerde yürütülen arkeolojik kazılarda tespit edilen piramidal formlu ağırlıklar, arkeolojik kontekst bulgularıyla da desteklenerek yorumlanmıştır. Bu yorumlamalar yalnızca eserlerin form, ağırlık ve kronolojik olarak sınıflandırılmasından ibaret değil, aynı zamanda endüstriyel bir ürün olarak kullanım amacı ve alanlarının da tartışılmasını ele almaktadır. Öte yandan çeşitli ağırlıklar üzerinde yer alan monogram ve sembollerin incelemesi yapılmıştır. Bu simgelerin ne amaçla kullanıldığı, üretim aşamasındaki ağırlık birimlerine bir etkisinin olup olmadığı ve fonksiyonel bir işlevinin bulunup bulunmadığı irdelenmiştir. Ağırlıkların kullanım alanları üzerine son yıllarda yürütülen bilimsel tartışmalar ve yaklaşımların da değerlendirilerek Metropolis buluntularının potansiyel kullanım alanları çözümlenmeye çalışılmıştır. Son olarak çalışmaya konu olan tüm ağırlıkları katalog tablosunda detaylı bir şekilde açıklanmıştır. Metropolis'te sivil konutlardan kamu yapılarına kadar kentin farklı bölgelerinde keşfedilen 20 adet piramidal formlu kurşun ağırlığın kontekst analizleriyle birlikte ele alınması ve değerlendirilmesi bu çalışmayla mümkün olmuştur.

Anahtar Kelimeler: Metropolis, Ionia, Piramidal Kurşun Ağırlık, Olta Ağırlığı, Kurşun Dokuma Tezgâhı Ağırlığı.

Introduction

Spread out over the summit, down the sides, and around the base of a hill located between Yeniköy and Özbey in İzmir's Torbalı township, the ancient city of Metropolis was situated in Ionia **(Fig. 1)** at a location which has served as a vital intersection of major routes for at least five millennia and which continues to do so even today. A 142-meter hill with a commanding view of the Torbalı plain was selected as the site for the city's acropolis. Among the artifacts unearthed on the acropolis, one of the earliest is a Bronze Age stone seal[1]. The city's strategic position and its historical exploitation of the fertile Küçük Menderes (ancient Kaystros) river valley resulted in an uninterrupted cultural stratification spanning millennia. Situated between the Bozdağlar (Tmolos) range to the north and the Aydın (Messogis) range to the south, the Torbalı plain forms the western part of the Küçük Menderes basin. This plain also encompasses the area surrounding Metropolis. The region is characterized by fertile soil and ample natural resources that make it ideal for agriculture. The abundance of other food resources here along with rich alluvial farmland played a crucial role in the founding and subsequent prosperity of Metropolis, which also owes its strategic importance to its location midway on the main route connecting Ephesus and Smyrna, two major cities in ancient western Asia Minor. The ancient geographer Strabo placed Metropolis between Ephesus and Smyrna, noting its distance from Ephesus as 120 stadia (roughly 25 kms)[2]. At Torbalı, a branch from the main road leads inland to Sardis through Karabel Pass. Metropolis's emergence as a thriving urban center with a rich cultural heritage was directly related to the continued importance of these routes throughout history[3].

1 Recep Meriç, *Metropolis, City of the Mother Goddess*, Mas Matbaacılık, İstanbul 2004, p. 31; Fahri Işık, "Anadolu'ya Sahiplik", *Geleceğe Miras, Türkiye Arkeolojisinin Altın Çağı*, eds. A. Engin-K. Özçelik-Ş. S. Çokay Kepçe-V. M. Tekinalp-F. Yıldırım-M. Özturan, Ankara 2025, pp. 217-267.

2 Strabo, *The Geography of Strabo*, Book VI. Translated by Jones, H. L., The Loeb Classical Library, Cambridge 1960, 14.1.2.

3 Serdar Aybek-Burak Arslan, "Eski Çağlardan Günümüze Torbalı Ovasında Ulaşım Ağı ve Metropolis'in Stratejik Önemi", *18. Türk Tarih Kongresi/18th Turkish History Congress*, *Ankara 1-5 October 2018*, *Bildiriler*, eds. Ö. Nurdan-M. Özler, Vol. 11, Türk Tarih Kurumu Yayınları, Ankara 2022, pp. 341-359.

Figure 1: Aerial view of Metropolis.

The twenty pyramidal lead weights unearthed at Metropolis were discovered in different parts of the city and in a variety of built contexts ranging from civilian dwellings to public buildings (Table 1). With the exception of one artifact, all of these weights are pyramidal in shape. The objects come in a wide range of sizes and masses; some feature a single suspension hole (eye), whereas others have two. Of these objects, the lightest (Table 1, Cat. 1) is 20.7 g, while the heaviest (Table 1, Cat. 20) is 547.8 g. These two examples alone should suffice to demonstrate the remarkable diversity in mass among the finds and make it rather improbable that they were all used in the same way or for the same purpose. It is a commonly-held belief that pyramidal lead weights were used as loom weights[4] but the notion that objects weighing less than 65 grams could be used for that purpose seems rather implausible. For this reason, recent research has also explored the possibility that these artifacts may have been used as fishing gear sinkers[5]. Underwater archaeology, particularly at shipwreck sites and along coastlines, has yielded findings that would lend support to this hypothesis[6]. The findspots of the twenty

4 Waldemar Deonna, *Le mobilier délien*, Exploration archéologique de Délos faite par l'École Française d'Athènes. Fase. XVIII, E. de Boccard, Paris 1938, pp. 155-156.

5 Antony John Parker, *Ancient Shipwrecks of the Mediterranean and the Roman Provinces*, BAR International Series 580, Oxford 1992, pp. 330, 333, 349.

6 Ehud Galili-Baruch Rosen-Jacob Sharvit "Fishing-gear sinkers recovered from an underwater

pyramidal lead weights discovered at Metropolis provide clues about their potential functions. The primary evidence supporting assertions about their likely use lies in the context in which the weights were found–particularly those discovered, along with other artifacts, in groups or in close proximity to one another.

Typology

Although the lead weights discussed in this study were found in different parts of the city, they share a striking degree of typological similarity. Nearly all the weights are pyramidal in form, the sole exception being Cat. 3, which is conical. Another notable shared characteristic is that all these artifacts resemble truncated pyramids; that is, unlike a true pyramid, they do not actually form anything even approximating a triangle. With two exceptions, the top and bottom ends of the artifacts are roughly square in shape; only the ends of objects 7 and 13 may be considered "equilateral". In the other examples, what are presumed to be the "faces" (because they are pierced), are wider than the "sides" (please refer to the catalogue). Cat. 1 through Cat. 7, all of which are thought to have been fishing gear weights, have only one eye each. Of the remaining thirteen objects, six have one eye each and six have two. Cat. 20 does not appear ever to have been pierced at all, and for that reason alone cannot possibly have been used as a loom weight as-is. Two possibilities have been suggested for this object. One is that it was used as a free-standing weight of some sort; the other is that the process of making it was somehow interrupted, and the object was not pierced for whatever reason. Both the locations of the eye in three of the single-pierced artifacts (10, 12, 15) and indications on the objects' fronts/backs suggest that they had been designed to be pierced twice but never were (there is no indication that a second eye was pierced and subsequently closed up). Like Cat. 20, it is possible that these are also unfinished objects whose manufacturing processes were interrupted.

What might these objects have been used for?

A review of the findspots of the twenty pyramidal lead weights unearthed in Metropolis and its vicinity indicates that the objects were likely to be encountered in every part of the city: three were found in the Roman commercial agora (Plot 1381), three on the acropolis (one of those in a Roman cistern), and one each in the stoa, the theater, the Araplıtepe church, and the Atrium House **(Fig. 2)**. All

wreckage site, off the Carmel coast, Israel", *The International Journal of Nautical Archaeology (IJNA)*, 31.2, Taylor & Francis, London 2002, pp. 182-184.

ten of the remaining objects entered the inventory as a result of chance finds in the vicinity of the formal excavation site. Researchers investigating the potential uses of pyramidal lead weights have come to multiple–and sometimes patently implausible–conclusions about what they were for. Three examples of pyramidal lead weights encountered one each at Ephesus, Corinth, and Pnyx for instance are all referred to as "loom weights"[7]. The Ephesus artifact weighs 255.6 g;[8] although the weight of the Corinth artifact is not mentioned, its length is given as 66 mm[9]. These dimensions make it at least possible for the objects to have been used as loom weights, as their terracotta counterparts would have been. However, in a list of artifacts that went missing from a collection of cultural properties belonging to a private collector that appears on the General Directorate of Cultural Heritage and Museums website, there are eleven pyramidal lead weights that are also referred to as "loom weights"[10]. The lightest of these objects weighs 15 g and the heaviest 205 g. Neither the dimensions nor the actual masses (15 g, 48 g, 49 g) of three of these objects make them heavy enough to have been used as loom weights. The possible functions of such objects are dealt with in depth in R. Kletter's "Pyramidal Lead Objects: Scale Weights, Loom Weights, or Sinkers?", one of the most extensive explorations of this topic to date[11]. Considering the possible functions of pyramidal lead weights, Kletter proposed that they might have been used as loom weights but also as scale weights and fishing gear sinkers and therefore attempted to classify the objects based on their dimensions and where they were found.

7 Gladys R. Davidson-Dorothy Burr Thompson, *Small Objects from the Pnyx:1,* Hesperia, Suppl. 7, Swets&Zeitlinger B.V., Amsterdam 1943, p. 94.

8 Andreas Pülz, *Byzantinische Kleinfunde aus Ephesos, Ausgewählte Artefakte aus Metall, Bein und Glas*. Forschungen in Ephesos 18/1, Verlag der Österrreichischen Akademie der Wissenschaften, Vienna 2020, p. 139, g 148, taf. 69, farbtaf. 74, g 148.

9 Gladys R. Davidson, *Corinth, The Minor Objects*, Vol. XII, The American School of Classical Studies at Athens, Princeton 1952, p. 172, pl. 77, 1212.

10 https://kvmgm.ktb.gov.tr/Eklenti/69332,ahmetcankayipeserler401-499pdf.pdf?0 last accessed: 21.01.2025.

11 Raz Kletter, "Pyramidal Lead Objects: Scale Weights, Loom Weights, or Sinkers?", *JESHO (Journal of the Economic and Social History of the Orient)*, Vol. 56, Brill, Leiden 2023, pp. 1-28.

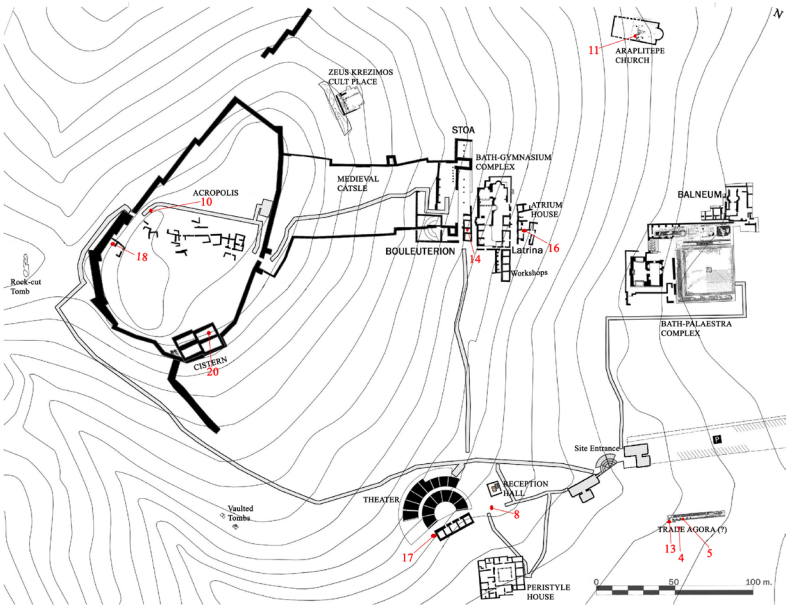

Figure 2: City plan of Metropolis and catalogue numbers of weights according to findspots.

Among the various artifacts retrieved by archaeologists from a submerged eleventh-century shipwreck near Serçe Limanı in Turkey's Muğla province are a number of pyramidal and conical lead weights[12]. In a published comprehensive study of the finds from this wreck, both types of weights are referred to as "sinkers"[13]. The masses of two of the pyramid-shaped objects are given as 22 g and 26 g[14]. In another shipwreck excavation, this one of a seventh-century vessel that sank off Yassı Ada (ancient Plati) near İstanbul, an assortment of fishing gear artifacts was encountered that included a large number of lead weights[15]. More than a thousand

12 George F. Bass, "Introduction and Explanations", *Serçe Limani, An Eleventh-Century Shipwreck, The Ship and its Anchorage, Crew, and Passengers*, Vol. 1, eds. George F. Bass-Sheila D. Matthews-J. Richard Steffy-Frederick H. van Doorninck Jr., Texas A&M University Press, College Station 2004, pp. 3-4.

13 G. Venetia Piercy-George F. Bass, "Fishing Gear", *Serçe Limani, An Eleventh-Century Shipwreck, The Ship and its Anchorage, Crew, and Passengers*, Vol. 1, eds. George F. Bass-Sheila D. Matthews-J. Richard Steffy-Frederick H. van Doorninck Jr., Texas A&M University Press, College Station 2004, p. 400.

14 Piercy-Bass, agm., p. 426, ls 1, ls 2.

15 Peter Ian Kuniholm, "The Fishing Gear", *Yassi Ada, A Seventh-century Byzantine Shipwreck*, eds.

metal objects were recovered from a Late Roman/Early Byzantine shipwreck site discovered off Haifa in 1992[16]. Among them were pyramidal-form objects fashioned from lead that presumably were used as sinkers. Based on whether or not the objects were pierced, researchers were also able to classify them as hook/line sinkers or cast net sinkers[17]. The smaller sinkers weighed between 24 g and 43 g. Two heavier (85 g and 154 g) examples, whose dimensions were correspondingly larger, are nevertheless thought to have been used for the same purpose[18]. Among the more significant of the fishing-gear finds discovered by archaeologists working at the Sea of Galilee was a mold that could be used to cast pyramidal lead weights. Sinkers cast from the mold have also been found[19]. Although Robinson's analysis of metal finds from Olynthus primarily classified pyramidal lead weights as loom weights,[20] the study also highlighted the potential for some of these artifacts to have had different functions. However, with the exception of one conical find (64 g), his catalogue does not indicate how heavy the entries are, so comparisons can only be made based on size. The fact that the bases of items 2483 and 2494 are less than 20 mm wide makes it much less likely they were intended for use on a loom[21]. Pyramidal lead weights discovered during excavations at Caesarea Maritima were subsequently studied by Holland. Holland considered the likelihood that these artifacts, which he classified as "weight-like objects", could have been used as loom weights, cast-net weights, or sinkers[22].

Applying Kletter's methodology to the twenty pyramidal lead weights encountered at Metropolis, we can potentially classify these artifacts into two groups: fishing gear sinkers and loom weights. The reason for not classifying any of them as scale weights is that all the finds of that nature (consisting of an unbroken sequence extending from the Hellenistic period to the Byzantine) which have so far been

George F. Bass-Frederick H. van Doorninck Jr., Vol. 1, Texas A&M University Press, College Station 1982, pp. 296-299.

16 Galili et al., *ibid*, p. 182.

17 Galili et al., *ibid*, pp. 182-84.

18 Galili et al., *ibid*, p. 186.

19 Ehud Galili-Avshalom Zamer-Baruch Rosen, "Ancient Fishing Gear and Associated Artifacts from Underwater Explorations in Israel - A Comparative Study", *Archaeofauna* Vol. 22, 2013, pp. 151, 153, fig. 11.

20 David M. Robinson, *Excavations at Olynthus, Part 10, Metal and Minor Miscellaneous Finds, An Original Contribution to Greek Life*, The Johns Hopkins Press, Baltimore 1941, pp. 472-473.

21 Robinson, *ibid*, pp. 472-73, pl. 153, 2483, pl. 154, 2494.

22 Lionel Holland, *Weights and Weight-Like Objects from Caesarea Maritima*, Hadera 2009, pp. 55-56.

encountered at Metropolis already fit neatly into existing typological and unit-based scale-weight categories. Put simply, scale weights found at the site are either rectangular or oval in shape, and their attributes allow them to be easily classified and identified within a well-established framework of standard weight units. None of the twenty pyramidal lead finds could have been used as scale weights because neither their forms nor their masses are compatible with that framework. Of the two main groups, the first we will consider is that of fishing gear sinkers. Seven (Table 1, Cat. 1 through Cat. 7) of the twenty pyramidal lead weights found at Metropolis are assigned to this group. Size and mass are the primary factors distinguishing the two groups. Based on the dimensions and masses of comparable artifacts thought to have been used as fishing gear, we have classified Metropolitan examples weighing less than 65 g as sinkers and only the thirteen weighing at least that much as loom weights.

The sinkers

The seven pyramidal lead weights encountered at Metropolis which we believe are fishing gear sinkers weigh between 20.7 g and 64.4 g. The longest of the seven (Table 1, Cat. 6) is a mere 4.5 cm. None of the seven are big enough to have been used as loom weights. The two lightest objects (Table 1, Cat. 1-2) bear an identical mark resembling a rosette **(Fig. 3)** that is also stamped in the same place on both. This likely indicates that the two were made (or possibly used) together. Unfortunately, the exact findspots of both are unknown as they were found by a local villager somewhere in the vicinity of Metropolis and surrendered to excavation personnel the same day. Another attribute interestingly shared by all the artifacts in this group is the presence of a single eye. All the eyes are round and centrally pierced somewhere near the apex of the pyramid. Besides the stamped rosette, another feature that only the Cat. 1 and Cat. 2 objects have in common is a slightly raised ring around the eye **(Fig. 3)**. The bases of five of these

Figure 3: Identical stamped rosette on Cat. 1 and Cat. 2 lead weights.

seven pyramidal lead weights lack any markings whatsoever. The two exceptions are the Cat. 3 and Cat. 4 weights, whose bases contain markings that were possibly intended to be decorative. The base of Cat. 3 contains chiseled lines forming a pattern that seems vaguely floral (**Fig. 9, no. 3**). While the ornamentation is not entirely clear, the lines suggest curved branches and leaves, making this the most likely interpretation. Cat. 3 is also the only one of the twenty pyramidal lead weights found at Metropolis whose form is actually conical (**Fig. 9, no. 3**). The other sinker with a potentially decorated base is Cat. 4, whose underside is marked with an elliptical depression containing some indented lines that cannot be identified even under magnification (**Fig. 9, no. 4**).

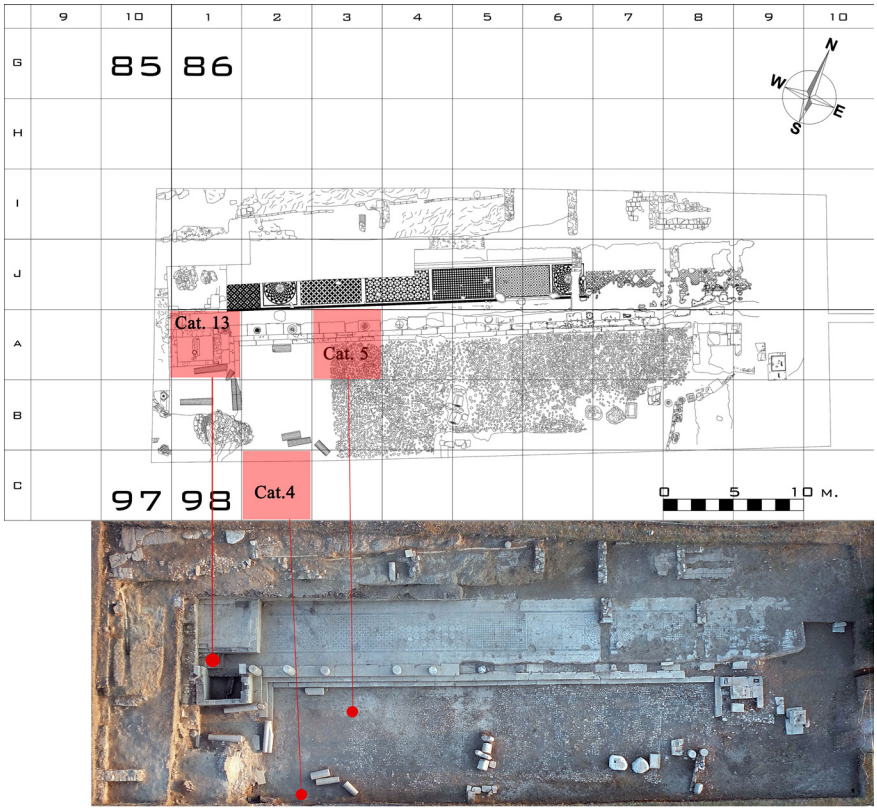

Figure 4: Findspots of the three lead weights discovered in the commercial agora.

The loom weights

Thirteen (Table 1, Cat. 8 through Cat. 20) of the twenty pyramidal lead weights encountered at Metropolis are deemed to be loom weights on the basis of their size and mass (size and mass are the sole criteria by which we distinguish between fishing gear sinkers and loom weights). The lightest of these artifacts is 110.5 g; the heaviest is 547.8 g. Twelve of the thirteen can be further divided into two subgroups: those with a single eye (8, 9, 10, 12, 15, 16, 19) and those with two eyes (11, 13, 14, 17, 18) **(Figs. 9-10)**. The sole outlier is Cat. 20, which has no eye at all **(Fig. 10)**. In the case of three of the objects (10, 12, 15) in the first subgroup, the eye is not centrally located but is set rather to one side; indeed, in two of these (10, 12), there is evidence of where a second eye could have been pierced **(Fig. 9, nos. 10, 12)**. The locations are faintly depressed, suggesting they were marked beforehand but never pierced, and that these weights were therefore not entirely finished when they were made. This is not unusual: unfinished lead weights have been encountered at other ancient sites[23]. That being so, it is possible that the objects lacking eyes were never used at all or were used for some other, unknown purpose. By contrast, incomplete manufacture is not a feature of any of the terracotta loom weights encountered at Metropolis. Every one of them has either a more-or-less centrally-placed single eye or a pair of eyes located side-by-side exactly as their makers must have intended[24].

Upon inspecting the bases of this group of artifacts, it was discovered that Cat. 9 and Cat. 18 each bears a monogram on the underside **(Figs. 9-10, nos. 9, 18)**. Although the monograms differ, both monograms appear to be associated with the letter "A" and both are in raised relief. One object (Table 1, Cat. 9) has a single eye; the other (Table 1, Cat. 18) has two. In both cases, the monograms are enclosed by a thickened frame. These monograms are most likely associated with the workshops where the weights were made. Pyramidal lead weights bearing monograms on their bases have been discovered at other ancient sites[25]. The underside of Cat. 15 is unusual in that it contains an elliptical depression; however, it is not entirely clear if this was intended to be a monogram or not

23 Robinson, *ibid*, pp. 472-73, pl. 154, 2490.

24 Serdar Aybek-Burak Arslan-Şahin Menteşe, "An Essay on the Contribution of Experimental Methods to Archaeology Teaching Based on Metropolis Data", *Höyük*, Vol. 11, Ankara 2023, p. 204, fig. 2.

25 Pülz, *ibid*, p. 139, g 148, taf. 69, farbtaf. 74, g 148.

(**Fig. 10, no. 15**). With the exception of these two artifacts, none of the other loom weights have anything resembling a monogram or a decorative or stamped marking on their base.

Analysis of the findings within their archaeological context

Up to this point, we have only presented our thoughts about what these twenty pyramidal lead weights might have been used for. Just as important–and worthy of consideration–as their potential use, however, is when these artifacts might have been made and where at the site they were found. When considered in this way, these objects become more than just weights. By interpreting their connection to their findspots, we can establish their links to the social fabric of the period in which they were made. To do that, the archaeological excavation context in which these artifacts were found is of paramount importance. That said, ten of the weights were acquired as donations or are random surface finds; that is, they were not formally excavated and thus lack any contextual information. The remaining ten artifacts were discovered by archaeologists in various locations throughout the city: the Roman commercial agora, the acropolis, the stoa, the theater, the Araplıtepe church, and the Atrium House.

Figure 5: Examples of discarded seashells encountered at the commercial agora (same context as Cat. 4).

On the basis of their masses, two of the three artifacts found in the Roman commercial agora qualify as fishing gear sinkers and only one as a loom weight. While none of them were found in the same grid square, their findspots are quite close to one another. The Cat. 4 and Cat. 5 sinkers were discovered during the 2022 excavation season: Cat. 4 in grid square 98(C2) and Cat. 5 in grid square 98(A3) **(Fig. 4)**. Although the artifacts were not located within the same grid square, their proximity to one another does allow for a meaningful comparison of their contexts. An examination of the context in which Cat. 4 was found reveals that the overwhelming majority (286 out of 293) of the ceramics immediately nearby date to the Roman Imperial period (predominantly from the 2nd century to the 5th). In addition to ceramics, the same context also yielded bone needles, miscellaneous metal objects, and seashells. Roman Imperial period ceramics similarly dominate the contextual assemblage associated with Cat 5. Of the 130 sherds that can be identified, 121 belong to the Roman Imperial period (predominantly from the 3rd century to the 5th). This assemblage also includes bone needles, metal objects, glass fragments, and a large quantity of seashells. A comparison of the find contexts of the Cat. 4 and Cat. 5 artifacts therefore allows us to say that the two are consistent with one another in terms of assemblage diversity and chronology. Both grid squares are characterized by a predominance of Imperial-period ceramic finds and a striking abundance of bone needles; the distribution and density of seashells common to both context assemblages are another rather important detail **(Fig. 5)**. The predominance of Roman Imperial period finds extends beyond the grid squares containing the pyramidal lead weights: a similar context density is to be observed in the surrounding ones as well. Furthermore, the presence of bone, glass, and seashell finds here supports the notion that the same context assemblage spans a broader area encompassing more than one grid square. The abundance of seashells in the area, coupled with the discovery of a bronze cochlearium–a spoon with a long tapering handle specifically designed for opening and eating shellfish–presents a coherent picture that aligns perfectly with the context[26] **(Fig. 6)**. Finally, the discovery of two bronze netting needles **(Fig. 7)** in the same context suggests that this part of the Roman agora may have housed a workplace or shop engaged in the production and/or sale of fishing gear. It should be noted, however, that the same context also yielded a large number of bone needles.

26 Onur Gülbay, "Home & Family Life", *Metropolis; A City, Its People, Their Way of Life*, eds. Serdar Aybek-Burak Arslan, Arkeoloji ve Sanat Yayınları, İstanbul 2023, p. 177, fig. 115.

Figure 6: Cochlearium (Photo: Mehmet Yasa).

Figure 7: Netting tools.

The last of the three examples of pyramidal lead weights discovered in the Roman agora is Cat. 13, which we interpret as a loom weight (**Fig. 10, no. 13**). Unlike Cat. 4 and Cat. 5, this was found not within the same paved floor level but inside a brick building corresponding to grid square 86(A1) (**Fig. 4**). This building was constructed directly atop the northwestern portico of the agora as part of a functional change in the structure and resulted in the destruction of that section of the portico. The findspot of the lead weight was on top of the western wall that delimits this space. The majority (22 out of 32) of the sherds unearthed from this context belong to the Roman Imperial period and consist primarily of cooking vessels and everyday tableware (predominantly from the 3rd century to the 5th). The abundance of bone artifacts and seashells in this grid square, mirroring a pattern observed in the contexts of the other two lead weights, points to a commonality between these two groups of finds.

Unlike the commercial agora, where only three of these artifacts have ever been encountered, the acropolis presents a different picture. Here, such artifacts have been unearthed across a significantly broader area and in the course of excavations exploring many different periods of the city's history **(Fig. 8)**. The oldest of these objects is Cat. 18, which was found during the 1994 season. This lead weight was unearthed along with an assortment of other artifacts in an area referred to as "Trench 2" and at a time when the course of the northwestern section of the Hellenistic wall encircling the acropolis was still being traced out. The other artifacts included two Doric capitals, two millstones, a heavy slingstone, an Ephesus lamp, a lagynos, and a terracotta theatrical comedy mask[27]. The motleyness of this assortment is reflected in the objects' dates, which range broadly from Hellenistic times to the Imperial Roman period. The sherds recovered from the context also exhibit a broad chronological range that extends from the Hellenistic period to the Byzantine.

Figure 8: Findspots of lead weights discovered on the acropolis.

Another lead weight encountered on the acropolis is Cat. 10, which was found in 2006. This too was unearthed during excavations conducted near the citadel's western gate. Alongside the sherds from the find context, other discoveries included a bronze belt buckle, various fragments of bronze objects, and a bronze

27 Burak Arslan, "The Theater & Theatrical Arts", *Metropolis; A City, Its People, Their Way of Life*, eds. Serdar Aybek-Burak Arslan, Arkeoloji ve Sanat Yayınları, İstanbul 2023, p. 339, fig. 245.

coin minted in Ephesus during the second or third century AD. The ceramic assemblage is meager. Among 14 identifiable sherds, 9 belong to the Roman Imperial period and consist mainly of everyday tableware and cookware as well as of fragments of jars and amphorae. The third and most recently-found example from the acropolis is Cat. 20, unearthed in 2019 during the excavation of a cistern located in the citadel's southern corner. Notably, this artifact is the heaviest of the lead weights discussed in this article.

The cistern in which the object was found is a substantial, four-chambered structure built on the acropolis during the Roman Imperial period[28]. The weight was discovered in the northern chamber of the cistern, at a time when only two of the building's sections had been excavated[29]. It appears that this structure remained in active use as a cistern until late Byzantine times, eventually turning into a midden or rubbish pit. Slowly filling over the years, the structure became a depository for a range of artifacts, primarily Byzantine ceramics but also objects from various other periods. The lead weight was found at an elevation of +132.20 meters, whereas the cistern's floor lies at +129.24 meters. This indicates that the weight was located roughly 3 meters above the cistern floor. The finds from the elevation where the weight was discovered were analyzed to determine whether the material in the fill was chronologically homogeneous or not. Unfortunately, the prolonged use of the area as a refuse dump during the Late Byzantine period resulted in a lack of chronological coherence among the finds. Of the 281 identifiable ceramics, however, 255 can be dated to the Byzantine period. Although fragments of glazed-pottery lamps and dishes, including some from the Islamic period, are prevalent, the assemblage also contains Hellenistic and Roman potsherds. In addition to ceramics, the finds also included terracotta loom weights, fragments of metal objects, mortar stones, and the discarded bones of animals that had been butchered for their meat and eaten.

The remaining lead weights discovered outside the acropolis and commercial agora are each represented by one example each. Two were unearthed in 2003 during excavations of the Araplıtepe Church and the Atrium House[30]. Cat. 11

28 Serdar Aybek-Burak Arslan-Yılmaz Balım-Umut Canseven-Vedat Onar-Emine Akkuş Koçak, "Metropolis Arkeolojik Araştırmaları" *2019-2020 Yılı Kazı Çalışmaları*, Vol. 4, Ankara 2022, pp. 202-204.

29 Aybek et al., *ibid*, p. 218, fig. 3.

30 Recep Meriç-Ali Kazım Öz-Aygün Ekin Meriç, "Metropolis Kazıları, 2003", *26. Kazı Sonuçları Toplantısı, Konya 24-28 Mayıs 2004, Bildiriler*, Vol. 2, eds. K. Olşen-H. Dönmez-A. Özme, Ankara

was discovered during initial test pitting at the Araplıtepe Church, alongside various architectural elements (predominantly marble fragments, including those of inscribed columns, and iron nails). The ceramic finds span the Hellenistic and Roman Imperial periods, with 11 items dating to the Hellenistic period and 17 to the Roman. Also discovered in 2003 was another lead weight (Cat. 16) that was found within the Atrium House. This area, located in the heart of the ancient city, is an insula comprised of houses planned and built during the Roman Imperial period. In other words, the excavated areas here are associated with private dwellings. Cat. 16 was unearthed during the excavation of spaces M-6 and M-1 inside the boundaries of this residential block. Among the contextual finds were 50 ceramic fragments. 25 of these date to the Roman Imperial period and consist of everyday tableware and cooking vessels. The remaining fragments include 18 from the Byzantine period and seven from the Hellenistic period. In addition to the ceramic assemblage, mosaic tesserae and fragments of colored plaster, glass, and bone associated with the dwellings were also found. While the building materials and techniques unquestionably point to a construction date within the Roman Imperial period, the broad range of the ceramic finds would appear to be indicative of a much longer period of habitation at the site.

Two of the lead weights were found during the 1997 season, one each at the stoa and at the theater[31]. Cat. 14, discovered in the stoa, was unearthed in front of piers 12 and 13 during the excavation of Roman-era shops associated with the structure. Excavations in this area yielded a considerable quantity of Roman-era pottery along with a substantial concentration of animal bone fragments. Cat. 17, discovered in the theater, was unearthed during excavations west of the stage building. Analysis of the accompanying ceramic fragments revealed that a majority were from the Hellenistic and Roman Imperial periods, with 43 Hellenistic and 56 Roman sherds identified. The broad chronological spread of the assemblage can be attributed mainly to the grid square's position outside the theater's footprint and to the backfill nature of the findspot's location. The discovery, during excavations of Late Classical-Early Hellenistic rock tombs hewn into the schist bedrock, further attests to the extensive chronological span characteristic of this area[32].

2005, pp. 138-140.

31 Recep Meriç, "Metropolis 1997 Yılı Kazı Raporu", *20. Kazı Sonuçları Toplantısı, Mersin 25-29 Mayıs 1998, Bildiriler*, Vol. 2, eds. K. Olşen, H. Çakmak, F. Bayram, F. Kaymaz, N. Tarlan, A. Özme, K. Ataş, H. Dönmez, Ankara 1999, pp. 335-337.

32 Serdar Aybek-Burak Arslan, "The Tombs Found in Metropolis and Thoughts on the Necropolis

Conclusion

The twenty pyramidal lead weights unearthed in the ancient city of Metropolis were found in a variety of contexts and locations, indicating that they served multiple functions across the city. This conclusion is supported by the available information, data, and interpretations related to these artifacts. Seven of them, weighing between 20 g and 65 g, are postulated to be fishing gear sinkers. The two lightest of this group bear an identical decorative rosette stamped in the same position on both objects (**Fig. 3**). One of the most noteworthy features of these seven sinkers is that only two of them were found in a structure believed to have been the commercial agora of Metropolis. The remaining five were chance finds from outside the formal excavation site, all brought in by the same individual, who surrendered four of them on the same day. The fact that the weights are sinkers and that the finder's property is adjacent to the Roman commercial agora raises the intriguing possibility of a connection between them and the weights and sinkers unearthed elsewhere during formal archaeological excavations at the site. This is because no such small pyramidal weights have ever been discovered anywhere else in Metropolis to date. It is therefore plausible that they originated from an area near the commercial agora. The presence, in addition to sinkers, of other fishing-related implements and of discarded seashells in the Roman commercial agora lends further credence to this hypothesis (**Figs. 5-7**).

Detailed contextual analysis of the weights leads to the conclusion that they were primarily manufactured during the Roman Imperial period. The sinkers with established contexts were unearthed during the excavation of the Roman commercial agora while associated small finds and sherds further confirm a Imperial-period date. The weights found on the acropolis were unearthed, along with a variety of other finds, in contexts characterized by a greater abundance of Roman Imperial period ceramics. The examples found in parts of the site other than the stoa and theater are mostly associated with Roman and Byzantine-period structural contexts. The weight unearthed in the stoa is straightforwardly datable to the Roman Imperial period based on the contextual materials. This dating is further supported by the fact that the artifact was discovered in a part of the stoa that underwent modifications during Roman times. Both the form of the weight discovered in the theater and the context in which it was found are similarly consistent with the Roman Imperial period.

Localization", *Tüba-ar (Turkish Academy of Sciences Journal of Archaeology)*, Vol. 26, Ankara 2020, pp. 116-117.

A key focus of this paper has been to answer this research question: Why and where were pyramidal lead weights used in ancient Metropolis? We believe that addressing, in light of fresh perspectives gleaned from our Metropolitan finds, the relatively unexplored topic of what pyramidal lead weights were used for can contribute valuable insights to the currently limited research on this subject. In particular, the smallness and lightness of some of these artifacts may offer important clues about their actual use, i.e. as fishing gear sinkers. Conversely, formal and typological similarities between these artifacts on the one hand and terracotta loom weights on the other suggest that at least some of these finds might have been used in textile weaving. However, although such artifacts are traditionally associated with weaving, archaeological evidence from sites like Metropolis and from ancient shipwrecks suggests they may have served other purposes as well[33]. For example, although pyramidal lead weights may be used as fishing gear sinkers and loom weights, there are many examples in the literature that are properly classified as scale weights. For reasons discussed in this paper, no pyramidal lead weights discovered at Metropolis could have been scale weights; all the examples encountered here could only have been sinkers or loom weights. Sinkers and loom weights differ markedly in terms of both size and mass. To take our Metropolitan finds as an example, the difference in mass between the lightest (Cat. 1) and the heaviest (Cat. 20) is 527.1 g. This variation alone is just one of the clues that pyramidal lead weights must have had more than one purpose. For technical reasons, the artifacts we classify as fishing gear sinkers are almost certainly too light to have served effectively as loom weights. Lead weights are commonly pyramidal in form, probably because that shape is inherently suitable for a wide range of applications and functions. Although pyramidal lead weights encountered at other archaeological sites are frequently classified as loom weights, the purpose of those weighing less than 50 g in particular really needs to be reconsidered in light of their utility. None of the numerous pyramidal terracotta loom weights encountered at Metropolis is as small or as light as are the more diminutive of our lead examples. The reasons why loom weights were fashioned from materials as different as baked clay and cast lead also warrant further investigation. Compared to lead weights, terracotta weights are undeniably cheaper and easier to produce due to the readily available material from which they are made. This raises an interesting question:

33 Ayşe Fatma Erol-Deniz Tamer, "Evaluations on Loom Weights Obtained from Excavations Held in Fatsa Cıngırt Kayası 2012-2014 Seasons", *Tüba-ar (Turkish Academy of Sciences Journal of Archaeology)*, Vol. 15, Ankara 2012, pp. 127-128.

Why were lead weights used as an alternative by weavers at all? Could their use have been associated with particular types of yarn that perhaps made it necessary for them to be heavier?

It is thought that the objects considered to be fishing-gear weights were locally manufactured for sale and use in Metropolis. The presence of so many of the fishing-related artifacts encountered in Metropolis in the commercial agora suggests that this is where they were made and/or sold. Metropolis was not located by the sea but it was in a region with an abundance of rivers, streams, marshes, and lakes. It would therefore not be unusual for fishing gear to have been made and sold in ancient Metropolis. The great quantity of discarded seashells found in the commercial agora and the discovery of a bronze cochlearium, an implement for opening and eating shellfish, are evidence that besides being a place where fishing gear was manufactured and sold, it was also a place where the products of the Metropolitan fishing industry were consumed (**Figs. 5-6**).

Review

This article has been reviewed by at least two reviewers using a double blind peer review model. A similarity check was performed to confirm that it was free of plagiarism.

Ethical Statement

It is declared that scientific and ethical principles were complied with during the preparation of this study and all the works referred are mentioned in the bibliography.

Complaints

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Use of Artificial Intelligence

No artificial intelligence-based tools or applications were used in the preparation of this study. The entire content of the manuscript was produced by the authors in accordance with scientific research methods and academic ethical principles.

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Değerlendirme

Bu makale en az iki hakem tarafından çift taraflı kör hakemlik modeliyle incelendi. Benzerlik taraması yapılarak intihal içermediği teyit edildi.

Etik Beyan

Bu çalışmanın hazırlanma sürecinde bilimsel ve etik ilkelere uyulduğu ve yararlanılan tüm çalışmaların kaynakçada belirtildiği beyan olunur.

Etik Bildirim

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Figure 9: Pyramidal lead weights 1-12.

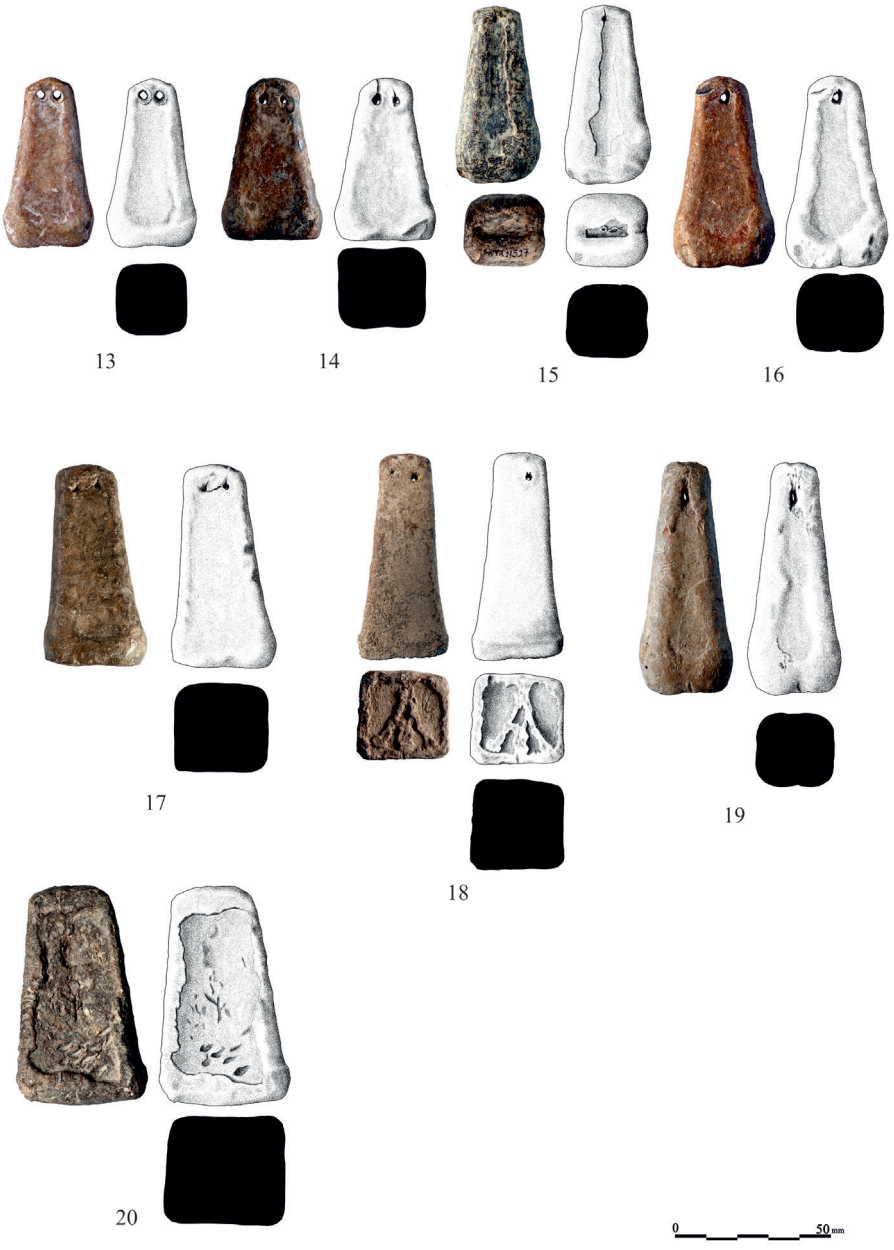

Figure 10: Pyramidal lead weights 13-20.

TABLE 1

Lead Weight Technical Specifications

Cat. No.[34]	Inv. Nr[35]	Context	Dimensions: height / base / top (mm)[36]	Weight (g)[37]	Stamp / Monogram	Suspension Hole	Description and Dating
1	İzmir Museum 20.622.	Metropolis 2000 (non-excavated find, donated by İ.E.)	30 / 13x12 / 6x6	20.7	a rosette stamp on the side near the base	one eye	The weight is whole. The bottom is blank. Roman Imperial period. For a photograph, see Fig. 9. 1.
2	İzmir Museum 20.621	Metropolis 2000 (non-excavated find, donated by İ.E.)	32 / 13x11.5 / 5x5	23	a rosette stamp on the side near the base	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 2.
3	İzmir Museum 19.617	Metropolis 1999 (non-excavated find, donated by İ.E.)	25 / 18 (diameter) / 9x7	33.52	a floral decoration with incised lines on the bottom surface	one eye	Conic-shaped weight is whole. Roman Imperial Period. For a photograph, see Fig. 9. 3.
4	İzmir Museum 12455 (Metropolis)	Commercial Agora 2022	31 / 18x15 / 11x9	50.5	a circular hollow on the bottom	one eye	The weight is whole. Roman Imperial Period. For a photograph, see Fig. 9. 4.
5	İzmir Museum 2023.215	Commercial Agora 2022	40 / 16.5x16.5 / 7x5.5	56	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 5.

34 Catalogue No
35 Inventory Number
36 Millimeter
37 Gram

6	İzmir Museum 20.620	Metropolis 2000 (non-excavated find, donated by İ.E.)	45 / 16x16 / 9x8	64	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 6.
7	İzmir Museum 20.623	Metropolis 2000 (non-excavated find, donated by İ.E.)	40.5 / 18x18 / 9x9	64.4	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 7.
8	Metropolis 11566	Theater 2018 (From surface, no context)	43 / 20x20 / 12x9	110.5	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 8.
9	İzmir Museum 17.500	Metropolis 1995 (non-excavated find, donated by İ.E.).	49 / 26x24 / 12x7	142.7	a monogram on the bottom which associated with the letter 'A'	one eye	The weight is whole. There is a monogram in relief at the bottom. Roman Imperial Period. For a photograph, see Fig. 9. 9.
10	İzmir Museum 24.340	Acropolis 2006	43 / 26x22 / 21x13	150.5	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 10.
11	İzmir Museum 22.448	Araplıtepe Church 2003	56 / 29x27 / 17x12	225.4	---	two eyes	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 11.

12	İzmir Museum 19.619	Metropolis 1999	57 / 29x28 / 15x9	230.6	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 9. 12.
13	İzmir Museum 12321 (Metropolis)	Commercial Agora 2022	54 / 30x30 / 17x17	232.4	---	two eyes	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 10. 13.
14	İzmir Museum 21.461	Stoa 1997	52 / 33x30 / 18x11	253.6	---	two eyes	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 10. 14.
15	İzmir Museum 2018.0301	Metropolis Environment 2018 (The Survey Project)	55 / 30x27 / 16x12	258	a hollow on the bottom surface without decoration	one eye	The weight is whole. Roman Imperial Period. For a photograph, see Fig. 10. 15.
16	İzmir Museum 22.448	Atrium House 2003	59 / 34x32 / 18x12	336.6	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 10. 16.
17	İzmir Museum 21.462	Theater 1997	68 / 32x31 / 19x14	342.5	---	two eyes	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 10. 17.

18	İzmir Museum 17.508	Acropolis 1994	69 / 32x31 / 19x11.5	352	a monogram on the bottom which associated with the letter "A"	two eyes	The weight is whole. Roman Imperial Period. For a photograph, see Fig. 10. 18.
19	İzmir Museum 23.257	Metropolis 2004	74 / 36x36 / 15x13	378.8	---	one eye	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 10. 19.
20	Metropolis 11712	Acropolis Cistern 2019	70 / 41x29 / 28x26	547.8	---	---	The weight is whole. The bottom is blank. Roman Imperial Period. For a photograph, see Fig. 10. 20.

Table 1: Lead weight technical specifications.