

Athenian Commercial Weights: A History of Museum Collections and a General Overview of the Corpus

Louise WILLOCX *

From the archaic period until the adoption of the Roman weight system in the 1st century BCE, Athenian weights form a consistent and unique set among ancient Greek commercial weights. On the one hand, they make up the most important corpus of ancient commercial weights with around eight hundred objects in several museum collections. On the other hand, unlike other Greek cities, the symbols on Athenian weights do not represent the *parasemon*, the city emblem of Athens, but refer to precise denominations. Using symbols in conjunction with denominations facilitates commercial transactions for the illiterate, making them more efficient and expedient.

I had the opportunity to study most of the Athenian weights kept in Greek and European museum collections and I am now able to present the development of the museum collections and offer a better overview of this vast corpus. However, before describing the history of the collections and outlining the corpus, I will quickly review the main characteristics of Athenian commercial weights.¹

* F.R.S.–FNRS Research Fellow (UCLouvain).

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¹ This paper focuses on Athenian commercial weights in lead and bronze. Stone weights and other types of weights are not taken into account.

1. The Athenian Weight System

The Athenian weight system is a complex structure organised around three reference measurements: the stater, the mina and the drachma. There are many denominations and, in addition, the weight system was regularly modified. The main symbols are, for the large denominations, the wheel (double stater or tetramina), the astragalus (one stater) and the dolphin (one mina). The amphora is usually related to one third of a stater, the half-amphora to one sixth of a stater and the quarter of an amphora to one twelfth of a stater. However, we know some half-minas equal an amphora and some quarters of a mina relate to a half-amphora. The shield represents one quarter of a stater. The tortoise stands for one sixth of a stater but in most cases for one quarter of a stater and the half-tortoise for one twelfth or one eighth of a stater. Finally, the crescent may refer to one quarter or one sixth, or even one eighth of a mina, whereas the half-crescent and the cornucopia represent one eighth of a mina.²

Symbol	Stater		Mina	
Four wheel spokes	2 Staters		4 Minas	
Astragalus	1 Stater		2 Minas	
(Bull's head) ³			2 Minas	
Dolphin	$\frac{1}{2}$ Stater		1 Mina	
Shield	$\frac{1}{4}$ Stater			
Amphora	$\frac{1}{3}$ Stater		$\frac{1}{2}$ Mina	
Half-amphora	$\frac{1}{6}$ Stater		$\frac{1}{4}$ Mina	
Quarter of an amphora	$\frac{1}{12}$ Stater		$\frac{1}{6}$ Mina	
Tortoise	$\frac{1}{4}$ Stater	$\frac{1}{6}$ Stater		
Half-tortoise	$\frac{1}{8}$ Stater	$\frac{1}{12}$ Stater		
(Quarter of a tortoise) ⁴		$\frac{1}{24}$ Stater		
Crescent			$\frac{1}{4}$ Mina	$\frac{1}{6}$ Mina
Half-crescent	$\frac{1}{16}$ Stater		$\frac{1}{8}$ Mina	
Cornucopia			$\frac{1}{8}$ Mina	

Tab. 1. Main Athenian symbols and denominations.

Some weights also have legends in relief or, more rarely, incised legends. There are two types of inscriptions. The first is an official mark guaranteeing the authen-

² This classification, based on the examination of hundreds of Athenian weights, is in broad agreement with Lang and Crosby (1964).

³ The bull's head is placed between brackets because this symbol is probably not Athenian. See discussion on p. 39.

⁴ The quarter of a tortoise is placed between brackets because of the low number of weights with this symbol. See the discussion on p. 40.

ticity of the weight. The most common legends are δῆμό(σιον) or δημό(σιον), “public”; or the inscription μετρο(νόμων) or ἀγορ(ανόμων), for “metronomoi” or “agoranomoi”, which are the name of magistrates in charge, inter alia, of weights and measures at the agora. The second common type of legend is the denomination of the weight (στατήρ, for “a stater”; τρίτη, for “one third of stater”). This kind of reference often duplicates the symbol and provides a way for us to link each symbol to its denomination [Tab. 1].

For five centuries, Athenian weights shared essentially the same characteristics and the same symbols and legends. However, despite this general uniformity, the symbols, legends, denominations and, above all, weight masses vary over time and therefore require special attention. These variations were caused by several metrological reforms.

Five significant changes in weight standards probably happened throughout the Classical and Hellenistic periods.⁵ Here is a possible development, following quite a regular pattern. During the 5th century BCE, the Athenian commercial mina⁶ weighed 100 drachmas (435 g), before rising to 105 drachmas (457 g) at the end of the 5th century BCE. The beginning of the Hellenistic period saw a new increase at 112 drachmas (489 g), and then maybe a commercial mina of 125 drachmas (544 g), but

⁵ However, there are differing views on the matter. Mabel Lang (Lang and Crosby 1964, p. 18–21) developed a first chronology of the Athenian weight standards. According to her, the 105 drachmas standard was introduced by Solon in the early 6th century BCE. Based on three bronze weights discovered at the Agora, she postulated the existence of a standard of 92 drachmas around 500 BCE for a short period before returning to the standard of 105 drachmas, which continued to increase gradually to a standard of 112 drachmas, or even 150 drachmas. At the end of the 5th century BCE, the old Solonian metrological standards, including the weight standard of 105 drachmas, were restored. Then the weight standards were further increased to 112, 126, 138, 150 and maybe 175 drachmas before the adoption of the Roman weight system. Konrad Hitzl (1996, p. 105–120) revised this chronology. He considers that a pre-monetary system called “Phidonian” with a mina of 60 drachmas preceded the Solonian standard of 105 drachmas established in the second half of the 6th century BCE until the 420s. From the end of the 5th century BCE, this standard was replaced by a standard of 110 drachmas which remained in force, with only a brief return to the standard of 105 drachmas in 403 BCE, until the 3rd century BCE. A standard of 138 drachmas was imposed from the 3rd century BCE to the second half of the 2nd century BCE. The time when the stater was discontinued as a reference unit in favour of the mina, coincided with the last change and the passage to a 150 drachmas standard which would end, at the same time as the Attic monetary issues with the sack of Athens by Sulla in 86 BCE. Recently, Charles Doyen (2012) proposed a complete revision of the evolution of Athenian weight standards which I follow in this paper.

⁶ It is important here to make a distinction between the so-called “monetary mina” and the so-called “commercial mina”. The standard of the first one does not change. The “monetary mina” always equals to 100 drachmas and weighs 435 g. But the weight of the commercial mina was obviously increased throughout the Classical and the Hellenistic periods, as we can see from the weights and their masses. It seems that the two standards were in use at the same time because they were not used for the same purpose. The monetary mina was the reference measurement for precious metals like gold, silver or for the coins. The commercial mina was the reference measurement for other metals like bronze or other goods sold by weight on the agora.

this standard is far less attested. Finally, the commercial mina weighed 138 drachmas (600 g) at the end of the 3rd century or the beginning of the 2nd century BCE and 150 (652 g) at the end of the 2nd century BCE.⁷

These changes are confirmed by the weights themselves (variation in design, symbols, legends and masses), but also by several literary and epigraphical sources. The *Athenaion Politeia* by the Pseudo-Aristotle (10.1–2) and a passage by Androtion (*FGrH* III 324, fr. 34) quoted in the *Life of Solon* by Plutarch, attribute to Solon the first metrological reform and the adoption of the 105 drachmas standard. The agoranomic decree *IG* II–III² 1013 attests the passage from a standard based on a mina weighing 138 drachmas to a standard based on a mina of 150 drachmas.

Such metrological reforms may stem from an economic or political crisis or could simply translate an adjustment need for greater commercial efficiency or metrological integration. It could also be related to the evolution of the ratio between bronze and silver. The reasons for these *standard* changes are still unclear and opinions differ within the scientific community. However, I will not linger on metrological reforms in this paper.⁸

2. The History of Athenian Weights in Museum Collections

For over a year, I have been conducting a thorough study of Athenian weights kept in museum and private collections. To this day, I have identified and examined over eight hundred Athenian commercial weights.⁹

The Numismatic Museum in Athens stores the most important collection of ancient weights, including 320 Athenian weights. The Ancient Agora Museum preserves the largest set of weights discovered in archaeological excavations in the 20th century, including 79 Athenian commercial weights. Then follow the British Museum in London and the National Museum in Warsaw with 86 and 80 Athenian weights each. 57 Athenian weights are kept in Boston at the Museum of Fine Arts, 23 weights at the Musée Saint-Raymond in Toulouse (France) and 21 weights at the National Museum of Denmark in Copenhagen. 34 Athenian weights were in the Antikensammlung in Berlin but most were lost during the Second World War. These are the main collections of Athenian weights. The remaining weights are kept in smaller groups, mainly in Greek and European museums, as well as in private collections.

⁷ I discuss elsewhere possible higher standards of 162.5 and 175 drachmas during the 1st century BCE (see Willocx 2020).

⁸ Such issues will be discussed in a future paper.

⁹ In this paper, only those weights identified with certainty as Athenian weights are considered. The weights (about 200) that have been lost and poorly documented have been deliberately cast aside, for example weights from the antiquities market in the 19th century, as well as those for which the Athenian attribution is less than certain.

Most of these museum collections, except for the Ancient Agora Museum and other smaller museums, were formed in the late 19th century with weights from the Athenian antiquities market. Therefore, it is worth examining the history of the collections in order to get a better understanding of their provenances and possibly to make connections between them.

The Numismatic Museum in Athens

Before being stored in the Numismatic Museum, most of the ancient and Byzantine weights belonged previously to the National Archaeological Museum of Athens and before that to the Archaeological Society of Athens.

The Archaeological Society of Athens was founded in 1837 by a group of scholars and politicians to assist the new Greek State in the protection, restoration and studies of Greek antiquities as well as to encourage excavations. The Society carried out several excavations in Athens and in Greece and founded many museums in Athens, which were later merged to form the National Archaeological Museum.¹⁰ The collections of the Archaeological Society came from excavations and private collections in Greece, and largely from donations and purchases done in Greece, especially in Athens.¹¹

Thanks to its inventories, we know that the Archaeological Society acquired 566 weights (125 bronze and 441 lead weights) between March 18, 1859 and December 1894. Every new acquisition received an inventory number. Concerning the weights, we must be careful because there were two registers, one for the bronze and one for the lead objects. The bronze are numbered from 1 to 1510 and the lead from 1 to 3257. Out of these 566 weights, Erich Pernice published 436 weights (89 bronze and 347 lead weights), mostly Athenian, in 1894. He probably visited the Archaeological Society in 1892. Several dozen of these weights had been mentioned in previous publications by Richard Schillbach (1865) and Michel C. Soutzo (1884).

In the 1890s, all the antiquities of the Archaeological Society moved to the new National Archaeological Museum, as well as various other collections in Athens and in Greece. Because of this transfer, the weights received new inventory numbers, mostly between 8453 and 8574 for bronze weights and between 8640 and 9394 for lead weights. The museum was also enriched with finds from all over Greece and from private collections, including some weights.

The size of the brand-new Archaeological Museum soon became inadequate to hold the ever increasing collections. Two extensions were added to the building at the beginning of the 20th century.¹² It is probably within this context that the former weights collection of the Archaeological Society along with the other weights

¹⁰ Website of the Archaeological Society of Athens <<https://www.archetai.gr/>> (accessed July 18, 2018).

¹¹ Ridder 1894, p. V.

¹² Andronicos 1975, p. 5.

acquired by the National Archaeological Museum, 751 objects in total, were transferred to the Numismatic Museum, which was then housed in the Academy of Athens.¹³ According to the Numismatic Museum's registers, the weight collection was transferred on June 30, 1912. Once again, the objects were given new inventory numbers by the director of the museum, Ioannis Svoronos.

These transfers between different institutions explain why most weights bear multiple tags and inventory numbers. Unfortunately, this situation led to many mistakes and confusion. Svoronos' inventory numbers are sometimes confused with Pernice's publication numbers. Some numbers were misread, interchanged or even read upside down. For a large part of the collection, Svoronos did a great work and indicated the corresponding numbers of the Archaeological Society, the National Museum and Pernice's publication. We must still be careful because Svoronos did some mistakes himself.

The Numismatic Museum of Athens probably houses the largest collection of ancient and Byzantine weights in the world. About 1050 weights in total are kept in its storage rooms. Most of the collection (751 weights) was acquired in 1912 when it was transferred from the National Archaeological Museum. In addition to this first acquisition, the University of Athens gave the Museum 71 weights found in Alexandria's harbour (Egypt) in 1917. In 1960, Jordan-Bassermann of Munich donated 151 weights to the Museum, mostly from Asia Minor and the Byzantine Empire, from the collection gathered by Dr. Mordtmann in Constantinople at the beginning of the 20th century.¹⁴ The remaining 71 odd weights come from different acquisitions, especially donations in the 1990s: Georgios Tsolozides in 1992, the heirs of Grigorios Empedoklis in 1994 and Adonis Kyrou in 1998 and 2005.¹⁵

In addition to the publications of some weights of the Archaeological Society of Athens by Schilbach (1865), Soutzo (1884) and Pernice (1894), 46 weights of the Numismatic Museum were published by David M. Robinson in 1941 in his book *Excavations at Olynthus*. Oğuz Tekin published 20 weights from Cyzicus in a paper in 2013. And Vivi Vasilopoulou wrote several papers mentioning 96 Byzantine weights in 1983, 38 and 22 Athenian weights in 1996 and 2001. The rest of the collection, mainly non-Athenian weights, remains unpublished.

The Ancient Agora of Athens

The weights collection of the Ancient Agora Museum is particularly interesting because, unlike most other weights in the corpus, these objects have known archaeological contexts.

¹³ Website of the Numismatic Museum <<https://www.nummus.gr>> (accessed July 18, 2018).

¹⁴ Varoucha-Christodouloupoulou 1962, p. 428.

¹⁵ See the paper given by Georgios Kakavas, Director of the Numismatic Museum, at the *Pondera Online: Second workshop* (Louvain-la-Neuve, 14–15 December 2017).

The agora was the heart of civic activity and public life in the ancient Athens. It was a hub of administrative, political, judicial, commercial, social, cultural, intellectual and religious activities. This large open square played an important role in all aspects of community life. Therefore, the objects and buildings located in this area are key channels to understand the ancient Athenian society.

The American School of Classical Studies has been excavating the Ancient Athenian Agora from 1931 upwards, in a series of yearly campaigns, with a hiatus during the Second World War. Theodore Leslie Shear was the first director of the excavations; he gathered around him many great archaeologists like Homer A. Thompson and Dorothy Burr (Thompson), Eugene Vanderpool, Benjamin D. Meritt, Virginia Grace, Lucy Talcott and John Travlos.

Archaeologists had known the general location of the agora since the 19th century because some of the monuments had never been fully buried. From the second half of the 19th century to the beginning of the 20th century, small excavations were undertaken.¹⁶ The Archaeological Society of Athens excavated the area around the Stoa of Attalos (1859–1862, 1874, 1898–1902), the Odeion with the Giants and Tritons (1859, 1874, 1912) and the West Side of the Agora (1907–1908). The German Archaeological Institute explored the area of the Temple of Hephaistos on the west side in the 1890s; they also explored the southern and southwestern areas. Finally, the public works for the extension of the railway on the north side of the area brought to light remains of buildings and sculpture, examined by both German and Greek archaeologists in 1890–1891.

However, the rest of the area was a residential district since the beginning of the 19th century and carrying out excavations would have required a lot of time and money to purchase and demolish the almost 400 houses. Therefore, the Greek parliament preferred not to undertake itself this project and gave permission to the American School of Classical Studies to carry out archaeological excavations. The agora excavations were largely funded by American individual donors and private foundations.¹⁷

Between 1953 and 1956, the American School undertook to rebuild the Stoa of Attalos to serve as a museum and workspace. At the same time, they restored the Church of the Holy Apostoles and they landscaped the site as an archaeological area.¹⁸ The thousands of objects found on the agora are stored in the Stoa of Attalos.

More than 165 weights were found during the American excavations of the Agora, half of which were certainly Athenian commercial weights. The majority were made of lead but some bronze and stone weights were also recorded. This is the largest set (79 objects) of Athenian weights found in an archaeological context.

¹⁶ The Athenian Agora 1954, p. 25.

¹⁷ Website of the Athenian Agora excavations <<https://www.agathe.gr>> (accessed July 24, 2018).

¹⁸ Website of the American School of Classical Studies at Athens <<https://www.ascsa.edu.gr>> (accessed July 24, 2018).

In addition to these, some 15 weights were brought to light on the Pnyx,¹⁹ at the Kerameikos²⁰ and on the site of the new Acropolis Museum.²¹ It is also worth mentioning the 10 Athenian weights found during underwater excavations in Thonis-Heracleion in Egypt²². As we do not know any archaeological context for the rest of the corpus, these collections are very important, particularly regarding chronological issues.

Most weights were found outside the square of the agora, on the southwestern area. This zone, between the Areopagus and the Hill of Nymphs has been identified as a residential and industrial district where several houses, commercial establishments and workshops, especially of bronze-workers, blacksmiths or marble-cutters were excavated.²³ Weights were also discovered in various places on the agora, near the Tholos, around the Middle and the South Stoa, near the Stoa of Zeus Eleutherios or the Stoa of Attalos; others were found at the foot of the Areopagus or the Acropolis.

The largest part of the collection (153 weights) was published by Mabel Lang and Margaret Crosby in 1964. Some weights were also mentioned in the annual excavation reports published in *Hesperia*.²⁴

The British Museum in London

Among the 440 ancient weights in the British Museum in London, 86 are Athenian. The weights collection of the British Museum is the result of donations, bequests and purchases from various collectors, mainly in the second half of the 19th century.²⁵ I will presently describe the four main donators of Athenian weights.

Some of the Athenian weights come from the private collection of Louis, Duke of Blacas d'Aulps (1815–1868). Louis de Blacas d'Aulps was a French nobleman and an antiquarian like his father, Pierre-Louis de Blacas d'Aulps.²⁶ He inherited and greatly enriched his father's collection of antiquities. He was particularly interested

¹⁹ Davidson and Burr Thompson 1943, p. 28–29.

²⁰ Knigge 2005.

²¹ Eleutheratou 2006, p. 40.

²² van der Wilt 2015, p. 161–172.

²³ Athenian Agora 1954, p. 83.

²⁴ Shear 1933, p. 473; 1935, p. 347; 1938, p. 362 and 1940, p. 306–307; Meritt 1934, p. 53, no. 40; Crosby 1949, p. 109 and 112; Camp and Kroll 2001, p. 148–149; Rotroff and Ntinou 2013, p. 106–107, 128, and 137.

²⁵ For more information on the various donors and private collectors who have enriched the museum's collection, see the "bibliographical details" page of each character on the British Museum website <<https://www.britishmuseum.org>> (accessed July 23, 2018).

²⁶ Edwards 1870, p. 689–691.

in coins and gems. In 1866, as the French government refused to pay for its acquisition, his heirs sold his collection to the British Museum.²⁷

Another third of the Athenian weights was previously owned by Thomas Burgon (1787–1858), a merchant and antiquities enthusiast. While he was travelling in Greece and Turkey, he collected many Greek artifacts. When his business failed about 1841, he became a member of the coin department at the British Museum.²⁸ He offered his collection to the museum in 1842 and he created watercolour paintings of his collection, which are now kept at the Ashmolean Museum.²⁹

Charles Merlin (1821–1896) was a British collector and dealer in antiquities. He spent the majority of his life in Athens. In 1839, he became clerk and administrator at the British Consulate of continental Greece at Piraeus. Then, in 1846, he became Vice-Consul and at the same time agent for the Ionian bank, a British institution established in the Ionian Islands. In 1865, he was appointed Manager of the Athens branch of the Ionian bank and, in 1868, he was promoted to the consulship at Piraeus. Throughout his diplomatic career, Merlin provided the British Museum with antiquities and played a significant role in the sourcing and trafficking of antiquities from Athens to London. He was not particularly interested in antiquities; his main motivations were his “patriotic duty”, financial needs and participating in an activity recognized among his peers. More than 450 objects in the British Museum were purchased from Merlin over a period of 30 years (1865–1892). As member of the Archaeological Society of Athens, he also donated a few objects to the Society Museum. However, the vast majority of the objects that he purchased from Athenian collectors and dealers were sent to the British Museum or sold on the London art market.³⁰

We know very little about James Woodhouse. This British merchant and collector acquired various antiquities and coins while he was staying in South Italy and in Corfou. He bequeathed his collection to the British Museum in 1866, including 8 Athenian weights.³¹

In 1868, Alexander S. Murray published 147 weights from the British Museum, 80 of which were Athenian weights. About 30 of them have already been published by Frederic W. Madden in 1864 and by Schillbach in 1865. Murray’s catalogue was reissued by Soutzo in 1884 and Pernice in 1894. In 1899, Henry B. Walters published 35 ancient weights in the catalogue of the Greek, Roman and Etruscan bronzes of the British Museum. More recently, in 2008, Christopher Entwistle has achieved a catalogue of the Late Roman and Byzantine weights of the British Museum.

²⁷ Dawson and Uphill 1972, p. 29.

²⁸ *Ibid.*, p. 48.

²⁹ Website of the Burgon Archive Project <<https://legacy.ashmolean.org/>> (accessed July 23, 2018).

³⁰ Galanakis 2012.

³¹ Edwards 1870, p. 702–705.

The National Museum in Warsaw

The National Museum in Warsaw preserves a collection of 176 ancient and Byzantine weights that include 80 Athenian weights. For the most part, the weights belonged to the Czartoryski Collection, acquired by the National Museum in 1956.

The Czartoryski were one of the most powerful aristocratic families in Poland. Its members have been closely involved in the defence of the Polish nation, which had endured many invasions, especially by the Russians, the Prussians and the Austrians, and lost its independence at the end of the 18th century. Princess Izabela Czartoryska (1746–1835) was the first family member to be enthused about collecting historical and artistic objects. She created a museum in Puławy, a “Temple of Memory” for rescuing art treasures that belonged to the fatherland. Withdrawn from political life, her husband, Adam Kazimierz Czartoryski (1734–1823), bibliophile, developed a large collection of books.³² However, in the 1830s and 1840s, the political situation in Poland deteriorated because of new uprisings against Russians and the repressions that followed. Having dispersed and hidden the collections in Poland, Prince Adam Jerzy (1770–1861), the eldest son of Adam Kazimierz and Izabela Czartoryska, decided to move the collections to Paris in 1849 and in 1856, in the recently acquired family residence, the Hôtel Lambert.³³

The Czartoryski family in exile in Paris resumed its political and cultural activities. Prince Adam Jerzy was very busy with his political and diplomatic duties, reminding Western governments about the Polish question. Nevertheless, his children, Prince Władysław Czartoryski (1828–1894) and Princess Izabela Działyńska (1830–1899), followed in the steps of their grandmother and enlarged the Puławy collection. They made many common purchases, they participated in important auctions in the major European capitals and were clients of the leading antique dealers.

But Prince Władysław wished to create a large and permanent museum in line with the Puławy tradition in order to serve the Polish nation. To achieve this, and because the objects were no longer safe in Paris at that time, he decided to transfer the collections to Poland. In 1874, the City Council of Cracow granted him some municipal buildings where he founded his new museum. In 1876, Prince Władysław ordered all family collections dispersed throughout Poland and abroad to be gathered in Cracow.³⁴

Before leaving Paris, the brother and sister divided up their shared collection. Princess Izabela Działyńska restored the castle of Gołuchów, south of Poznań, and converted it into a magnificent museum. The Princess’ collection was transferred to Poland before 1880. The antiquities did not constitute the main part of her collection but a valuable part. In addition to the Greek vases she had received from her husband,

³² Rostworowski 1978, p. 6–9.

³³ *Ibid.*, p. 19–21.

³⁴ *Ibid.*, p. 23–26.

Jan Działyński (1829–1880), Izabela Działyńska purchased many objects from antiquarians, notably the Parisian Henri Hoffmann, between 1852 and 1899. She was in contact with several French scholars who advised her in her selections, especially Wilhelm Froehner (1834–1925), who published the Gołuchów collection of antiquities in 1899.³⁵ After her death, the Czartoryski family continued her work with some new acquisitions and the Gołuchów castle became a public museum.

During the Second World War, the most precious part of the collection was housed in the Warsaw National Museum, created in 1915 on the foundations of the Fine Arts Museum built in 1862. Unfortunately, the Germans devastated and plundered the museum and transferred some objects to the Reich, from where they were taken by the Russians at the end of the war and moved to the Soviet Union. Most of the artworks returned to Poland in 1956 to the National Museum in Warsaw, but not to Gołuchów castle. The minor objects which had remained in Gołuchów during the war had already been incorporated into the National Museum collection in 1948. A few objects stayed in the castle, which became a branch of the Poznań Museum.³⁶

Thanks to the integration of the former German collections and to the nationalization of the Polish private collections, the collection of antiquities of the National Museum was significantly augmented.³⁷ Throughout the 20th century, the National Museum made new acquisitions and received donations and bequests.

The great majority of the Athenian weights of the National Museum in Warsaw belonged to the Czartoryski collection in Gołuchów and were probably acquired by Princess Izabela in Paris and in other European capitals in the second half of the 19th century. Of the 176 weights of the National Museum in Warsaw, 129 were published by Wanda Zdrojewska in a series of papers between 1974 and 1990.³⁸ 107 weights had already been mentioned by Froehner in his Catalogue of the Czartoryski Collection in Gołuchów in 1899. The unpublished weights are for the most part non-Athenian weights.

The Museum of Fine Arts in Boston

All 82 weights in the Museum of Fine Arts collection were acquired by the art collector Edward Perry Warren.

Edward Perry Warren (1860–1928) came from a wealthy Bostonian family who contributed to the enrichment of the collections of the Museum of Fine Arts with several gifts. His father and his brother, both named Samuel Dennis Warren, were Trustees of the Museum. In 1888, Warren moved to England where he spent most

³⁵ Froehner 1899, p. 187–192.

³⁶ Łajtar and Twardecki 2003, p. 10–11.

³⁷ *Ibid.*, p. 5–6.

³⁸ Zdrojewska 1977, p. 75–98; 1978 p. 11–42; 1979, p. 91–114; 1980, p. 123–143; 1981, p. 133–170; 1982, p. 155–168; 1986, p. 30–40; 1987, p. 239–262; 1988, p. 25–62, 63–79; 1989–1990, p. 101–112, 113–126.

of his life. With his friend and archaeologist John Marshall, he travelled throughout Europe to visit private collections and participate in auctions; they were particularly interested in Classical antiquities.³⁹ Many of the objects he collected are now part of the Museum of Fine Arts collection.

Between 1895 and 1904, the Department of Classical Archaeology of the Museum of Fine Arts, which was founded in 1887, enjoyed its golden age, mostly because Warren devoted much time to the acquisition of antiquities in Europe and offered them for purchase to the Trustees of the Museum. With limited funds in the beginning, between 1870 and 1890, the Museum of Fine Arts received in the 1890s several large endowments, some restricted to the purchase of Classical antiquities, including the Henry Lillie Pierce Found (1898) that enabled the acquisition of the collection of weights.⁴⁰ Within ten years, the Department added over 4,000 objects to its collection, mainly through purchases. In addition to these favorable circumstances, this process was also encouraged by the Curator in Classical Archaeology, Edward Robinson (1858–1931), who had placed a high priority on the acquisition of works of art.⁴¹

Over half the weights, including 31 Athenian weights, were acquired by Warren in the Helbing auction of May 1899 in Munich. The auction catalogue mentions a collection of 46 lead weights.⁴² The same collection was already on sale two years earlier and was part of the auction catalogue of October 1897.⁴³ This collection belonged to Philippos Margaritis (1810–1892), a Greek painter and photographer, teacher at the Fine Arts School in Athens. The other 36 weights, including 26 Athenian, were also acquired by Warren from unknown sources. Then, all these weights were purchased by the Museum of Fine Arts from Warren in 1901; the Curator Robinson mentioned the acquisition of 80 weights in the annual report of the same year.⁴⁴

Coins and Medals Department of the Musée Saint-Raymond in Toulouse

All the ancient weights of the Musée Saint Raymond previously belonged to Edward Barry (1809–1879), professor of archaeology and history at the University of Toulouse. Barry was also an avid collector of antiquities, Etruscan figurines and vases, bronzes and terracotta figurines. In 1848, he started to build a collection of weights, which he called “le musée des poids et mesures”, mainly consisting of medieval and modern weights. He acquired several ancient weights to serve as an introduction to the rest of his collection. After his death, the city of Toulouse purchased part of his

³⁹ Whitehill 1970, p. 142–144.

⁴⁰ Vermeule and Comstock 1972, p. 1–2.

⁴¹ *Handbook of the Museum of Fine Arts* 1946, p. 31.

⁴² Auction Helbing 1899, p. 23.

⁴³ Auction Helbing 1897, p. 31–32.

⁴⁴ Robinson 1902, p. 28 and 38.

collection, including the ancient weights, after 1889, probably in 1890. Another part of the Barry collection, including Etruscan figurines, are now in the Louvre Museum.⁴⁵

Of the 28 ancient weights, 23 are Athenian. Whilst their provenance is unknown, they were probably bought in Athens, according to the mention in the inventory. They were all published in 1993 by Michel Amandry.

The Coins, Medals and Antiquities Department of the French National Library
Of the 470 weights in the Coins, Medals and Antiquities Department of the French National Library, half are ancient Greek and Roman and the other half are Byzantine weights. Among the first, 23 are clearly identified as Athenian weights.

11 of them belonged to Wilhelm Froehner (1834–1925) who bequeathed his collection of Greek, Roman, Byzantine and Egyptian antiquities (about 3450 objects) to the Coins and Medals Cabinet in 1925.⁴⁶ This German scholar, naturalized French by Napoleon III, was passionate about books and numismatics. Throughout his life, he had gathered a host of small objects (weights, tesserae, seals, figurines, amphora stamps, ostraka, rings, fibulae, engraved stones, tablets, mirrors, amulets, glassware, etc.) which were mostly inscribed. He became attached to the Louvre Museum in 1862, was appointed Deputy Curator in 1867 and Curator of Art Objects and Imperial Palaces in 1870. But after Sedan's defeat, he was accused of treason and imprisoned for several days. He spent the rest of his life mainly teaching German courses and writing sales and collection catalogues for merchants, such as Hoffmann, or private individuals, such as Princess Izabela Działowska.⁴⁷

The others weights were also part of private collections, either purchased or donated in the 19th century to the French National Library, such as that of Count Auguste-Arthur Beugnot (1797–1865), French historian and statesman, that of the associate booksellers and public sales experts Émile Paul and L. Guillemin, or that of Honoré d'Albert, Duke of Luynes (1802–1867), rich aristocrat, benefactor, numismatist and archaeologist. At the beginning of the 19th century, we know that the Coins, Medals and Antiquities Department had a special relationship with James Millingen (1774–1845), an Anglo-Dutch archaeologist, who sold or traded several antiquities with the museum curators.⁴⁸ James Millingen is also mentioned in the inventories of the British Museum as a dealer in antiquities. Two or three Athenian weights of the British Museum were acquired from Millingen.

At the end of the 19th century, at least one Athenian weight was part of the Hoffmann's sale in 1891. Henri Hoffmann (1823–1897) was a numismatist and collector, German-born naturalized French. Famous for his practical knowledge, flair, and sound judgment, he was in charge of several antique sales, including his collection,

⁴⁵ Amandry 1993, p. 133.

⁴⁶ Dieudonné and Feuardent 1926, p. 237–239.

⁴⁷ See p. 33.

⁴⁸ Sarmant 1994, p. 251.

and published illustrated catalogues.⁴⁹ Princess Isabela Działyńska also bought several antiquities from him.⁵⁰

9 Athenian weights of the Coin Cabinet are already mentioned by Ernest Babelon and Jules Adrien Blanchet in their catalogue of the antique bronzes of the National Library of France in 1895;⁵¹ the others, especially the Froehner Collection, are unpublished.

The National Museum of Denmark

According to its inventory, most of the 62 ancient and Byzantine weights, including 21 Athenian weights, of the National Museum of Denmark were acquired in the 1870s. The great majority of the Athenian weights were bought in Athens by Theodor von Heldreich, then Director of the Athens Botanic Gardens. He sold them to the Antiksamlingen of the Kunstmuseet which became the Nationalmuseet in 1892. All the Athenian weights are unpublished.

The Antikensammlung of Berlin

The Antiquities collection in Berlin is spread over three museum buildings: the Altes Museum, which opened in 1830, the Neues Museum, which opened in 1855, and the Pergamonmuseum, which opened in 1930.

In the early 20th century, about 270 ancient weights, including 34 Athenian weights, were part of the Antikensammlung. Unfortunately, half of them have been lost or destroyed at the end of the Second World War. Like most part of the museum collections, the bronze collection had been removed for safekeeping to the Flakbunker in Berlin-Friedrichshain. But the building caught fire in May 1945 and hundreds of objects were seriously damaged. Then, the Soviets stole and brought back to Moscow or Leningrad a vast number of antiquities and masterpieces. Around one-and-a-half million works of art were returned in 1958 to the German Democratic Republic.⁵² It was not until 1995, after the political reunification in 1989, that the Antikensammlung was made whole again. Today, about two-thirds of the former bronze collection has been identified and returned to Berlin; the remaining third includes missing or suspected destroyed pieces, the bronzes still kept in Russia and the loans to other museum departments or to several German museums. Almost all the Athenian weights are in the final third among the missing and possibly destroyed pieces. Of the 34 Athenian weights recorded by the Database of Antike Bronzen,⁵³ only one still exist today; the others are missing.

⁴⁹ Bordeaux and S. 1897, p. XXXIII–XXXV, 226.

⁵⁰ See p. 32–33.

⁵¹ Babelon and Blanchet 1895, p. 674–677.

⁵² Website of the Staatliche Museen zu Berlin <<https://www.smb.museum/>> (accessed August 9, 2018).

⁵³ Website of the Database of Antike Bronzen in Berlin <<http://antike-bronzen.smb.museum/>> (accessed August 9, 2018).

Most of them were acquired in the 1870s via several trade merchants and collectors, among others Paul Lambros, Theodor von Heldreich and Charles Merlin. The Greek numismatist and art dealer Paul Lambros (1820–1877) also sold some weights to the Numismatic Museum. We know from Pernice that he had quite an important collection of ancient weights. I already mentioned Theodor von Heldreich who sold many weights to the National Museum of Denmark⁵⁴. And Charles Merlin is also a well-known collector and art dealer who sold several weights to the British Museum, as stated above.⁵⁵

Almost all the Athenian weights of the Antikensammlung were published by Pernice in 1894; 19 were already mentioned by Schillbach in 1865 and in 1877, 6 by Carl Friederichs in 1871 in his catalogue of the antique bronzes of the Altes Museum,⁵⁶ and 14 by Soutzo in 1884.

The Antiquities Trade

It is worth noticing that quite an important number of Athenian weights are potentially still preserved in private collections. At the end of the 19th century, Pernice mentioned over one hundred Athenian weights in the hands of a private collector or seen on the antiquities market. Throughout the 20th century, some Athenian weights were sometimes mentioned in auction catalogues. The most important sale of Athenian weights was the Hirsch auction of 1909 with about 50 weights.⁵⁷

Research opportunities

This journey through the history of the museum collections of Athenian weights is interesting in several respects. Above all, it provides a better understanding of how the collections were organized within each museum. Then, it shows that it was mainly in the 19th century, and particularly in the second half of this century, that museums acquired antique weights. This should not come as a surprise given the favourable context for the growing antiquities market in Athens at that time, linked to the major works of the city's urbanization and the development of archaeological excavations. Finally, this research reveals the crucial role played by private collectors and dealers. These figures sometimes gave or sold their collections not only to one, but to several European museums.

Further research on the archival data of museums and the various private actors will undoubtedly help us reconstruct the original state of these private collections and, hopefully, go further back in time to identify the provenance of the objects and collect clues about their findspot.

⁵⁴ See p. 36.

⁵⁵ See p. 31.

⁵⁶ Friederichs 1871, p. 202–203.

⁵⁷ Auction Hirsch 1909, p. 246–248.

3. Overview of the Corpus of Athenian Weights and Initial Observations

The majority of the identified Athenian weights, i. e. almost 600 objects out of 800, bear one of the well-known symbols. About 200 weights without symbols can also be attributed to Athens thanks to other characteristics like inscriptions, countermarks, archaeological context and formal features. Among the latter, the “drachma” weights form the vast majority. They are easily identified from their inscription that refers to their denomination.

I have carried out a first analysis of my corpus, which includes statistical data and has led to a number of observations. In particular, I looked at the symbols and compared them according to different parameters: the number of attestations of each symbol, the type of legend (denomination or authority) accompanying each symbol and its frequency, and the different associations between symbols and denominations. All this information is combined in a single table, which makes it easier to compare the symbols according to different criteria [Tab. 2a–b].

First, I observed significant differences in the number of attestations of each symbol. The most frequent symbol is the half-tortoise: to date we have 93 weights of this kind. Then follow the amphota (82 weights), the tortoise (79 weights), the dolphin (70 weights) and the half-amphora (69 weights). The crescent and the half-crescent are also quite common on Athenian weights with respectively 66 and 55 weights. The astragalus is less frequently found: only 32 weights. There are also 19 weights with a quarter of an amphora, 17 with four wheel spokes and 12 with a shield. Finally, regarding the rarest attestations, I have only identified a few weights bearing a cornucopia (5), a bull’s head (3) and a quarter of a tortoise (2).

I have noticed the same phenomenon for the “drachma weights” with an over-representation of some denominations compared to others. The weights of four drachmas (FFFF) are by far the most common. I am also aware of many weights of eight (ΓFFFF or H), five (Γ or FFFFF) or two drachmas (FF or B). Several other denomination are attested: 33 drachmas 2 obols (ΔΔΔFFFI), 25 drachmas (ΔΔΓ), 20 drachmas (ΔΔ), 16 drachmas (ΔΓF), 12 drachmas (ΔFF), 10 drachmas (Δ), 6 drachmas (ΓF), 3 drachmas (FFF or Γ), 2 drachmas 1 obol (FFI), 1 drachma 3 obols (FIII), 1 drachma (F or A), 4 obols (IIII or ····), 3 obols (III or ···), and 2 obols (··).

Then, I analysed the type of legend (denomination or authority) on the weights and their frequency. Indeed, some symbols are often accompanied by the mention δῆμό(σιον), while others carry a legend referring to their denomination. Finally, some symbols frequently lack a legend. I also examined the correspondence between symbols and legends and wondered whether it could enlighten the relationship between symbols and denominations. Typically, two cases emerge: on the one hand, some symbols always seem to tag the same denomination, usually the largest denominations; and, on the other hand, almost all symbols associated with the smallest denominations seem to have undergone changes.

The symbol of the four wheel spokes is usually accompanied by the authority legend δῆμό(σιον) (13 out of 17). But on 3 weights the legend indicates the denomination of this symbol: one weight is inscribed with διστ(άτερον) for two staters, one with τετράμνω and the last one with TM TM for τετράμνω (four minas). The symbol does not seem to have changed its denomination,⁵⁸ as for the astragalus, which often bears (17 out of 32 weights) the denomination legend στατήρ, sometimes abbreviated, for one stater, or, in two cases, δίμν(ον) for two minas. However, there are some examples of much lighter weights with the symbol of the astragalus. But none of them bear any inscription and it is difficult to identify them for sure as Athenian weights.

It is also difficult to determine if the symbol of the bull's head is really Athenian. The number of weights with this symbol is relatively low, none of the weights with a bull's head have been found in an archaeological context and, with the exception of 3 weights with the legend δίμνουν for two minas, the weights with a bull's head have quite different masses and legends.

The vast majority of the "dolphin weights" (44 out of 70) bear the legend μνᾶ and represent one Athenian mina; a few bear the corresponding denomination legend ἡἔ(μιστάτερον) for half a stater.

Finally, the symbol of the shield is also a stable one. Only 3 out of 12 bear a legend indicating the denomination of one quarter of a stater: τετάρτε, abbreviated or not. However, all the other weights seem to correspond to the same denomination with their masses.

Therefore, the greatest denominations seem to have kept the same symbol and denomination throughout the Classical and Hellenistic periods. The same does not apply to smaller denominations.

Over half the weights with an amphora are accompanied by the denomination legend τρίτη, sometimes abbreviated, for one third of a stater. Over half the weights with a half-amphora usually bear the legend ἡμίτριτον, sometimes abbreviated, for one sixth of a stater. Finally, half of the weights with a quarter of an amphora have the legend ἡμισσημίτριτ(ον), sometimes abbreviated, for one twelfth of a stater, or, in one case, the legend ἑκτη(μόριον) for the corresponding one sixth of a mina. However, at least 12 weights bear other denominations. 8 amphoras are inscribed with the legend ἡμιμν(αῖον) or ἡμι(μναῖον) for half a mina and 4 half-amphoras the legend τέταρτον or ταρτημόρ(ι)ον for one quarter of a mina. Interestingly, the authority legend δῆμό(σιον) or δημό(σιον) appears on more than one third of the weights marked by a half-amphora. As for the astragalus, the amphora is a symbol represented on

⁵⁸ A unique piece may contradict this statement. Next to a weight with the four wheel spokes symbol whose mass actually corresponds to 2 staters, another four wheel spokes weight was discovered at Thonis-Heracleion in Egypt. This weight is 1 kg heavier (2920 g) than the first one (1920 g) and would therefore seem to correspond to a weight of 3 staters.

lighter weights in low proportions, without possibility of determining with certainty if these weights are Athenian or not.

The symbols of the tortoise and the half-tortoise have also undergone changes in their denominations. Out of 79 weights, over 24 weights with a tortoise refer certainly to one quarter of a stater with the legend τετάρτη, sometimes abbreviated. And one third of the weights representing a half-tortoise bear the legend ἡμιτέταρτον, sometimes abbreviated, for one eighth of a stater. However, 2 weights with a tortoise (or a sea-turtle?) bear the denomination legend *hēμίτρικτον* or the abbreviation *hēμί(τρικτον)* for one sixth of a stater, and there are also 2 exemplars of “half-tortoise weights” with the legend ἡμισυημίτρ(ικτον) for one twelfth of a stater. The symbol of a quarter of a tortoise raises an issue: I only know two examples of this type, both without inscription and kept at the Numismatic Museum. Their masses seem to correspond to one twenty-fourth of a stater or one twelfth of a mina. It is worth mentioning that the authority legend δξμό(σιον) or δημό(σιον) appears on more than one third of the weights with a half-tortoise and that over 35 “tortoise” weights do not bear a readable inscription or are not inscribed at all.

The denomination legends on the weights with a crescent are often difficult to read. Yet, I have clearly identified one (maybe two) “crescent weight” with the inscription τετάρτη for one quarter of a mina and at least 5 weights with another denomination legend: ξξημ(όριον) for one sixth of a mina. The authority legend δξμό(σιον) or δημό(σιον) is more frequent and appears on one third of the weights with a crescent and over half of these weights are not inscribed. As for the crescent, very few weights with a half-crescent bear a denomination legend: 6 are inscribed: ὄγδοον for one eighth of a mina and 2 ἡμισυημ[ι]τέτ(αρτον) or ἡμισ(υημιτέταρτον) for the equivalent one sixteenth of a stater. I should also mention the 2 weights with drachma signs referring to 12 drachmas or to 13 drachmas $\frac{3}{4}$ obol. 11 weights bear the authority legend δξμό(σιον) or δημό(σιον) but, out of 55 weights, 36 are not inscribed at all.

Finally, the 5 known weights with a cornucopia are accompanied by the legend ὀκδοον for one eighth of a mina.

Some other weights bear an Athenian symbol like an owl but their masses are all very different from each other. They probably do not represent a particular denomination and their function is unclear.

It is worth mentioning that the “drachma weights” are for the largest part lighter than the theoretical weight corresponding to their denominations. The changes in standards do not seem to have much affected the drachma standard. The drachma standard probably remained unchanged, one drachma equal to 4.35 g.

4. Conclusion and Research Opportunities

This general overview of the history of museum collections singles out some important issues. As mentioned earlier, research in museum archives provides information about the circumstances surrounding the acquisition of objects. It appears that a large number of the weights in these museum collections were gathered in the 19th century, with the help of some well-known private collectors and dealers. However, much remains to be discovered particularly about the links between private actors and museums and about the exact provenance of the objects.

This first analysis of the corpus of Athenian weights has also allowed me to be better acquainted with the material and highlight some notable features and differences between the symbols. For example, some symbols, like the dolphin or the amphora, are often accompanied by a legend referring to their denomination, while others, the half-tortoise or the wheel, often bear a reference to authority. The different legends associated with the same symbol inform us about the denomination changes that accompany the evolution of the weight standards. There may also be significant variations in the number of attestations for each symbol.

This data will allow me in a second phase to refine the chronology of these weights. To do this, I will build, on the one hand, on a precise typology of the weights and symbols and, on the other hand, on data from known archaeological contexts. A typological analysis and a revised chronology will certainly help us better understand the evolution of weight standards during the Classical and Hellenistic periods.

Appendix

Symbol	Attestations	Denomination	Legend
Four wheel spokes	17	3 Staters	
		2 Staters	διστ(άτερον)
		4 Minas	τετράμνω
Astragalus	32	1 Stater	στατήρ
		2 Minas	δύμν(ουν)
(Bull's head)	3	2 Minas	δύμνουν
Dolphin	70	½ Stater	ἕμιστάτερον
		1 Mina	μνᾶ
Shield	12	¼ Stater	τετάρτε
Amphora	82	⅓ Stater	τρίτη
		½ Mina	ἡμιμναῖ(ον)
Half-amphora	69	⅓ Stater	ἡμίτριτον
		¼ Mina	τέταρ(τον)
Quarter of an amphora	19	⅓ Stater	ἡμισυημίτριτ(ον)
		⅓ Mina	ἕκτη(μόριον)
Tortoise	79	⅓ Stater	ἕμίτριτον
		¼ Stater	τετάρτη/τέταρτον
Half-tortoise	93	⅓ Stater	ἡμισυημίτρ(ιτον)
		⅓ Stater	ἡμιτέταρτον
(Quarter of a tortoise)	2	⅓ Stater	
Crescent	66	¼ Mina	τετάρτη
		⅓ Mina	ἕξημ(όριον)
		Other denominations	
Half-crescent	55	⅓ Stater	ἡμισυημιτέτ(αρτον)
		⅓ Mina	ὄγδοον
Cornucopia	5	⅓ Mina	ὄκδοον

Tab. 2a. Symbols, legends and denominations on Athenian weights and their frequencies.

Weights with denomination	Weights with authority	Weights with denomination and authority	Uninscribed or illegible
	1		
1			
2	12		1
16	9	1	4
2			
2		1	
3		2	
39	8	5	13
2	1	1	8
42	18	2	12
3		5	
29	13	10	13
3		1	
7	3		8
1			
2	1		20
24	17		15
2	2		18
26	30	8	7
			2
2	1		8
1	18	5	23
4			4
2			
6	11		36
5			

Tab. 2b. Symbols, legends and denominations on Athenian weights and their frequencies.

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