

ISTITUTO ITALIANO DI NUMISMATICA

WEIGHTS IN CONTEXT

**BRONZE AGE WEIGHING SYSTEMS OF EASTERN MEDITERRANEAN
CHRONOLOGY, TYPOLOGY, MATERIAL AND ARCHAEOLOGICAL CONTEXTS**

PROCEEDINGS OF THE INTERNATIONAL COLLOQUIUM
Rome 22nd-24th November 2004

(ESTRATTO)

STUDI E MATERIALI - 13

ROMA 2006

STONE BALANCE WEIGHTS? THE EVIDENCE FROM AKROTIRI ON THERA

Introduction

In the Aegean sea, on the island of Thera, one of the southern Cyclades, today more often called Santorini, in a site near the village of Akrotiri, a flourishing settlement was excavated by the late professor Spyridon Marinatos; it was destroyed by material ejected by a volcano. This volcanic deposit also preserved the multistoried houses and their equipment, whence the title: *Thera, Pompei of the ancient Aegean*, of the book written by the director of the excavations, Christos Doumas.¹ There is no agreement on the absolute date of the volcano's eruption, but luckily there is an agreement on the relative date of the final destruction of the Akrotiri site, to the effect that it is to be placed within the New Palace period in Minoan Crete: the settlement was abandoned during the Late Minoan IA, at some time before the Late Minoan IB style on pottery had developed in Crete.

I. The balance weights

To this period belong the contents of the buildings packed by the ash and pumice that sealed the ruins. Among them is a great number of lead discoid artefacts identified as balance weights by the excavator Marinatos, on the basis of previous discoveries of similar lead or stone discs in other Aegean sites.

Balance weights from the Aegean were first systematically

¹ DOUMAS 1983.

gathered by Karl Petruso in his Ph.D. in 1978.² His aim was to publish the balance weights from Keos, another Cycladic island, to which John Caskey has assigned a unit of 65.5 grams; Petruso also devoted a whole chapter to the weights from Akrotiri.³

Before advancing to the particular aim of this paper, which is to present stone artefacts some of them defined as balance weights and others as *mere candidates* for this function, let us consider first the contextual information on the discs of lead whose primary use as balance weights is definitely agreed on. One or two have been found almost in every building⁴ and, luckily, sometimes whole groups coming from the same house have been found, sometimes even from the same room, as is the case of the West House where 26 discs were found in the cellar of the upper floor; this is the largest collection found so far, which also contains the heaviest weights, their present weight masses varying from 5 and a half kilos to 11 grams – if we take to account only the integer samples. This group also incorporates a lead weight of 3 kilos which recalls the unit LANA for the records of wool in the Linear B tablets.⁵ In this house a great number of loom – weights were also found in the largest room of the upper floor with a central column, so it was considered most probable that this set of balance weights was used for weighing wool in the textiles – producing workshop housed in this very room.⁶ There was another concentration of seven weights in room Delta 1 of the House 1 of Complex Delta, a ground floor storeroom where later also a pair of bronze pans of a balance were found inside a pithos, while two more weights are recorded from another room of the same house, the room Delta 9. Lead weights were also found in the other houses of the same complex.⁷ The heaviest balance weight of the Aegean was found in

² PETRUSO 1978.

³ PETRUSO 1978; 1992; CASKEY 1969.

⁴ For a general plan of the excavated site, see DOUMAS 1983: 46–47; PALYVOU 1990: fig. 3, or more recently in the volumes of *Ergon* of the Archaeological Society at Athens.

⁵ Cf. MICHAÏLIDOU 1990, with relevant citations.

⁶ TZACHILI 1990; MICHAÏLIDOU 1990.

⁷ For the layout of the four houses of Complex Delta: MICHAÏLIDOU 2001a: fig. 209 (English caption on page 481).

House 3, weighing around 15 kilos and thus considered as a half talent. In the upper levels of House 4 of the same complex, an excavated area above the later specified rooms Delta 8 – Delta 3 is called in Marinatos’s notebook as “the area of the Lead Weights” and there 29 weights are recorded, along with a lump of lead. It has been proposed that «the concentration of examples of writing observed in at least three out of the four houses in complex Delta is possibly related to the particular finds in storerooms of these houses, and these finds suggest that the occupants may have been businessmen or merchants».⁸

But the problem with metal weights is their corrosion and bad condition, which in most cases prevents us of reaching definite conclusions in the field of metrology. An attempt to calculate their original value through their volume has been applied to the West House collection,⁹ but it is obvious that this method of restoring their value tends to over-estimate their weight, though, on the other hand, it enables us to incorporate even broken items in our statistics, as long as they preserve their diameter and height and I can conceive of no other way for future comparison among sets of weights from the various houses, apart of such an empirical approach, that is to place one upon the other. However this may be, so far the so-called “Minoan” unit of 62 to 65.5 grams seems to hold for Akrotiri too, as Petruso has pointed out. Evans was right in taking the “Minoan” unit of 65.5 grams as the 5th multiple of the Egyptian unit of gold (from 12–14 grams),¹⁰ but we should also keep in mind Zaccagnini’s definition of the Aegean standard as the tenth multiple of a shekel of 6.5 grams, as we now turn to the main focus of our paper, the stone weights.¹¹

It is widely accepted that stone weights are more accurate, and, when integer, their actual weight is reliable for constructing metrological tables. Moreover, stone was the first material employed to

⁸ MICHAILIDOU 2000–2001.

⁹ MICHAILIDOU 1990.

¹⁰ EVANS 1906; cf. PARISE 1968; MICHAILIDOU 2004.

¹¹ ZACCAGNINI 1986: 422.

manufacture them.¹² Some stone weights deriving from Thera, are mentioned in Petruso's Ph.D. catalogue.¹³ out of twenty stone objects from a collection in the French School at Athens, coming from the mid-nineteenth century excavations by Mamet and Gorceix, Petruso presented seven as candidates for the function of weighing. He did not include them, though, in the printed edition of his Ph.D.¹⁴ where he is particularly cautious and explains the dangers of misidentification of stone weights.¹⁵ I select two points from his discussion: 1) The possibility that some stones were used as balance weights, though not manufactured with the primary intention of functioning as such. As Petruso points out, «the easiest way for a merchant or craftsman to build his set of weights was to search for pebbles equal in mass to specially made balance weights [...] if a pebble were slightly overweight, it could be ground away on one side to decrease its mass as needed; this would have had the added advantage of providing a flat and stable base for seating the item in the balance pan. Indeed, virtually all recognizable prehistoric stone weights, regardless of shape, exhibit at least one flat side».¹⁶ 2) The second point is that for stone weights the most valuable criterion is their context, especially when they are found with balances or weights of more diagnostic shape. At the end of this paper a very representative case is discussed, where we would never consider the stone disc to be a balance weight if it had not been found with the balance itself.

I tried to select possible balance weights made of stone, with the great help of my colleague Tania Devetzi, who is responsible for the stone objects found in the settlement.¹⁷ One might present tables with the more or less original weight of these stones. However, it is not safe to proceed any further if we cannot agree on what grounds they are to

¹² PETRUSO 1992: 1; MICHAÏLIDOU 2001b: 65.

¹³ PETRUSO 1978.

¹⁴ PETRUSO 1992: 42–43.

¹⁵ PETRUSO 1992: 4.

¹⁶ PETRUSO 1992: 1.

¹⁷ The drawings are by Andreas Kontonis, assisted by Lila Bolotis, and the photographs by Dimitris Sakkatzis. I thank them all for their help. I am also indebted to Panayiotis Drivas for his assistance on matters of electronic databases.

be considered as real balance weights. So this paper is more of a presentation of the methodological problems arising. We will start with stone objects of primary function as balance weights, which we identified by their shape, material or perhaps a very indicative mass-value, and cite also their context in the settlement and then proceed to more dubious specimens.

II. *Stone weights of diagnostic shape / material / marks/ context*

Two are *barrel shaped*:

The first one, is No. 892 (*Fig. 1*), unfortunately with no recorded origin, though, according to the wife of the late Marinatos, it is said to have been found in Delta 16, a broad room with a central column and with various imported objects stored there; due to its broad window, unusual in a ground floor room, this storeroom has been considered¹⁸ as a 'shop' of some sort, as a special function storeroom, or as of a



Fig. 1 – The sphenonoid or barrel shaped stone weight No. 892.

¹⁸ Cf. DOUMAS 1983: 51.

secondary use for temporarily storing the valuables, after the first seismic destruction. According to the geologist Yannis Bassiakos the weight is made of agate. Since fragments of this raw material have been found in the settlement, this object of a supposed foreign shape was not necessarily an import. It is carefully made and polished all over, and its weight is 478 grams, so it is equivalent to the “Western Syrian” Mina (L=0.125 m, W=0.052–0.055 m, d=0.025 m).¹⁹

The second one, No. 902 (*Fig. 2a–b*) is one of the earliest sphendonoid in use in Aegean Late Bronze Age context. It is made of hematite, according to Y. Bassiakos, an XRF examination by E. Pernicka, and also an experiment by the archaeologist S. Chatzissavas; its shape accords with a canonical part of a sphendonoid balance weight. Its flattened base preserves part of a single groove (?) which recalls a whole sphendonoid specimen from Knossos,²⁰ first published by Evans,²¹ also reported as of hematite but of a later date (LM III). The Akrotiri weight (L=0.022 m, D=0.021x0.018 m, d=0.01 m) has a value of 21.9 grams. Along with its material and shape, it has also the advantage of a very indicative context: it was found in complex Delta, in the so-named “area of the Lead Weights”. The material of this half-sphendonoid weight – the hematite – certainly places it in the category of precision weights. The groove was a drilled hole executed either for splitting off the required part²² or for adjusting a lead plug in the original weight, as shown in the drawing in *Fig. 2b* which is inspired by Cemal Pulak’s suggestion that the weight may have been either half (21.9 x 2 = 43.8 grams) or perhaps less than half of the original, in the latter case perhaps pointing out to an original mass of 5 Egyptian *qedet*/“Syrian” shekels = 46.5 grams. In any case, the artefact as found was probably used as 1/3 of a “Minoan” unit of 65.7 grams.

¹⁹ MICHAILIDOU 1990: fig. 19 and 2004: 316; for this Mina, cf. PARISE 1984; ZACCAGNINI 1999–2001.

²⁰ PETRUSO 1992: pl. 6 no. 59; MICHAILIDOU 2004: fig. 26.7.

²¹ EVANS 1906: 349–350.

²² As ERAN, EDELSTEIN 1977: 61, in the half-sphendonoid of hematite no. 240, *Fig. 25:16* (weight: 7.5 grams); I thank Yosha Al-Amri for the information on this article.

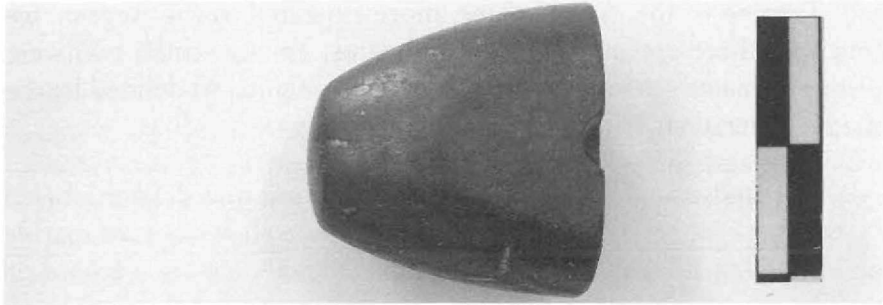


Fig. 2a – The half-sphendonoid hematite weight No. 902.

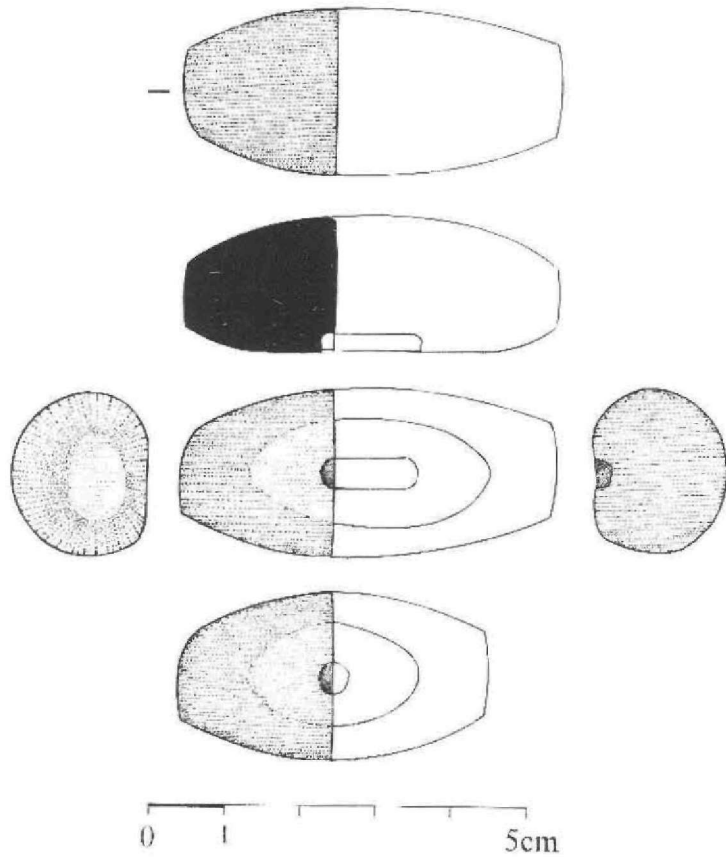


Fig. 2b – The drilled hole in the hematite weight No. 902 was executed either for splitting off the half part of the originally sphendonoid weight or for producing a groove for adjusting a lead plug in the original weight.

Turning to the *discoid shape*, more expected in the Aegean, we find that there are quite a few candidates, among which two were primarily manufactured to serve as balance weights, so defined by the shape, material and the mark they bear:

The first one, No. 3964 (*Fig. 3*), was found in a drawer labeled “stone lids” in the Apotheke of the Excavation. It is made of marble and there is a coincidence of the mark, a circle indicating – according to Petruso – the “Minoan” unit, and the very mass of the object which is 62.1 grams, exactly the weight of the “Minoan” unit ($D=0.043$ m, $H=0.018$ m). This artifact was most possibly manufactured as a model for the “Minoan” – or “Aegean” – unit, and it comes from one of the important buildings of the settlement, called Xeste 3, known for the famous wall paintings with the crocus gatherers; it is recorded as having been found upon the floor of the ground floor room 4; the building may have been a public one. There is only one lead weight from another room of this house but it is one of the best manufactured (of 52.5 grams weight, after cleaning).²³ There are some possible stone weights from this house, even a fine black pebble, of 1 gram weight, coming from the same room with the marble disc of 62 grams, could be useful for tiny quantities. The wall paintings of the building connected it with the crocus gathering and religious activities (plenty of publications) so it is reasonable to assume that perhaps crocus, that is saffron, was weighed there. In Linear B tablets,²⁴ crocus is measured only by weight and recorded in quantities from twice the unit N (of 250 grams) – so approximately a mina – to very tiny quantities (around 3.6 grams). Even today in Greece saffron is expensive and sold in small quantities.

With the marble disc 3964 (*Fig. 3*) with the inscribed circle and the weight of a “Minoan” unit there is a close parallel from Knossos of 59 grams, also a frustum, again with a dot, of 62.26 grams, and another

²³ See MICHAILIDOU 2004: fig. 26.6 left. This photo was published there by my mistake instead of another with the stone weight no. 370 and the stone weight no. 3964 (as written in the caption).

²⁴ Cf. SARPAKI 2001.

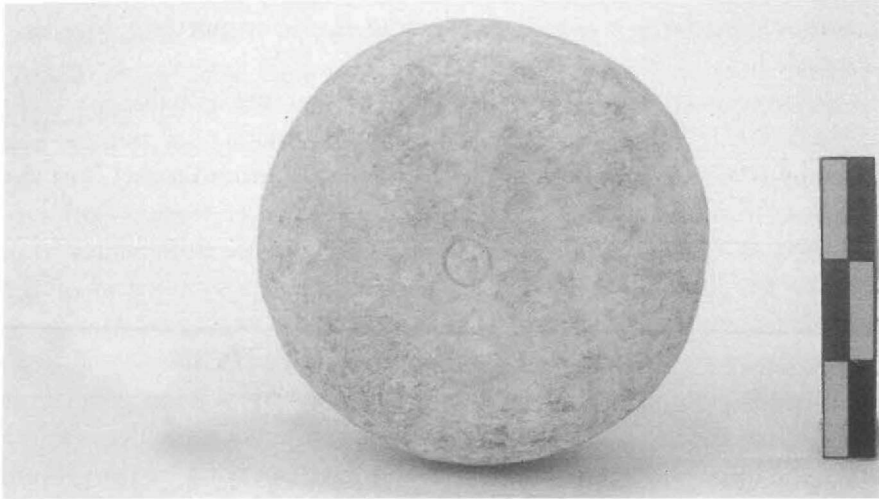


Fig. 3 – The marble discoid shaped weight No. 3964.



Fig. 4 – The stone disc No. 1804 (top left), and the stone weights No. 1740 (top right) and No. 370 (bottom centre).

alabaster disc with a dot, this time of 19 grams, all deriving from Knossos.²⁵ Perhaps what we have here is the imported “Minoan” standard?

The second stone disc of primary manufacture as balance weight is No. 370 (*Fig. 4*, bottom) (D=0.03 H=0.011), made of serpentine and bearing a triangle as a mark; Petruso rightly identified it as 1/3 of the “Minoan” unit, its weight being 20.2 grams. Further more, its primary function as a balance weight is verified by its context: it comes from the Sector Alpha, where many discoid lead weights were found (in the area of the storerooms 2 and 3; however, as the excavator Marinatos points out, «the circumstances of finding show that they come from both the upper and the lower floors».²⁶) This particular stone weight is reported as having been found in a small handleless cup perhaps fallen from the upper floor, while in the same room, but lying on the ground floor, were found (*Fig. 5*) two small shiny black natural pebbles (of 39 and 35 grams weight each) and one polychrome pebble of 66.5 grams, plus a semi-worked spherical piece of marble of 1028 grams (a weight near to the double mina, recorded in the Linear B tablets as M). Among a total of 19 lead discoid weights from both floors in sector A, two of them were found in position one on top of the other resting on a slab on the ground floor of storeroom 2, along with the above white marble weight and one of the black pebbles.²⁷

So, thanks to the context, it seems that the three pebbles (No. 4556), especially the polychrome one with the typical weight of 66.5 grams (close to the “Minoan” unit), and the white marble stone No 145 (with a flattened base) may have been used as balance weights, though not primarily manufactured as such (*Fig. 5*).

To return to the secure example No. 370 with the mark of a triangle (*Fig. 6*, right), its weight of 20.2 grams is one of the significant masses for both the Minoan and the Linear B denominations, so to what extent could this weight-value define other discs as balance weights? For example, the disc next to it in the picture (*Fig. 6*, left),

²⁵ See for instance PETRUSO 1992: 38.

²⁶ MARINATOS 1969: 48–49.

²⁷ MARINATOS 1969: 49, pls. 14,2; 19,1; 41,2; 41,3.



Fig. 5 – The marble stone No. 145 and the three pebbles No. 4556.

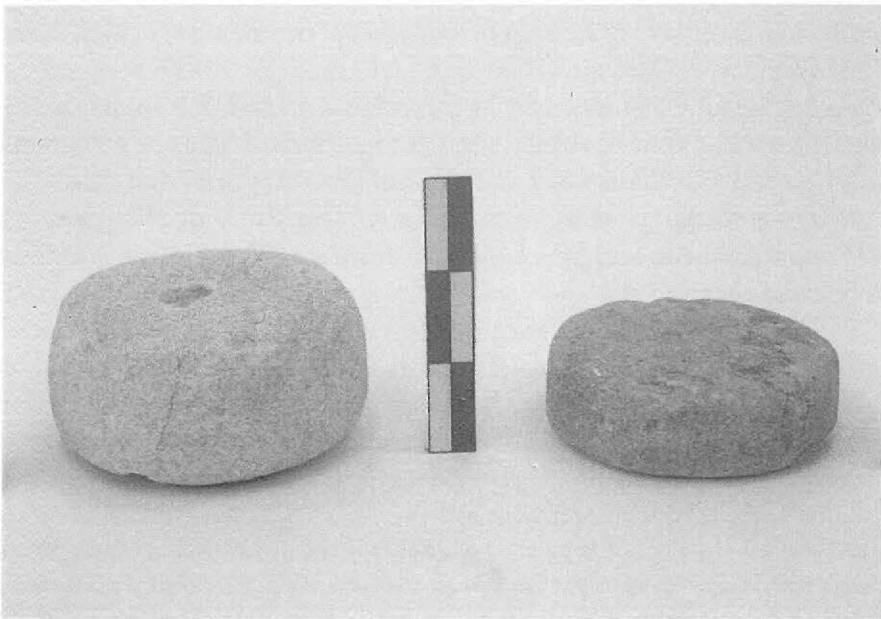


Fig. 6 – The stone disc No. 1971 (left) and the stone weight No. 370 (right).

the No. 1971, is of exactly the same weight (20.2 grams); it bears a circular depression on both sides, plus a groove, on the other side (to reduce its weight?), while its larger volume is due to its material, that is tuff, a stone lighter than serpentine. Unfortunately it is of unknown context.

III. Possible stone weights of a particular, perhaps foreign (?) shape

Again from sector Alpha, where so many weights have been found, from the upper levels of the storeroom 3 comes this gypsum item, No. 829 (*Fig. 7*), with a circular depression on both bases. It is presently underweight – of 237.5 (–) grams – but by using Evans’s method²⁸ we can restore its original weight to 272.11 grams, which may be equal to 3 Egyptian *deben* of 90.7 grams, if it is of Egyptian origin, or to 4 heavy “Minoan” units of 68 grams.

The same experiment performed on another foreign looking shape, No. 1754, made of limestone, of original weight 114.7 grams, gave a weight of 129.26 grams (*Fig. 8*). It may very well have functioned as 2 “Minoan” units of 64.64 grams, or 10 Egyptian *deben* of gold (of 12.92 grams), or 14 Egyptian *qedet* of 9.2 grams, or 14 shekels of 9.3 grams (resulting though to a “Syrian” mina of 465 grams and not 478, that we have found in Akrotiri) and also 15 “Mesopotamian” shekels of 8.6 grams. The value of 9.2 grams is represented at Akrotiri by a stone disc from the West House, if indeed a balance weight.

This dome-topped balance weight comes from the area excavated around Well 17 (one of the old wells excavated for the construction of pillars to support the excavation’s shelter) where many stones without working traces (which are therefore not tools) are reported from various levels, some of which reach the Early Cycladic horizon. A conical weight or a game token (?), the No. 1767 (see the small one in the drawing of *Fig. 15b*) of 11.6 grams, was found in the same stratum

²⁸ As described in EVANS 1906: 343–344. The experiments in Akrotiri were done by Andreas Kontonis, Panayiotis Vlachos and Efi Gioulba.

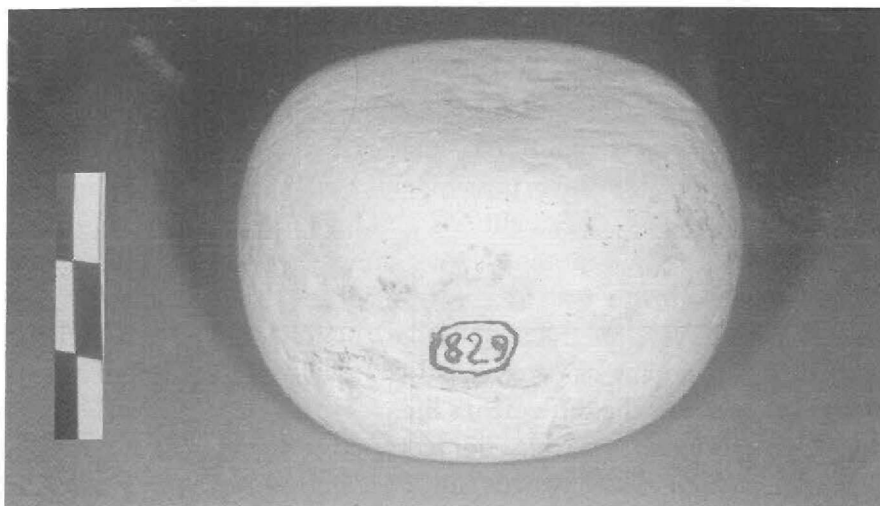


Fig. 7 – The stone weight No. 829.

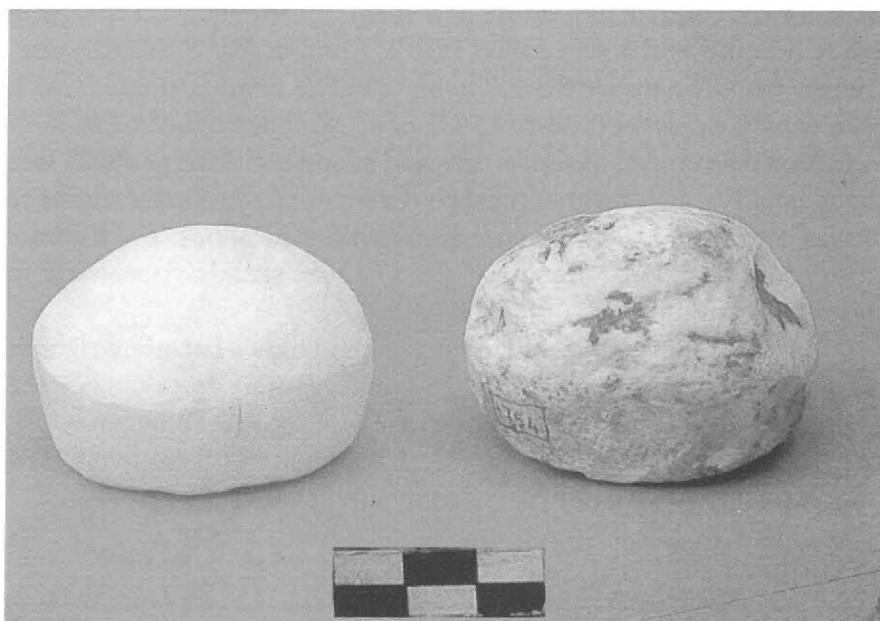


Fig. 8 – The stone weight No. 1754 and a restored replica made of plaster of Paris.

with the dome-topped No. 1754 and from the same area comes also the perfect disc No. 1804 of 8.1 grams (*Fig. 4*, top left). Another foreign looking shape, which may be a lid, is the gypsum No. 1862 (see the drawing in *Fig. 15c*), found again in the area of Well 17, perhaps suitable for a *deben* weight of 85.7 grams. But the dating of the levels of such objects and their possible interconnections with foreign standards requires further cautious investigation. In the view of the excavator P. Sotirakopoulou, we cannot securely speak of an archaeological cluster, but they are all part of the same activity that filled up the area after the seismic destruction, at the rebuilt of the town in the beginning of Late Cycladic I, therefore they do not belong to the last phase of the settlement's life.

There are two marble dome-topped artefacts, at first sight resembling pommels of swords but if so, both unfinished and of the same weight. The one, No. 3901 (*Fig. 9a*, right), is of unknown provenance and its weight is 167.8 (–) grams. The other, No. 3832 (*Fig. 9a*, left), of 168.3 grams weight, was found in one of the new wells for the construction of the new shelter of the site; it comes from inside a house and it was found inside a pot, a shape called *cymbe*, coming from the upper floor. The date of the context is LC I. Both objects have a mass equivalent to 1/3 of a “Mesopotamian” Mina.²⁹

A marble object, of similar size and shape, AE Myrina 20223 (see drawing of *Fig. 9b*), again unfinished if a pommel, finished if a balance weight, is reported from Lemnos, Koukonisi excavations, and it comes from a late Middle Bronze/Early Late Bronze stratum, according to the excavator Boulotis.³⁰

The most interesting, and in my view certainly a balance weight, is the marble No. 1740 (*Fig. 10*) of 26 grams, coming from outside the building called Xeste 3. It has one circle on each one of its bases. We can see it also in another photo (*Fig. 4*, top right) with the items 1804 (top left) and the 370 (bottom), already discussed.

²⁹ They look a bit alike a stone weight found in the – of a later date – Uluburun wreck: PULAK 1996: 419, W 97.

³⁰ Cf. BOULOTIS 1997: 257, fig. 24, where also a sphenonoid hematite balance weight of the same date is shown in fig. 22.



Fig. 9a – The dome-topped marble artefacts Nos. 3832 (left) and 3901 (right).

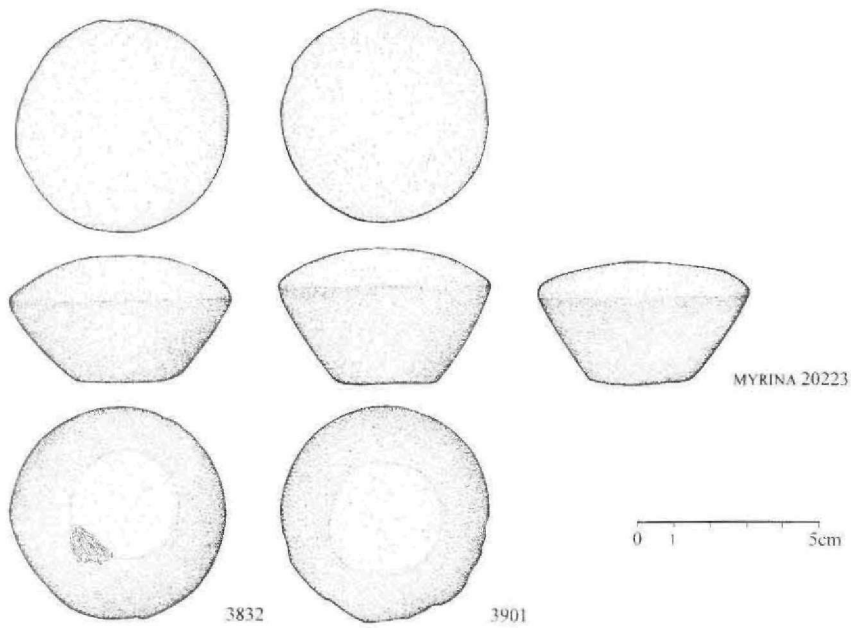


Fig. 9b – The two dome-topped marble artefacts from Akrotiri and the No. 20223 from the Myrina Museum, found in Koukonisi at Lemnos.

One wonders, if for lesser quantities and precision weighing, small pebbles could also have functioned, whether in primary use or not. No. 3004 (*Fig. 11*), a white fine egg-shaped pebble of 3.2 grams, from room Delta 16 (where many imported objects and the sphenonoid mina of agate and also two pairs of balance pans were found) would have been very convenient for weighing saffron, for instance.

IV. *More discoid shaped stone artefacts, cones and spheres*

If we decide to seek for the proposed by Zaccagnini “Aegean shekel” of 6.5 grams,³¹ we will find three discs at least and some cones also around this value, mainly made of tuff.

The weight values of 6.4, 11.5, 12.5 and 22–25 grams are not uncommon. These discs or lids (*Fig. 12*) have indeed convenient weights: first row from the left: 29, 12.1 and 18 (underweight) grams respectively, and in the second row: 22.7 and 11.5 grams (both from the same place) and the last on the right is 6.4 grams. There are a number of examples of this shape, some of them being parts of marble cores, e.g. Nos. 3831 and 3777 in *Fig. 13* (the last on the right is of tuff). The No. 3831 comes from an excavated area (New well 39) from where a lead balance weight is reported and this marble disc has a weight of 46.8 grams, which is 5 times the value of 9.3 grams.

The integer conical tokens of tuff (*Fig. 14*) (out of a total of ten found together in one place, while excavating the New well 70) have weight values of 22, 13, 7.8, 6.8 and 5.8 grams. What does this mean? Were they game tokens, *calculi* of some sort, or were they also used as balance weights? A very particular case of a cone (*Fig. 15a*) is the No. 3833 (B46/5) (the taller one in the drawing of *Fig. 15b*, where also the smaller one No. 1767, already discussed), made of limestone and looking like a smaller version of the tokens of the Knossian *zatrikion*-game; it has the very indicative weight of 91 grams which is exactly the Egyptian *deben* and it also bears the circle of *deben* (?) in the bottom. Or is it a seal, as written in the excavator’s notebook?

³¹ ZACCAGNINI 1986: 422.

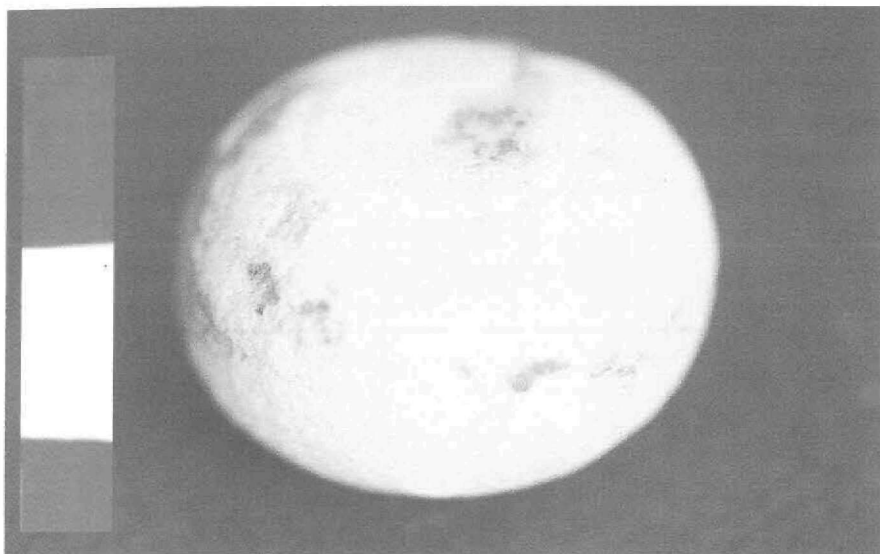


Fig. 10 – The marble weight No. 1740.

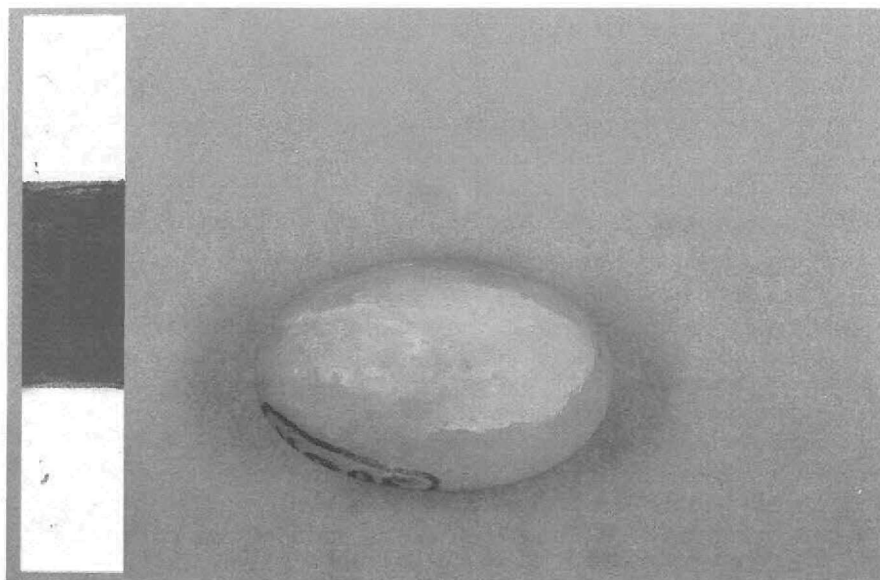


Fig. 11 – The white pebble No. 3004.

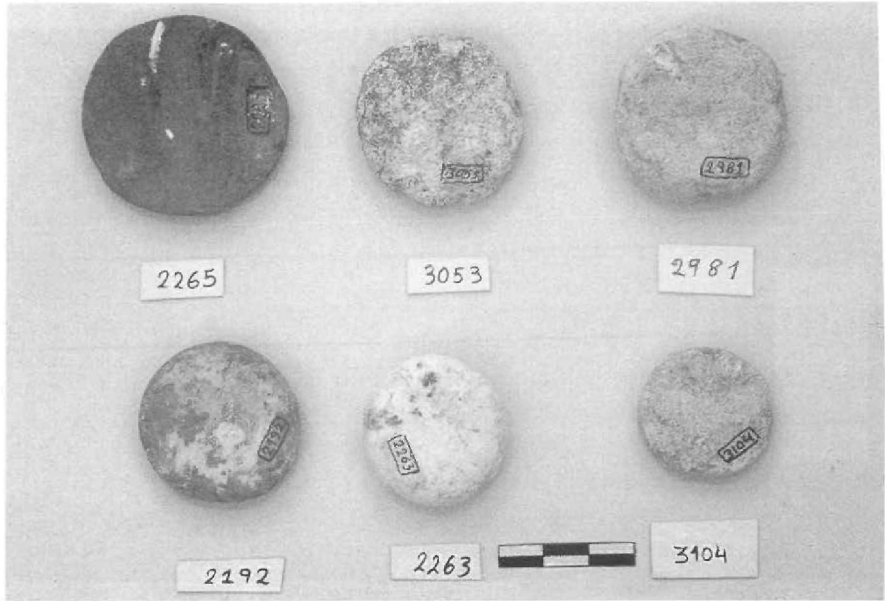


Fig. 12 – Stone discs Nos. 2265, 3053, 2981 and 2192, 2263, 3104.



Fig. 13 – Stone discs Nos. 3831, 3777 and 3768.

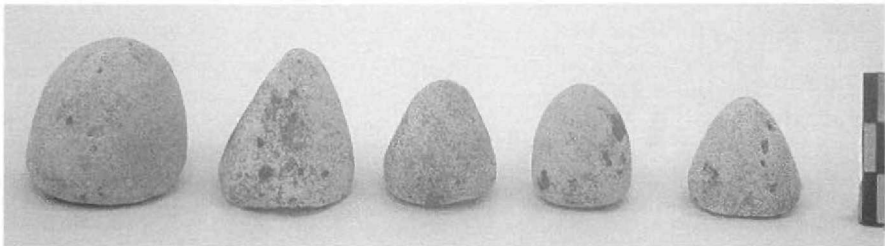


Fig. 14 – Five stone cones, out of a total of ten found together.

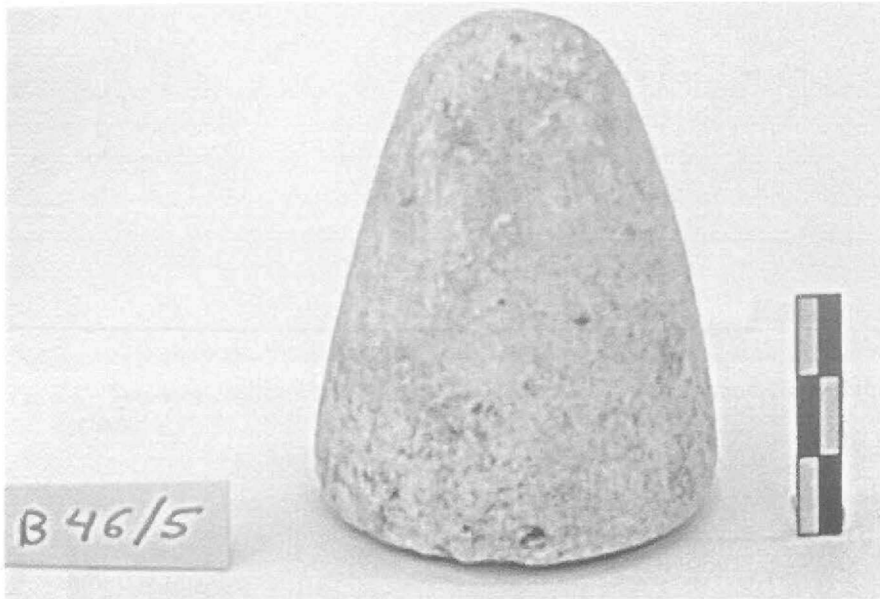


Fig. 15a – A perfect stone cone is the No. 3833.

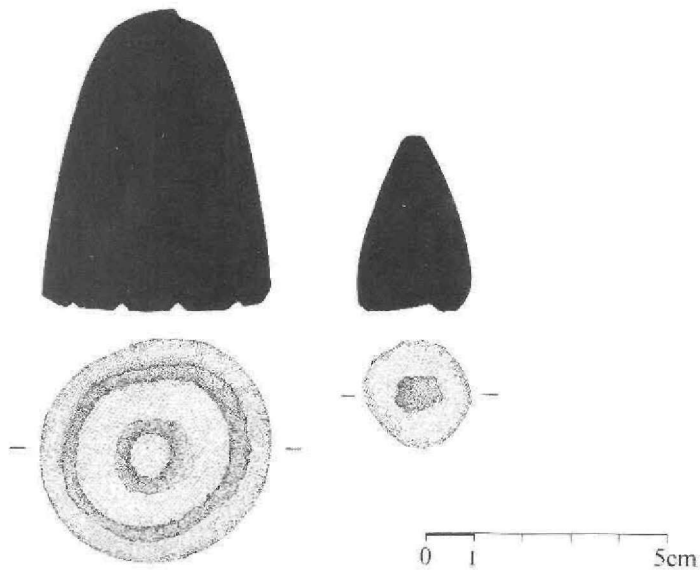


Fig. 15b – The stone cone No. 3833 and the smaller one No. 1767.



Fig. 15c – The shape of the gypsum lid (?) No. 1862.

And what can we say about the large number of stone spheres of various sizes found in the settlement? We have, for example, two spheres and a disc (*Fig. 16*), each one of the same weight as the others, 11.5 grams. But spheres constitute a distinct subject for discussion.

V. Other shapes, of indicative or not material, as candidates for weights

There are some of rectangular shape and of semi-oval section: e.g. the No. 4324 (*Fig. 17*), of grained marble, has the indicative weight of 59.2 grams (very near the “Minoan” unit) and also comes from a good context, the room Delta 1a, where, as we mentioned in the start, seven lead weights were found; twenty years later, when we were emptying one of the pithos, two balance pans were discovered inside this vessel.

Two other items, Nos. 4074 and 3829, of similar shape and weight, of 57 and 55(-) grams respectively, were found in two newly excavated wells, but they are of black hard stone and should be

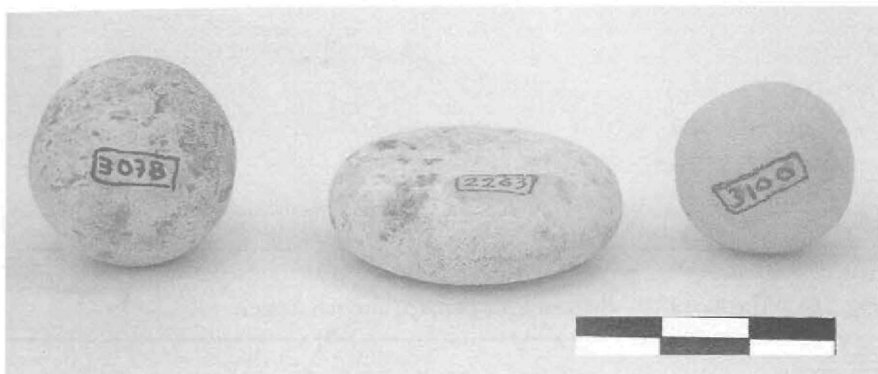


Fig. 16 – Two stone spheres and one stone disc, each one of the same weight as the others.



Fig. 17 – The stone rectangular weight (?) No. 4324.

examined as candidates for *pierre de touche* (cf. the No. 3829 in Fig. 18a and the drawing in Fig. 18b).

One has also to decide about some of the items recorded as polishers. Of various types of stone weights, displayed in the Kairo Museum, some resemble polishers. Possible weights may perhaps be the “polishers” made of marble or serpentine, if no traces of working activity are preserved on their surface. E.g. No. 2432 (Fig. 19a), made of serpentine, comes from an area (New well 1B) where the discs Nos. 2263 and 2192 of Fig. 12 were found. Of a weight of 268.5 grams, it reminds

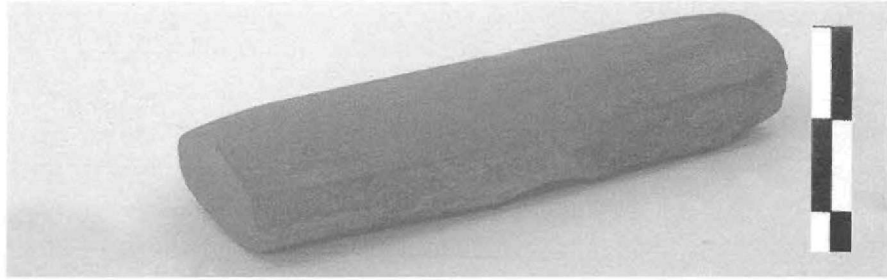


Fig. 18a – The No. 3829 whetstone, or perhaps a touch stone?

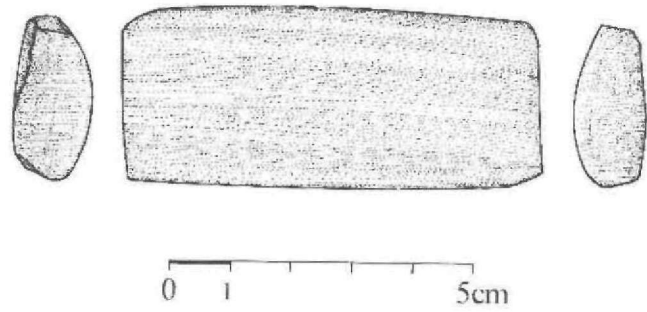


Fig. 18b – The No. 3829 whetstone, or perhaps a touch stone? (drawing)



Fig. 19a – The serpentine "polisher" No. 2432 coming from the same area as the discs Nos. 2192 and 2263 (cf. Fig. 12).

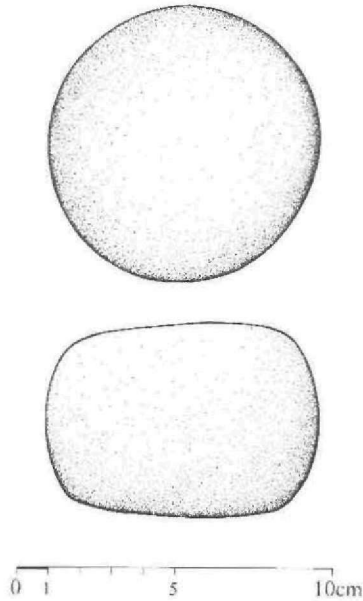


Fig. 19 b – The marble “polisher” No. 3465.

us of Egyptian weights (perhaps 3 *deben* of almost 90 grams?). No. 3465 (cf. drawing in Fig. 19b), of white marble, from the House of the Ladies, Room 6, weighs 817 grams. Its shape reminds us of the Zakros weight of 1421 grams. On the other hand, another small item from the old excavations at Potamos, the No. 1446 (Fig. 20), made of serpentine, weighs 151.1 grams (perhaps 2½ “Minoan” units of 61 g), and has a circular depression which may indicate a weight unit, but its circular base (Fig. 21) is far more polished than the others. So, was it a polisher?³²

And I would like to end the problematic cases with a very peculiar object: the No. 3830 (Fig. 22a and drawings of Fig. 22b), of a weight of 18.5 grams, perhaps 2 times the value of 9.3 grams (a value of a *qedet* or a “Syrian” shekel), that resembles Egyptian parallels but could be also anything but a balance weight. I would also like to pose the question: what was the use of a number of perforated discs, if not usable as whorls? Pietro Militello has already mentioned such a case from Ayia

³² To be published with the other stone items from Potamos by T. Devetzi.

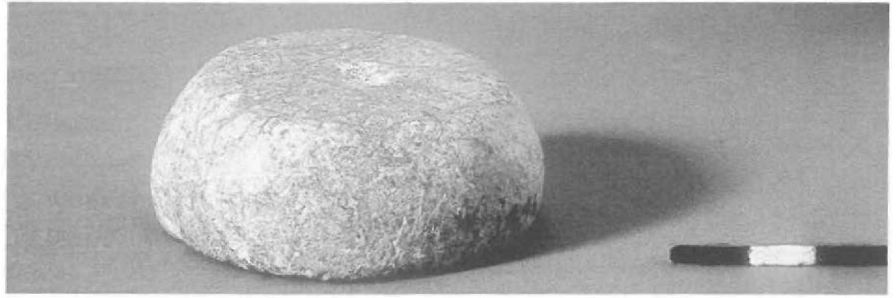


Fig. 20 – The serpentine polisher No. 1446 from the old excavations at Potamos area.

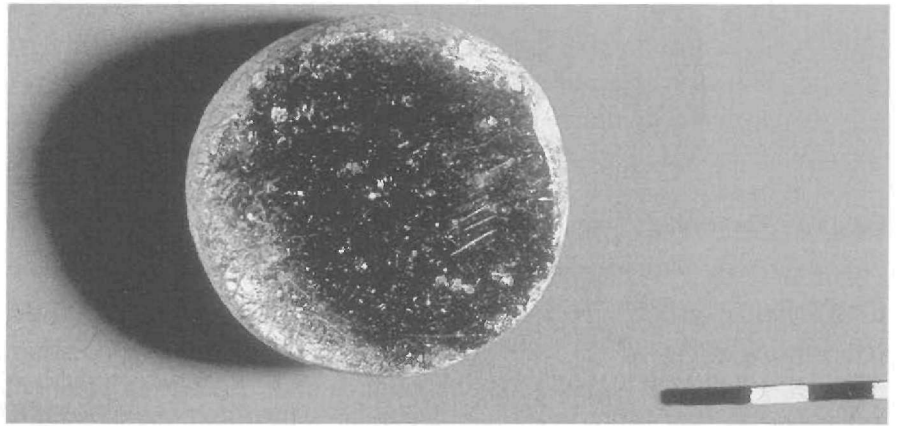


Fig. 21 – The circular base of the polisher No. 1446.

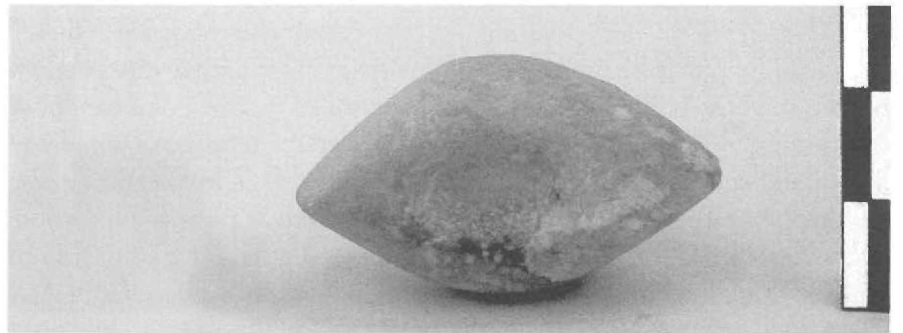


Fig. 22a – The stone artefact No. 3830 of a two *qedet*/Syrian shekels value.

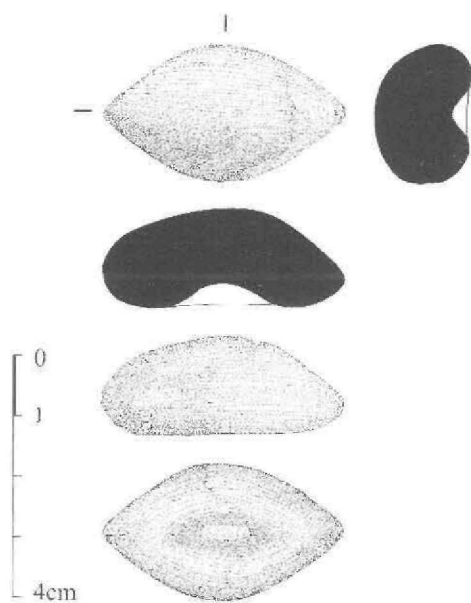


Fig. 22b – The stone artefact No. 3830 of a two *qedet*/Syrian shekels value (drawing).

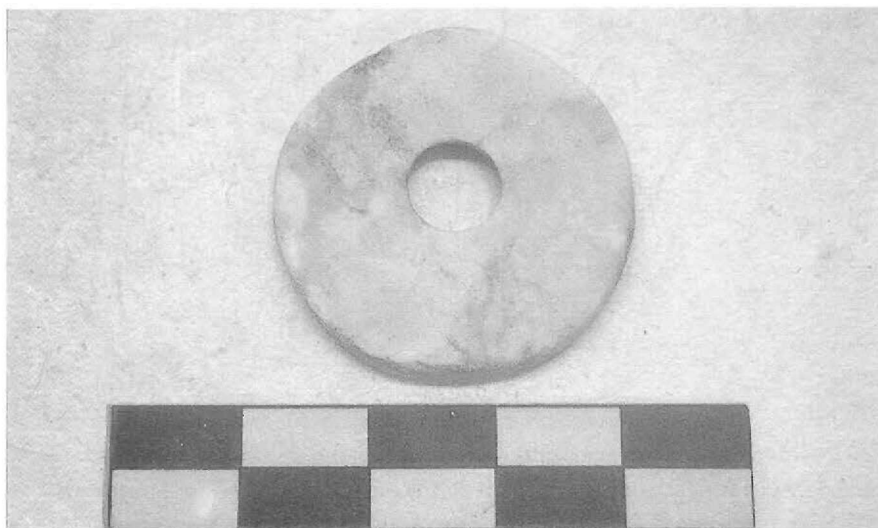


Fig. 23 – The marble perforated disc No. 3774.

Triadha, in Crete (marked with a Linear A fraction).³³ One example from Akrotiri is the marble one No. 3774 (*Fig. 23*) of 6.2 grams weight.

VI. Balances

Balances are not a frequent find even in Akrotiri, in spite of the great amount of equipment preserved. We have so far relics of seven balances in all, that is their pans made of bronze. Yet, two balances were part of the equipment of one and the same room, Delta 16: one pair of small and poorly preserved pans were found inside a jar containing clay imported askoi. The other was found inside a jar lying broken (in this case the pans, placed one upon the other, are the largest hitherto found in Akrotiri, of a diam. of 12.5 cm). Another pair was found again inside a pithos, this time in room Delta 1a, while another pair of pans comes from Sector Alpha. All these areas have also yielded balance weights. *Fig. 24* shows one of the pans from Delta

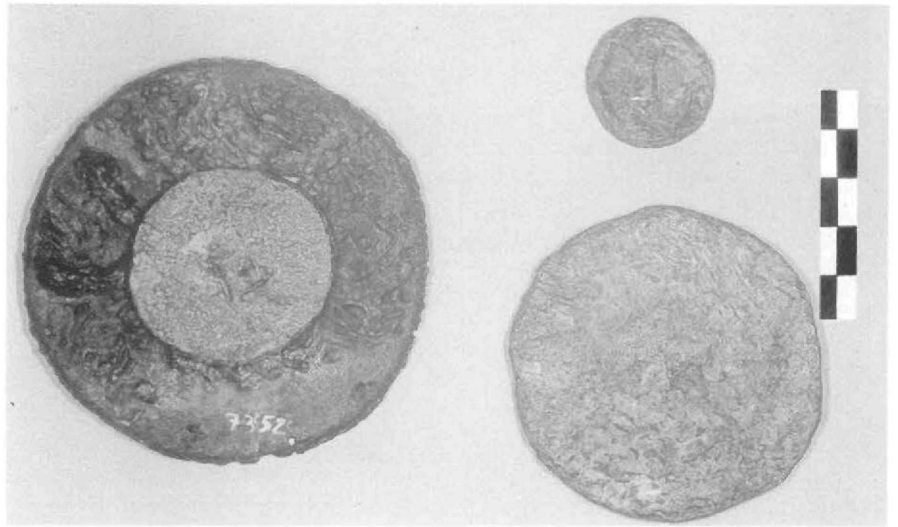


Fig. 24 – One of the two pans and three of the lead weights, all found in the same place.

³³ MILITELLO 1988–89: fig. 2.



Fig. 25 – Another balance as found together with two weights within traces of a wooden Box.

1a (the ground floor storeroom where seven lead weights plus the possible rectangular “Minoan” unit of grained marble of *Fig. 17* were found), the best preserved weight of the set inside the pan and also two weights (the biggest and the smallest) of the same set. That balances found inside the jars were usually kept in baskets or boxes, as is known from Egyptian parallels, is indicated by traces found on some of the pans along with the traces of the threads. And now we come to the highly informative case (*Fig. 25*) of two pans, plus two discs, one of lead and one of stone, found within the traces of a box, that according to the excavator N. Sigalas, had the dimensions of 20 x 10 cm. The pans (*Fig. 26*) are of the same diameter (8.2 cm) as the ones from Delta 1a, and they preserve traces of wood on the convex side. The lead weight (top left) is of 101.7 grams and the stone disc (top right) is of 39.5 grams weight. A thin oblong metal plate found together (bottom in the same *Fig. 26*) was perhaps for taking some dust inside the pan for weighing purposes, as I have seen in examples from the early 20th century. Two hinges and a small ring, attached to a nail, found



Fig. 26 – The finds of Fig. 25 after cleaning.



Fig. 27 – The two weights of Figs. 25–26 (bottom left and centre) among other lead weights from the settlement.

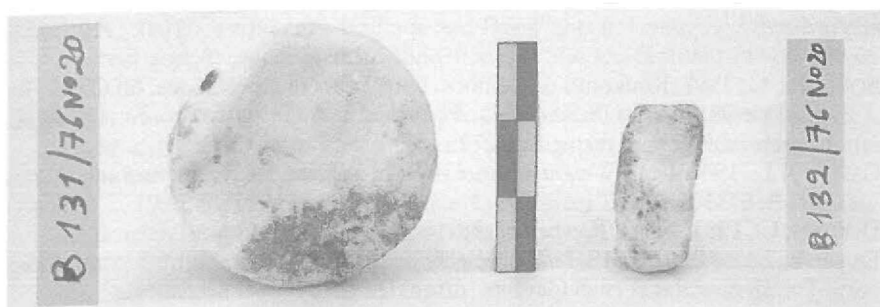


Fig. 28 – Two weights made of gypsum found together with one of the lead weights of Fig. 27 (the No. 9196).

together, perhaps belonged to the wooden box, from which a fragment of a clay sealing may indicate the proprietor of the box. And the oblong black, hard and very smooth, worked stone reported also from the box (see above *Fig. 18a* and drawing *Fig. 18b*), is being examined as a candidate for a touch-stone. This is indeed a very typical case of the importance of context in defining a stone item as weight. One would be chary of describing as a weight the stone disc No. 8591 (*Fig. 27*, bottom middle, among lead weights from various places), if it had not been found practically inside the box with the balance. And the first left on the second row (lead weight No. 9196 of 21.9 grams) has helped to identify as a weight another gypsum disc of 20 grams (*Fig. 28* left), with which it was found together inside a basket. In the same basket, another small cylinder of gypsum, of 3.3 grams, may also have functioned as a weight (*Fig. 28* right). Further more this basket provides the clue as to how balances and weights were part of the personal belongings of individuals, since in the same basket eleven beads of faïence were also found, and this basket with all these contents also contained a smaller basket found closed and to be studied by M. Beloyanni; in the mean time we know from an X-Ray examination that the small basket contained five hooks!

ANNA MICHAILIDOU

References

- BOULOTIS, C., 1997. Koukonisi on Lemnos. Four Years of Excavations. (in Greek) In: C. DOUMAS, V. LA ROSA (eds.), *Poliochni and the Early Bronze Age in the Northern Aegean*. Athens: 230–272.
- CASKEY, J.L., 1969. Lead Weights from Ayia Irini in Keos. In: *Αρχαιολογικόν Δελτίον* 24, A: 95–106.
- DOUMAS, C., 1983. *Thera. Pompeii of the Ancient Aegean*, London.
- ERAN, A., EDELSTEIN, G., 1977. The weights. In: S. BEN-ARIEH, G. EDELSTEIN, Akko. Tombs near the Persian Garden, 'Atiqot (English series) 12: 52–62.
- EVANS, A., 1906. Minoan Weights and Mediums of Currency, from Crete, Mycenae, and Cyprus. In: *Corolla Numismatica*, Oxford: 336–367.
- Manufacture and Measurement*, A. MICHAÏLIDOU (ed.), *Manufacture and Measurement. Counting, Measuring and Recording Craft Items in Early Aegean Societies* (MEΛETHMATA 33), Athens 2001.
- MARINATOS, SP., 1969. *Excavations at Thera II (1968 Season)*, Athens.
- MICHAÏLIDOU, A., 1990. The Lead Weights from Akrotiri: The Archaeological Record. In: *TAW III*: vol. I: 407–419.
- MICHAÏLIDOU, A., 2000–2001. Indications of Literacy in Bronze Age Thera. In: *Minos* 35–36: 7–30.
- MICHAÏLIDOU, A., 2001a. *Akrotiri on Thera: The Study of the Upper Storeys of the Settlement's Buildings* (Library of the Archaeological Society at Athens, No. 212), Athens (in Greek and with an English Summary).
- MICHAÏLIDOU, A., 2001b. Script and Metrology: Practical Processes and Cognitive Inventions. In: *Manufacture and Measurement*: 53–82.
- MICHAÏLIDOU, A., 2004. On the Minoan Economy: a Tribute to “Minoan Weights and Mediums of Currency” by Arthur Evans. In: G. CADOGAN, E. HATZAKI, A. VASILAKIS (eds.), *Knossos: Palace, City, State*. Proceedings of the Conference at Herakleion 2000 (for the Centenary of sir Arthur Evans's Excavations at Knossos) (British School at Athens Studies 12), Nottingham: 311–321.
- MILITELLO, P., 1988–89. Un peso (?) con segno inciso da Haghia Triada. In: *Annuario della Scuola Archeologica Italiana di Atene* 66–68: 163–172.
- PALYVOU, C., 1990. Architectural Design at Late Cycladic Akrotiri. In: *TAW III*: Vol. 1: 44–56.
- PARISE, N., 1968. I pani di rame del II Millennio a.C. Considerazioni preliminari. In: *Atti e Memorie del Primo Congresso Internazionale di Micenologia, Roma 1967* (Incunabula Graeca XXV), Roma: 117–133.
- PARISE, N., 1984. Unità ponderali e rapporti di cambio nella Siria del nord. In: A. ARCHI (ed.), *Circulation of Goods in Non-Palatial Context in the Ancient Near East*, Roma: 125–138.
- PETRUSO, K.M., 1978. *Systems of Weight in the Bronze Age Aegean*, Ph.D. Diss., Indiana University.
- PETRUSO, K.M., 1992. *Keos VIII. Ayia Irini: The Balance Weights*, Mainz am Rhein.
- PULAK, C.M., 1996. *Analysis of the Weight Assemblages from the Late Bronze Age Shipwrecks at Uluburun and Cape Gelidonya, Turkey*, Ph.D. Diss., Texas A&M University.

- SARPAKI, A., 2001. Condiments, Perfume and Dye Plants in Linear B: A Look at the Textual and Archaeobotanical Evidence. In: *Manufacture and Measurement: 195–265*.
- TAW III – CH. DOUMAS, D.A. HARDY, J.A. SAKELLARAKIS, P.M. WARREN (eds.), *Thera and the Aegean World III*. Proceedings of the Third International Scientific Congress, Santorini 1989, London 1990.
- TZACHILI, I., 1990. All Important yet Elusive: Looking for Evidence of Cloth-making at Akrotiri. In: *TAW III*: Vol. 1: 380–389.
- ZACCAGNINI, C., 1986. Aspects of Copper Trade in the Eastern Mediterranean during the Late Bronze Age. In: M. MARAZZI, S. TUSA, L. VAGNETTI (eds.), *Traffici Micenei nel Mediterraneo*, Taranto: 413–424.
- ZACCAGNINI, C., 1999–2001. The Mina of Karkemish and other Minas. In: *State Archives of Assyria Bulletin* 13: 39–56.

