THIASOS

RIVISTA DI ARCHEOLOGIA E ARCHITETTURA ANTICA

2021, n. 10.2

Offerte in metallo nei santuari greci
Doni votivi, rituali, smaltimento
Atti del seminario internazionale online
29 ottobre 2020

a cura di Chiara Tarditi e Rita Sassu

«THIASOS» Rivista di archeologia e architettura antica
Direttore: Giorgio Rocco
Comitato di Direzione: Monica Livadiotti (vice-Direttore), Roberta Belli Pasqua, Luigi Maria Caliò,
Redazione: Davide Falco, Antonello Fino, Chiara Giatti, Antonella Lepone, Giuseppe Mazzilli, Valeria Parisi, Rita Sassu
Anno di fondazione: 2011

James Lloyd, *The Spartan lead votives: new data from archival and scientific analysis*

Edizioni Quasar di Severino Tognon s.r.l., via Ajaccio 41-43, 00198 Roma (Italia)
http://www.edizioniquasar.it/

ISSN 2279-7297

La pubblicazione di questo volume ha ricevuto il contributo finanziario dell'Università Cattolica del Sacro Cuore sulla base di una valutazione dei risultati della ricerca in essa espressa.
Università Cattolica del Sacro Cuore contributed to the funding of this research project and its publication.

Come citare l'articolo:
J. Lloyd, *The Spartan lead votives: new data from archival and scientific analysis*, in C. Tarditi, R. Sassu (a cura di), *Offerte in metallo nei santuari greci. Doni votivi, rituali, smaltimento, Atti del seminario internazionale online, 29 ottobre 2020*, *Thiasos* 10.2, 2021, pp. 33-44

Gli articoli pubblicati nella Rivista sono sottoposti a referee nel sistema a doppio cieco.

The Spartan lead votives:
new data from archival and scientific analysis

James Lloyd*

Key Words: *Sparta, sanctuary of Artemis* Orthia*, lead votive figurines, Greek trade, Archaic period, Pb isotope and pXRF.*

Parole Chiave: Sparta, Santuario di Artemide *Orthia*, figurine votive di piombo, commercio in Grecia, periodo arcaico, isotopo di PB e pXRF

Abstract:
The Spartan lead votives from the sanctuary of Artemis Orthia *number over 100,000. This article demonstrates how two complementary methods of research (archival and scientific) can help us better understand these objects over 100 years after their excavation by the British School at Athens, between 1906 and 1910. Key conclusions include the identification of Laconia as a source of the lead used to make the votives (previous studies had shown only Laurion as a source), and a tally of the total number of votive lead wreaths, goddesses, women, warriors, and musicians, as well as a presentation of how unpublished details concerning the lead votives allow us to more fully interpret the assemblage.*

Gli oggetti votivi in piombo spartani del santuario di Artemide Orthia *sono oltre 100.000. Questo articolo dimostra come due metodi di ricerca complementari (archivistico e scientifico) possano aiutare a comprendere meglio questi reperti oltre 100 anni dopo il loro scavo da parte della British School at Athens, tra il 1906 e il 1910. Le conclusioni chiave comprendono l'identificazione della Laconia come luogo di origine del piombo usato per realizzare i votivi (studi precedenti avevano indicato solo il Laurion come luogo di provenienza), e un conteggio del numero totale delle corone votive e delle figurine di, dee, donne, guerrieri e musicisti in piombo, nonché una presentazione di come dettagli inediti riguardanti questi oggetti votivi ci permettono di interpretare in modo piu' completo tutto l'insieme.*

Introduction

The sanctuary of Artemis *Orthia* in Sparta is located by the western bank of the River Eurotas in the Taygetus valley of Lakonia[1]. For over a thousand years, it was one of the religious sites in Sparta. The customs, buildings, types of votive objects dedicated there (and even the name of the goddess) changed to varying degrees during this period. These customs thus reflected wider developments in Sparta, Greece, and the Mediterranean more broadly, as much as they did the ancestral traditions of the Spartans. This article publishes the results of ongoing research into the group of lead votives found at the sanctuary, focusing on two complementary methods; archival study, and scientific analysis. It is not intended as an exhaustive survey of the material (for a map of key locations, see fig. 1).

For around three-hundred years, from c. 700 - c.400, a key part of worship at the sanctuary of *Orthia* was the dedication of small lead votive wreaths and figurines[2]. 100,773 of these lead votives were recorded at the sanctuary during excavations, making this one of if not the largest assemblage of votive objects found at a single sanctuary in

* University of Reading: j.t.lloyd@reading.ac.uk

[1] As far as we can tell, the goddess was referred to as *Orthia* until around c. 70 CE, when inscriptions start to refer to the goddess as Artemis *Orthia*. Roughly, the change in name occurs around the Flavian period, though it is possible that it might have begun slightly earlier (cf. Woodward 1929, pp. 310-311, inscription no. 27). I thus refer to the goddess as *Orthia* when dealing with material from the sanctuary that specifically pre-dates the Flavian period.

[2] Precisely dating the production of the lead votives is difficult. It is possible that production ceased before 400 (as Boss 2000, pp. 173-5 argues). Wace 1929, p. 252, thought "possibly as late as 250 B.C." which seems to be based on a misunderstanding of stratigraphic contamination of earlier survivals. See Wace 1929, pp. 250-252; Boardman 1963; and Boss 2000, pp. 153-172 for discussions of chronology of the *Orthia* leads. See also Thommen 2014, p. 75 (citing Chrimes 1949, p. 76). Lloyd (forthcoming) provides a critique of Wace's chronology of the *Orthia* lead votives in more detail. Cavanagh, Laxton 1984, in a study of the lead votives from the *Menelaion*, have a more detailed understanding of the stratigraphy, seriation, and typology of the lead votives at that site compared to *Orthia*'s sanctuary, and thus the specific chronology of some of the votive types at that sanctuary in specific trenches.

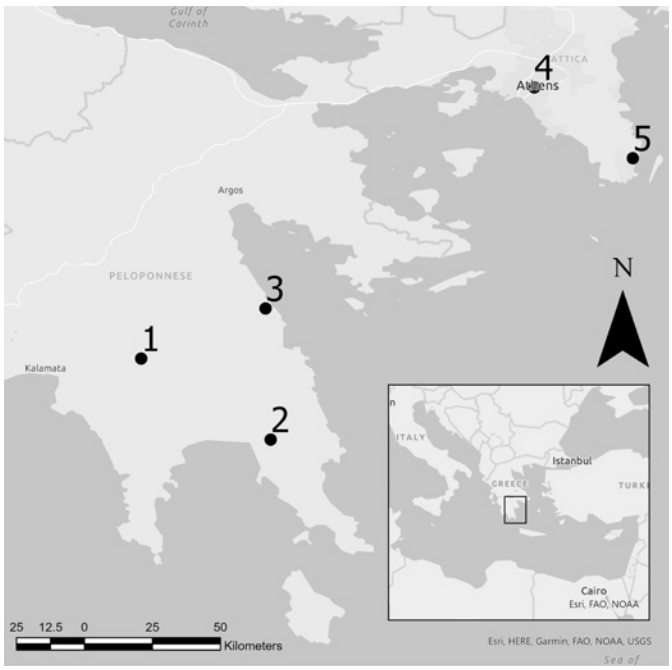

Fig. 1. Map of locations mentioned: 1. Sparta; 2. Molai; 3. Ano Tiros; 4. Athens; . 5. Thorikos (Laurion).

Fig. 2. Detail of geometric patterns on a Spartan lead figurine (Ure Museum, 23.11.31n2).

ancient Greece[3]. Lead votives were also found at a smaller scale at the Spartan Menelaion, as well as at other locations in Lakonia. There are also a few examples of the votives being found in the wider Peloponnese. Thus, the lead votives (or lead figurines) are a distinctive feature of Spartan, and perhaps Lacedaemonian, religion. They were, for all intents and purposes, limited to local sanctuaries but given their small nature were moveable[4].

The lead votives were cast (it has been suggested with stone moulds) so that one side is in relief and the other is flat. It is possible that they could have been sand-casted, and this would also explain the lack of surviving moulds[5]. The channel through which the molten lead was poured to cast these votives is sometimes still partially attached to surviving votives, and multiple moulds could be lined up and cast at the same time[6]. The votives can be divided into two broad categories; those that depict objects (wreaths, branches, jewellery, rosettes, fabrics, rings, lyres, etc), and those that depict figures (winged goddesses, women votaries, warriors, musicians, dancers, deer, cocks, lions, other animals, and mythological beasts, etc.). It is also worth noting that there are a very small number of lead votives that were fashioned in the round, such as small statuettes. Decorative pin-brooches exist too[7].

The figurine types vary in size from around 2.5-6 cm tall and 1-2 cm wide (the 'winged-goddess' types can have wingspans of c. 4 cm). The details of the figurines, such as lyre-strings or geometric patterns on clothing, are often only a millimetre thick or less, representing a subtle craftsmanship (see fig. 2) [8].

[3] Wace 1929, pp. 251-252. On earlier finds of lead votives from Sparta, see Ross 1861, 1854; Dressel, Milchhöfer 1877; Tsountas 1892; Perdrizet 1897; Tod, Wace 1906. Lead is an unusual material for religious votives in Greece, with few examples outside Sparta and never at a comparable scale. See Lamont 2021 for a study of the material and psychological qualities of lead that reinforced its use as a material for written curses. On the lead figurines from Thonis-Herakleion in Egypt, see Heinz 2011 and 2015 146 ff. See Mitchell 1983 for the use of lead (inlaid with ivory and glass) on Anatolian votive statuettes. Boardman 1999 p. 76, notes parallels with earlier Anatolian lead figurines and uses of lead votives at other Greek sites. See Emre 1971 for Anatolian lead figurines, which were cast in stone moulds, and produced from the Early Bronze Age (Troy IIg) to the end of the Assyrian Trading Colony Period (p. 97). Emre catalogued 51 individual lead figurines and stone moulds (pp. 101-117).

[4] See Boss 2000, pp. 4-14, for a discussion of the locations (inside and outside Sparta) where these votives have been found. On the votives from the *Menelaion*, see Cavanagh, Laxton 1984.

[5] Boss 2000, pp. 20-21 for arguments as to why limestone moulds may have been used. I am thankful to Dr. John Creighton for suggesting sand-casting. The process has many variations, but would involve pressing a mould into packed wet sand placed in box, leaving a channel into which molten lead could be poured. Since the Spartan lead votives are mainly flat on one side, the box would have been sealed with a similar box of sand, smoothed over. This process would allow for the multiple casting of the same mould that see evidenced (e.g. Wace 1929, pl. CXCII, 11) as well as the casting of multiple different moulds at the same time that we see too (e.g. Boss 2000, p. 19 fig. 13). Given the sanctuary of Artemis *Orthia*'s proximity to the Eurotas river, there would have been a ready supply of alluvial sand for this purpose, if this method were employed.

[6] See references in above note.

[7] Wace 1929, pp. 258-259, 267-268, 271; Boss 2000, pp. 142-147 (figs. 109-113).

[8] Hodkinson 2000, pp. 277-279.

The figurine types are notable just as much for the unique examples of designs that survive, as they are for the large quantities of 'stock' designs that are used, re-used, and then adapted over time. The convention is to refer to the designs that survive according to a general 'category' (object, figure), 'type' or 'variety' (rings, pins, pendants), and then 'mould' (individual votives which on close visual analysis are identical and thus made using the same mould or copies of the same mould), and then individual 'figurines' or 'votives'[9].

In his 1929 chapter, Wace published the total number of lead votives (100,773), and the numbers of lead votives in each of his periods (Lead 0 - Lead VI), but gave no tally for categories or varieties[10]. Using the Sparta archives at the British School at Athens, Boss was able to provide percentages for different types, organised by period and context, but published no absolute numbers nor did he discuss the notebooks in much detail. He also presented this data according to his new chronology of three phases, so there is a need to examine the data as it was originally recorded[11].

Over the lifetime of the production of these votives, by far the most numerically frequent were the 'wreath' or 'garland' type, as can be seen in the table fig. 3, which is based on my tally of these types in the two lead figurines notebooks in the Sparta archive at the British School at Athens. What else can the Artemis *Orthia* excavation archives tell us about the lead votives? What else was left out of Wace's 1929 publication? These are questions that deserve to be more fully considered.

Type	**Wreaths**	**Goddesses**	**Women**	**Warriors**
Total tally	59,981	4,354	10,362	8,129
Percentage of total (100,773)	59.52%	4.32%	10.28%	8.07%

Fig. 3. Table showing the total tally and percentage of four key categories of lead votive from the BSA's excavations at the sanctuary of Orthia.

The British School At Athens' Sparta Archive

The British School at Athens' Sparta archive primarily includes daybooks, notebooks recording small finds, sketches, drawings, plans, and letters relating to all of the British School at Athens' work in Sparta, during 1906-1910 and beyond[12].

While the 1906-1910 excavations at Sparta, specifically those at Artemis *Orthia*, were widely praised, the results and methods, as published in 1929's Artemis *Orthia*, were found by some to be lacking. If there were any criticisms, they were aimed at the theories and methods of stratigraphy that the excavators had used to understand the chronology of the materials that they were publishing[13].

The excavators often referred to their meticulous recording of everything that came up from soil, and that contexts had been carefully defined and recorded (thus enabling a clear understanding of the stratigraphy, and hence the chronology of the sanctuary). However, they never actually published those records, meaning that readers could not analyse the data and methods used to inform the excavator's conclusions[14].

As Francesca Luongo has shown, the BSA's Sparta archives allow us to reconstruct the "square and level system" used to excavate the sanctuary. The documents in the archive allow us to better understand the merits and limitations of the excavators' methods (and the conclusions built on their methods) in a way that is impossible if we only rely on the material published in reports[15]. The sanctuary was excavated in squares, with the depth of material recorded relative to sea level. Features and finds were recorded according to the number of the square from which they were excavated, as well as the depth at which they were found (often in c. 0.2 m sections). A plan of the excavation squares was never drawn up for publication, nor were any of the small finds or features published with the square and level from which they had been excavated[16].

9 Following Cavanagh, Laxton 1984, p. 23.
10 Wace 1929, pp. 250-252.
11 Boss 2000, pp. 147-153.
12 See Luongo 2017a for a summary of the material.
13 See the critical review of V. W.-G. (Wade-Gery) 1930, pp. 146-150, and the response given of Dawkins, Droop, Wace 1930 pp. 329-333, which ends with a rather scathing quotation of Horace, *Ars Poetica*, 39-41. On Vivian Wade-Gery, see Thornton 2020.
14 Annual excavation reports allow for a rough piecing together of their method (e.g. Dawkins 1906-107, p. 71). See also Dawkins 1929, p. 17 n. 27.
15 In particular, Luongo 2017a, pp. 71-74 and fig. 9 (a plan of the sanctuary showing the excavation squares). See also Luongo 2013, 2014, 2017b, 2017c.
16 Though they were sometimes stored with this data, or with it recorded in notebooks: Luongo 2017a.

Based on this unpublished plan, Luongo has created a digital plan of the *Orthia* sanctuary that incorporates the excavation squares[17].

Luongo's work to date has focused on using the notebooks to better understand and reassess the stratigraphy of and excavation methods at *Orthia*, primarily in relation to ceramic finds and features, and while she notes the materials relevant to the *Orthia* leads in the British School at Athens archive, they have not been part of her published studies[18].

As already noted, two unpublished notebooks provide relatively detailed records of the square and levels for all the lead votives that were excavated at *Orthia*'s sanctuary[19]. The archive also includes pencil drawings of some of the lead votives, and daybook notes can help to further contextualise the lead votives if entries refer to them[20]. What I add to the previous studies of Boss and Luongo is a more detailed explanation of the *Orthia* lead votive notebooks, with the aim of making them more accessible to others, as well as some examples of how the notebooks help us to better understand the lead votives more broadly.

How were then were lead votives recorded? Take the page for square 74 in the first notebook (Sparta 19). It shows a representative entry (fig. 5). The number at the top of the page refers to the square from which the material was recovered (74). The different levels within the square are then given with a top and bottom height above sea level (in this case 195.41-.07 and 195.13-194.97). The type and number of votives in each level within the square are then recorded. This can then be recorded in tabular form (fig. 4).

SQUARE 74		
Level 195.41-.07	Votive type	Number
	Blob wreath	2
	Spike wreath	1
	Women	2
	Grilles	1
	Warriors	9
	Ionic capital	1
Level 195.13-194.17	Votive type	Number
	Blob wreath	2
	Spike wreath	2
	Women	6
	Grilles	2
	Warriors. Shield-type: none given	6
	Warriors. Shield-type: whirl	1
	Horses	1
	Lions	1
	Winged goddess – solid figure	1
	Lead relied of warrior	1
	Man with stick	1

This data provides us with the information to reconstruct and plot the distribution of the lead votives throughout the sanctuary, as well discovering the total number of any given type of votive. This is, however, not an easy task. While Boss' study focused on providing a detailed iconographic study of the lead votives, and from that, on developing a revised chronology of them, he did make some headway into an analysis of the distribution of the lead votives. He published a few graphs comparing the total number of lead votives according to the general areas from where they were excavated. However, the published graphs provided few accompanying figures, and while he noted the use of the square and level system, he only provided graphs for specific areas that are mentioned in the notebooks, and not individual squares or levels within

[17] Luongo 2014, pl. 1.

[18] Luongo 2017a, p. 66, n. 23 and p. 67, n. 31.

[19] British School at Athens archive: Sparta 19 (Lead Figurines 1: 1906-1908) and Sparta 20 (Lead Figurines 2: 1909-1910). Both notebooks were written by Walter Sykes George (1881-1962), for biographical and bibliographical details, see Gill, 2011, pp. 339-340.

[20] British School at Athens archive: Sparta 31 (Notes and drawings of lead figurines), T. E. Peet.

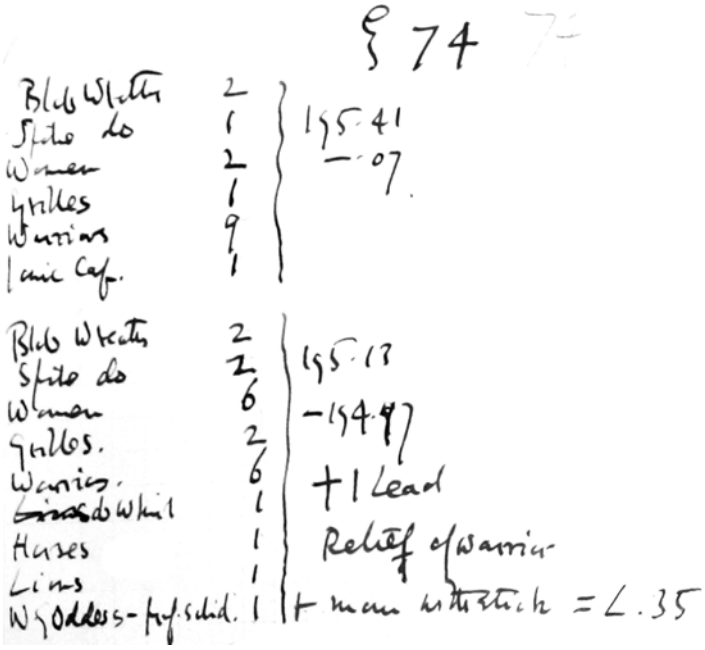

Fig. 5. BSA Archive, Sparta 19, square 74.

squares.[21] Further, the handwritten nature of the notebooks leads to, at times, uncertain readings, and it is less than certain that there is a total consistency in the terms used to describe the votives. These are considerations that Boss, as far as I can tell, does not directly discuss. Additionally, the terms used in the notebooks were not always kept in the 1929 publication.

I leave a more thorough examination of how Wace used the square and level system to inform his chronology of the lead votives for a forthcoming chapter[22]. For this article, I will provide a short example of how the detailed account of types and numbers of votives recorded in the notebooks helps us to reconsider some assumptions.

There has been a tendency to think that where Wace recorded a large variety of different moulds of any type of votive, that that also meant that there was a numerical large amount of those types of votives (that more individual moulds equalled a popular votive type). This has been the case for the musician types[23]. However, the notebooks give a total of only 277 musician types (see fig. 6 for a breakdown of types)[24]. Music was an important aspect of religious worship at *Orthia*'s sanctuary (the site contains fragments of the earliest surviving Hellenic aulos)[25]. By better understanding the full extent to which musicians did or did not dominate the wider iconography present in the sanctuary, we are in a better position to understand the nature of the overall assemblage. One noticeable observation here is that 229 aulos-players are recorded compared to only 48 lyre-players. The lyre is often held-up as a significant instrument in Sparta, but within the context of religious dedications at *Orthia* the aulos, numerically, appears to have been more significant.[26]

Lyre	Lyre tortoise[shell]	Lyre 'running man'	Lyre player female
11	3	1	3
Lyre player male	Lyre player	Flute	Flute pigtail
1	29 or 30	17	14
Flute pigtails	Flute player 'vax'(?)	Male flute player	Female flute player
8	53	38	13
Flute player	Nude men (flute player)	Flautists	Female flautists
76	1	8	1

Fig. 6. Tally of musicians recorded in BSA Archive, Sparta 19 & 20, using the terms used in the notebooks (excluding cymbal players).

[21] Boss 2000, pp. 147-153.
[22] Lloyd (forthcoming).
[23] Muskett 2014, p. 166 writes: "The Liverpool material also includes examples of the figurines of musicians and dancers which were frequent finds at the sanctuary." The author of this article also assumed this until examining the notebooks.
[24] There is a margin of error here. Given uncertainties in handwriting, the total number could also be 293.
[25] Dawkins 1929, pp. 236-237. For a new analysis see Lloyd 2019, pp. 38-69.
[26] Lyre or kithara plectra have been found at *Orthia*'s sanctuary, as well as the earliest known Greek aulos fragments: see Lloyd 2019, pp. 38-69 for further references.

Nevertheless, taken together with the numbers given in fig. 2, the overriding feature of the lead votives is that they were largely quite generic. Nearly 6 out of every 10 lead votives deposited at the sanctuary of *Orthia* was a type of wreath, a miniaturised symbol of devotion. However, given textual and visual evidence concerning the different uses of wreaths in Sparta, it is possible that the different types of lead wreaths could have had contextual meanings beyond their generic symbolism[27].

The lead votives are also generic in the sense that beyond the categories of 'women', 'goddess', and 'warrior', any unique attributes and skills attached to the figurines are numerically underrepresented compared to the assemblage as a whole (using the case of the musicians, a specific attribute, as a case study). The votive figurines act as a largely unified community of images. When viewed like this, might not the 'warrior' votives be better understood as representing male citizens, or examples of heroic form, and the 'women' votives, as women citizens, reinforcing the total community of worshippers who dedicated the lead votives at Spartan sanctuaries, and at *Orthia*'s sanctuary in particular, symbols of different roles according to gender and occasion?

If so, this makes the production of specific types in small numbers all the more interesting[28]. Were the more specific types used in the same way as larger 'generic' categories? Who was requesting and producing them, and why? What relationship was there between the dedicator and the craftsperson who made the votives? Do the musician votives represent the dedications of musicians? We cannot know the answers to all of these questions, but by asking them we can better appreciate the possible ways in which the lead votives could have contributed to the reinforcement of key Spartan socio-cultural and religious ideologies and identities.

The use of lead to make these votives, and the largely generic nature of their depictions, is not a sign of a so-called Lycrugan austerity (the votives co-existed after all with dedications of ceramics, ivory, and bronze), but, I suggest, a deliberate consideration in the creation of a religious custom that could involve the Spartiate community in a shared act of worship paired with the highly personal act of dedicating a miniature votive[29]. Lead was likely very easy to procure, both as an import, but also locally. Lead's low melting point (327.5°C) paired with the use of sand-casting from wooden moulds would have facilitated the fast and scalable production of votives that were artistically intricate while still maintaining the flexibility to produce more unique and personal types of votives, perhaps not only to match the expectations or requests of those acquiring the lead votives from their manufacturers, but also the occasion of different festivals and acts of more personal worship within the sanctuary too.

Scientific analysis

Having laid out the benefits of archival study to our understanding of the Spartan lead votives, I will now look at the types of questions that scientific analysis can help us address. Provenance and material composition studies, such as Pb isotope analysis and pXRF respectively, allow us to better understand the actors, networks, and knowledge needed to produce the lead votives[30]. The lead votives have traditionally been viewed as low value items, given their diminutive size and the cheapness of lead, but this ignores the value of labour and the processes used to make them, as well as their wider symbolic and religious value[31]. Further, such views tend to give undue stress to ideas concerning the influence of Lycurgan laws in Sparta during a period that is otherwise regarded as largely un-Lycurgan in spirit.[32]

[27] On the religious role of *stephanoi*, see Blech, 2011. I provide some specific examples from Sparta. Sosibius *BNJ* 595 F5 tells us that *thyreatikoi* or *psilinoi* were worn only by the chorus-leaders at the *Gymnopaidiai* (or perhaps the Parparonia). A Classical Lakonian stele shows two women and a smaller figure approaching an altar with a wreath held high in their right hands (British Museum, London, 1843,0531.14). In Archaic Laconian black figure pottery wreaths are sometimes worn by diners and dancers (e.g. Michael C. Carlos Museum, Emory University, 2006.042.001A-B, where the musicians wear a wreath). Following Pipili 1987, p. 30, wreathes might have also acted as symbols of unity in Sparta in certain contexts. See Tod, Wace 1906 no. 1 (two figures on a pyramidal stele, perhaps Helen and Menelaus) and no. 447 (a stele dedicated to the Dioskouroi), both are Archaic. The two figures on each stele hold or exchange a wreath.

[28] Cavnagh, Laxton 1984 record 561 moulds used for only 61 different varieties of votive.

[29] See Ekroth 2003 for considerations on the association of miniature dedications with the dedications of the poor and Pilz 2011 on the semiotics of miniaturisation, who concludes that (p. 24) "... miniature objects frequently play important roles in propagating and reinforcing ideologies, particularly in cases where their connotative meanings refer to social role models."

[30] For previous Pb isotope studies of the Spartan lead votives see Brill, Wampler 1967; Brill 1970; Gill, Vickers 2000.

[31] E.g. Tod, Wace 1906, p. 230: "At Sparta we know that under the laws of Lycurgus iron and not gold or silver was used for coin. It seems then probable that these leaden figurines were the Spartan substitutes for votive offerings in precious metal. Offerings of gold and silver must have been common at nearly all Greek shrines... leaden figurines would have been cheap, and as they could not be sold or turned to any useful purpose, there would be great accumulations of them at the shrines."

[32] For the wider problems concerning when exactly a more austere Spartan society began to emerge, and the uneasiness of dating its emergence to before the late 6th century, see Powell 2018, p. 20 ff. Cartledge 2002, p. 111 comments: "In short, the cultural picture for Lakonia between c. 775 and 650 has no features in common with the image of sterility beloved by the ancient and-more reprehensibly-the modern 'mirage'."

Inv. No.	Description	Wace Period	208Pb/206Pb	207Pb/206Pb	Group
23.11.31vv	Female votary (two fragments)	?	2.08410	0.84076	1
23.11.31c1	Frag. of warrior (?) plume/ hair, facing r. (?)	?	2.08411	0.84078	1
23.11.31zzzz	Winged goddess	?	2.08500	0.84080	1
23.11.31g1	Frag. earring, spoked acanthus (?)	Lead 1/2	2.08418	0.84076	1
23.11.31ee	Pendant/ earring with 14-pronged rosette shape,	Lead 1	2.08420	0.84077	1
23.11.31jj	Warrior	Lead 6	2.08390	0.84076	1
23.11.31F1	Cockerel	?	2.08404	0.84080	1
23.11.31r1	Animal (?) fragmentary and worn.	?	2.08410	0.84080	1
23.11.31o1	Animal	?	2.10005	0.85353	2
23.11.31kk	Poseidon with trident and fish type	Lead 5	2.09803	0.85319	2
23.11.31qq	Winged deity	Early?	2.09902	0.85331	2
23.11.31e2	Aegis wearing snake goddess (?) Quite worn	?	2.09794	0.85285	2
23.11.31gg	Solid disc with raised centre (cymbal?)	Lead 6	2.09802	0.85322	2
23.11.31ii	Solid flat disc.	?	2.07811	0.83796	3
23.11.31FF	Solid disc with raised centre (cymbal?)	Lead 6	2.07703	0.83811	3
23.11.31XXXX	Female votary, facing right.	?	2.07689	0.83790	3
23.11.31a2	Winged goddess	Lead 6	2.08399	0.84389	4
23.11.31x1	Winged goddess (top half)	?	2.08440	0.84390	4
23.11.31d	Warrior with shield	?	2.11325	0.86699	5

Fig. 7. Pb isotope analysis of lead votives from the sanctuary of *Orthia* now in the Ure Museum, Reading.

Further, these lead votives provide an almost unique opportunity to reveal information about Spartan industry and trade at a scale and certainty that is difficult to achieve with other materials and methods. There is the potential to learn about what is coming into Sparta, and from where, rather than what is being exported from Sparta (such as pottery and bronzes). Scientific analysis of the Spartan lead votives can help provide us with the data needed to address these issues.

This next section publishes for the first time the results of Pb isotope analysis conducted on nineteen, and pXRF analysis on 58, lead votives from the Ure Museum of Greek Archaeology, Reading, and offers some initial interpretation of results. The following data should be read with the proviso that they represent a very small sample, c. 0.019% of all the lead votives found at *Orthia*'s sanctuary. One of the reasons for using more than one method of analysis was to see if there was any correlation between the two results.

At the time of the experiment, it was known the pXRF was unlikely to return overly reliable results, since it can only penetrate a few layers into lead. Nonetheless, the method was tried since if did return useable results the method

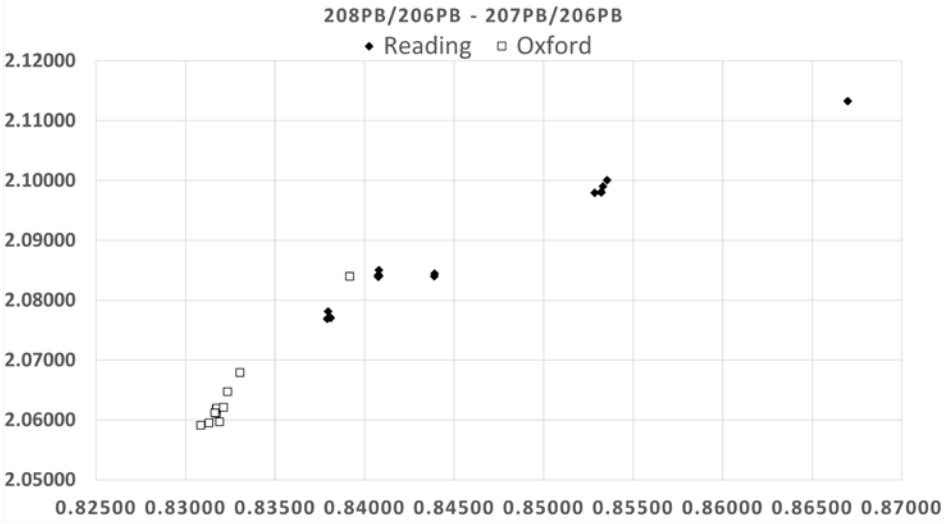

Fig. 8. Pb isotope analysis, Reading and Oxford votives.

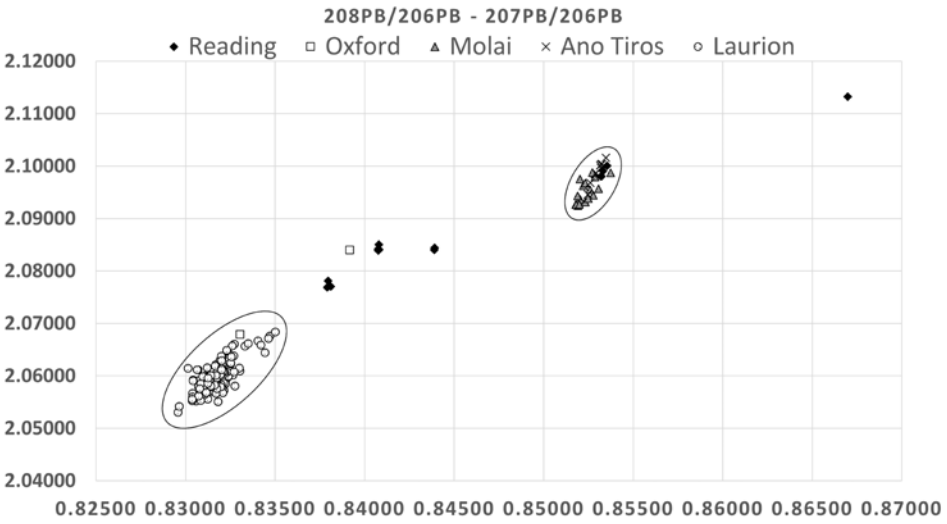

Fig. 9. Pb isotope analysis showing the correlation between Reading Group 2 and ore from Molai and Ano Tiros.

could then be used at speed on much larger numbers of votives, which would obviously have been of benefit. Ultimately, the expected result was achieved, and the results proved too varied to be reliable. In future, methods will be pursued to mathematically correct the pXRF results, taking into account the oxidisation of surface lead.

The 19 votives from the Ure Museum used for Pb isotope analysis were selected in order to represent both 'early' and 'late' types (based on Wace's chronologies). Even though Pb isotope ratios are not affected by metallurgical process, it was decided to test internal samples of lead, in case there had been surface contamination from other lead votives. This was achieved by using a micro-drill, used on the side or back of the votives to minimise the visual effects of the process. The lead was then weighed and diluted in hydrochloric acid, before then beginning tested with a mass spectrometer. The results for the 208Pb/206Pb and 207Pb/206Pb ratios were within the accepted margin of error[33], however, the ratios for 206Pb/204Pb were not, and so are not included here[34] (fig. 7).

These ratios were then plotted against those published in Gill and Vickers' study and the data for lead ores from Greece in the OXALID database, with relevant locations then being plotted (figs. 8 and 9)[35]. Based on this, the lead votives tested at Reading can be divided into five groups based on their Pb isotope ratios (fig. 7). The most interesting is Group 2 (five votives), which can probably be matched to a lead source from the geological area ranging including Molai and Ano Tiros in Laconia, which seem to have overlapping lead isotope ratio fields. The data for the ores from

[33] Stos-Gale, Gale 2009, pp. 196-198.

[34] Generally, lead isotope provenance studies include two tables, plotting 208Pb/206Pb and 206Pb/204Pb against 207Pb/206Pb. While only plotting 208Pb/206Pb and 207Pb/206Pb leads to less discrimination between potential sources, the current data still provides accurate enough information for the purposes of this study. However, in future studies it would be preferable to include data for the three different isotope ratios. See Pernicka 2017, pp. 3-4.

[35] Oxford Archaeological Lead Isotope Database: http://oxalid.arch.ox.ac.uk/. Gill, Vickers 2000.

Molai and Ano Tiros, while certainly not as extensive as that from Laurion, is still quite good. Ano Tiros has eight samples (one galena, seven chalcopyrite /galena), and Molai has 18 samples (all galena)[36].

Thus, it seems likely that the lead used for Group 2 could have been sourced from (east) Laconia, though it is difficult to say for certain if it came specifically from Molai or Ano Tiros. Given that there are no ore samples from the region, we should also not rule out the possibility of Kardamyli as a source of local lead, as others have suggested[37]. Given the nature of Pb isotope analysis, it is also possible that the lead used in the votives of Group 2 could have come from another mine (in the general area or elsewhere) from which ore samples have not been taken, but which might nonetheless have a similar ratio of lead isotopes to the ore from Molai and Ano Tiros[38]. The leads from Group 2 range from what can stylistically be matched to early votives and late votives.

Group 1, while not obviously connected to any known source of lead, provides the tightest cluster of isotope ratios. Some of the votives are clearly early types[39]. Others are too damaged to properly identify. Group 3 is also of interest, with three closely grouped samples, yet not from any obvious known source of lead. There is little to be drawn from groups 4 and 5, containing only two and one votives respectively, however, they seem to suggest even greater variety in terms of potential sources of lead, or, perhaps more likely, the mixing of different sources of lead, which would alter isotope ratios[40]. None of the votives tested have isotope ratios that matched those known for Laurion.

Taken with earlier Pb isotope studies, this new data would seem to suggest that variant sources of lead were used to make the Spartan lead votives. Whereas it had previously been argued that either Laconian lead or Laurion lead was used, these results suggest that both could have been sources, and that other unknown or untested sources might have been used, or, perhaps more likely, that lead from different sources was mixed together to make the votives in Groups 1, 3, 4, and 5. The suggested presence of lead from Laurion in Gill and Vickers' study, and the suggested presence of Laconian lead demonstrated in this study, cannot at the moment be linked to any specific period of the lead votive's production. In fact, it can be demonstrated that in the early and late periods of the leads' production both Laurion and Laconian sources seem to have been used (at least using Wace's Group categorisations). A larger study would likely reveal the extent to which the makers of the lead votives relied on one source in relation to another, and whether any changes can be observed over time, as well as the proportion of votives made from lead from a single source or from recycled or mixed lead[41]. This will in turn help us to better understand the extent to which the Spartans relied on local or imported supplies of lead, a metal vital for construction, fishing, warfare, and in a range of other areas.

Conclusion

Most of our understanding about Spartan trade and commerce during the Archaic and Classical periods focuses on bronze and pottery (often exported examples), specific events highlighted by Herodotus and other contemporary writers, and the assessment of claims made by later sources about the existence of some kind of Lycurgan austerity. The lead votives provide us with the opportunity to think about Spartan trade and commerce in terms of the materials resources within Laconia and those that were imported. By applying the scientific analyses similar to those highlighted here, we can better understand Spartan trade and commerce at a scale of quantity and chronology not possible with other materials. By studying archival material, we can better understand the types of lead votives that were produced and the numbers and distributions of those votives within the sanctuary of *Orthia*. The use of both methods places us in a stronger position to understand this unique aspect of Spartan material religion, including the reliability of the conclusions made about the lead votives in 1929.

[36] All the samples had a run quality of 'v. good' or 'good' (OXALID database). Pernicka 2014, p. 250: "some deposits show a small variation in their lead isotope ratios and those are the ones that can best be used for provenance discussions. It is often found that lead ore deposits show this behaviour. In such cases, five to ten analyses may be sufficient for their characterisation." But see Stos-Gale, Gale 2009, p. 203: "Ideally, it requires analyses of about 30 to 50 different ore samples from a particular ore deposit to establish its characteristic lead isotope field...".

[37] E.g. Cartledge 2002, p. 111; Thommen 2013, p. 73.

[38] Dr. Chrysanthi Gallou, 2016, private communication, informs me that there is an "unpublished zinc-lead mine site (in which geologists have told me that they have found traces of ancient activity) ... in the region on Molaoi in southern Laconia...".

[39] As Cavanagh, Laxton 1984 note (p. 35) concluded that (in relation to distinguishing the Lead 3 and 4 style periods at the Menelaion), "it was impossible to define the groups in such a manner that a lead of unknown date could be assigned to one style or another. Thus, deposits can de dated securely only on the grounds of a reliable sample which can be compared either through the frequencies of the broad varieties or specifically in terms of moulds." There is a similar problem with the *Orthia* leads. Since the lead votives from *Orthia* in the Ure Museum were acquired with no documentation on their period or context, only some of the votives can be visually matched to moulds found only in specific periods (as published in Wace 1929). Those that are Lead 1 or 2 I count as early, those that are Lead 5 or 6 I count as late.

[40] See Stos-Gale, Gale 2009, p. 205.

[41] Such a study would also benefit from a new sampling of ores in Laconia.

As demonstrated here, the initial enquiries into the *Orthia* lead votives using these two methods have proven fruitful and challenge previous interpretation of the votives. Until now, there had been no Pb isotope analysis to support the claim the local lead was used in make the votives. In combination with the groups of lead votives analysed here that might have been used with recycled or mixed lead, and the evidence for votives having been made with lead from Laurion too, we now have evidence for a more complex system of procurement that did not rely on lead from a single source.

Research into the archival records related to the *Orthia* lead votives reveals how they were recorded during excavations, and highlights certain problems and avenues for further research. In particular, by better understanding the generic and specific qualities of the assemblage, we can better understand the use of a cheap metal such as lead, not as a symptom of Lycurgan austerity, but as a symptom of a form large-scale communal worship that sought to emphasis the unity of Spartiate identities and ideologies while leaving room for the production of more specific votives as required.

Acknowledgements

Many thanks are given to Stuart Black and Chris Speed for helping with the Pb isotope and pXRF analyses respectively, as well as Amy Smith for granting permission for these analyses to be carried out on the votives from the Ure Museum, and to Jayne Holly for additional assistance. Many thanks are also due to Amalia Kakissis for her support in accessing the materials from the BSA archive mentioned here. Any errors in this article remain my own.

Literature

Artemis Orthia = Dawkins R. (ed.), *The Sanctuary of Artemis* Orthia *at Sparta*, London 1929.

Blech 2011 = Blech M., *Studien zum Kranz bei den Griechen*, Berlin, Boston 2011.

Boardman 1963 = Boardman J., *Artemis* Orthia *and chronology*, in *Annual of the British School at Athens*, 58, pp. 1-7.

Boardman 1999 = Boardman J., *The Greeks Overseas: their early colonies and trade*, London1999.

Boss 2000 = Boss M., *Lakonische Votivgaben aus Ble*, Würzburg 2000.

Brill 1970 = Brill R., *Lead and Oxygen Isotopes in Ancient Objects*, in *Philosophical Transactions of the Royal Society of London. Series A, Mathematical and Physical Sciences*, 269, 1193 (A Symposium on the Impact of the Natural Sciences on Archaeology), 1970, pp. 143-164.

Brill, Wampler 1967 = Brill R. and Wampler J., *Isotope Studies of Ancient Lead*, in *AJA* 71(1),1967, pp. 63-77.

Cartledge 2002 = Cartledge P., *Sparta and Lakonia*, London 2002.

Cavanagh, Laxton 1984 = Cavanagh W., Laxton R., *Lead Figurines from the Menelaion and Seriation*, in *ABSA* 79, 1984, pp. 23-36.

Dawkins 1929 = Dawkins R., *Objects in Carved Ivory and Bone*, in *Artemis* Orthia, pp. 203-248.

Dawkins, Droop, Wace 1930 = Dawkins R., Droop J., Wace, A., *Notes: A Note on the Excavation of the Sanctuary of Artemis*, in *JHS* 50.2, 1930, pp. 329-336.

Dressel, Milchöfer 1877 = Dressel H., Milchöfer A., *Die antiken Kunstwerke aus Sparta und Umgebung*, in *MDAI Athen* 2, 1877, pp. 293-474.

Ekroth 2003 = Ekroth G. 2003, *Small pots, poor people? The use and function of miniature pottery as votive offerings in Archaic sanctuaries in the Argolid and in the Corinthia*, in Schmaltz B., Söldner M. (eds.), *Griechische Keramik im kulturellen Kontext. Akten des Internationalen Vase-Symposions in Kiel vom 24.-28.9.2001*, Münster 2003, pp. 35-37.

Emre 1971 = Emre K., *Anadolu kursun figurinleri ve tas kaliplari / Anatolian Lead Figurines and Their Stone Moulds*, Ankara 1971.

Gill 2011 = Gill D., *Sifting the Soil of Greece: the early years of the British School at Athens (1886-1919,* in *Bulletin of the Institute of Classical Studies*, Supplement 111, 2011, pp. iii-474.

Gill, Vickers 2001= Gill D., Vickers M., *Laconian Lead Figurines: Mineral Extraction and Exchange in the Archaic Mediterranean, in Annual of the British School at Athens*, 96, 2001, pp. 229-236.

Heinz 2011 = Heinz S., *The lead statuettes and amulets of Heracleion-Thonis*, in *Pallas* 86, 2011, pp. 211-232.

Heinz 2015 = Heinz S., *The Statuettes and Amulets of Thonis-Heracleion*., Thesis, University of Oxford 2015.

Hodkinson 2000 = Heinz S., *Property and Wealth in Classical Sparta*, London 2000.

Lamont 2021 = Lamont J., *Cold and Worthless: The Role of Lead in Curse Tablets*, in *TAPA* 151.1, 2021, pp. 35-68.

Lloyd 2019 = Lloyd J., *Music in Ancient Sparta: instruments, song, archaeology, and image*, Thesis, University of Reading, 2019.

Lloyd *forthcoming* = Lloyd J., *"No figures warranted absolutely accurate": the final phases of the lead votives at the sanctuary of* Orthia, in Pagkalos, M., Scarpato, A. (eds.), *The Hellenistic Peloponnese*, London forthcoming.

Luongo 2013 = Luongo F., Cui Bono*? Perché tornare a riflettere sulle fasi arcaiche del santuario di Artemis* Orthia *a Sparta*, in *ASA Atene* 89, T. 1, 2011 (2013), pp. 79-94.

Luongo 2014 = Luongo F., *Il santuario di Artemis* Orthia *a Sparta. Precisazioni cronologiche e stratigrafiche delle fasi arcaiche*, Thesis, University of Salerno 2014.

Luongo 2017a = Luongo F., *The Artemis* Orthia*'s notebooks revised. New informations from old excavations*, in *ASA Atene* 93, s. III.15, 2015 (2017), pp. 63-79.

Luongo 2017b = Luongo F., *Il Santuario di Artemis* Orthia *a Sparta Nuove considerazioni sulle tracce di frequentazione più antiche dell'area sacra*, in Pontrandolfo A., Scafuro M. (eds.), *Dialoghi sull'Archeologica della Magna Grecia e del Mediterraneo. Atti del I Convegno Internazionale di Studi. Paestum 7 – 9 settembre 2016.* Fondazione Paestum, Vol. 1.3, 2017, pp. 595-604.

Luongo 2017c = Luongo F., *Nuovi dati da vecchi scavi Il materiale d'archivio del Santuario di Artemis* Orthia *a Sparta*, in De Caro F.L.S., Scafuro M., Serritella A. (eds.), *Percorsi. Scritti di archeologia di e per Angela Pontrandolfo*, Vol. 2, Paestum 2017, pp. 177-186.

Mitchell 1983 = Mitchell T., *An Urartian Lead Figurine from Toprak Kale*, in *Anatolian Studies* 33, 1983, pp. 157-162.

Muskett 2014 = Muskett G., *Votive Offerings from the Sanctuary of Artemis* Orthia*, Sparta*, in *Liverpool Collections. ABSA* 109, 2014, pp. 159-173.

Perdrizet 1897 = Perdrizet P., *Offrandes Archaïques du Ménélaion et de l'Amyclaion*, in *Revue Archéologique* 3.30, 1897, pp. 8-19.

Pernicka 2014 = Pernicka E., *Provenance Determination of Archaeological Metal Objects*, in Roberts B., Thornton C. (eds.), *Archaeometallurgy in Global Perspective: methods and syntheses*, New York 2014, pp. 239-268.

Pernicka 2017 = Pernicka E., *Provenance and recycling of ancient silver. A comment on "Iridium to provenance ancient silver" by Jonathan R. Wood*, Michael F. Charlton, Mercedes Murillo-Barroso, Marcos Martinon-Torres. J. Archaeol. Sci. 81, 1e12*, in *Journal of Archaeological Science* 30, 2017, pp. 1-4.

Pilz 2011 = Pilz O., *The uses of small things and the semiotics of Greek miniature objects*, in *Pallas*, 86, 2011, pp. 15-30.

Pipili 1987 = Pipili M., *Laconian Iconography of the Sixth Century B.C.*, Oxford University Committee for Archaeology 1987.

Powell 2018 = Powell A., *Sparta: Reconstructing History from Secrecy, Lies and Myth*, in Powell A. (ed.) *A Companion to Sparta*, Hoboken 2018, pp. 3-28.

Ross 1851 = Ross L., *Wanderungen in Griechenland* (Vol. II), Halle 1851.

Ross 1854 = Ross L., *Bleifigürchen vom Menelaïon*, in *Archäologische Zeitung* 12, 1854, pp. 218-219.

Dictionary of Art Historians = Sorensen L. (ed.), *Dickins, Guy*, in *Dictionary of Art Historians*. Retrieved May 13, 2021, Web site: https://arthistorians.info/dickinsg.

Stos-Gale, Gale 2009 = Stos-Gale Z., Gale N.H., *Metal provenancing using isotopes and the Oxford archaeological lead isotope database (OXALID)*, in *Archaeol Anthropol Sci* 1, 2009, pp. 195–213.

Thommen, L. 2013 = Thommen L., *Die Wirtschaft Spartas*, Stuttgart 2013.

Thornton 2020 = Thornton A., *Vivian (Whitfield) Wade-Gery (1897-1988),* web site: https://research.reading.ac.uk/curiosi/vivian-whitfield-wade-gery-1897-1988/

Tod, Wace 1906 = Tod, M., Wace, A., *A Catalogue of the Sparta Museum*. Oxford 1906.

Tsountas 1892 = Tsountas C., *Ex του Αμυκλαίου*, in *Arch. Eph.* 1892, pp. 1-26.

Wace 1929 = Wace A.J.B., *The Lead Figurines*, in *Artemis* Orthia, pp. 249-284.

W.-G. (Wade-Gery) 1930 = W.-G. (Wade-Gery), *Review: The Sanctuary of Artemis* Orthia..., in *JHS* 50.1, 1930, pp. 146-150.

Woodward 1929 = Woodward A.M., *Inscriptions*, in *Artemis* Orthia, pp. 285-377.