IRON PRODUCTION AND IRON VOTIVE OFFERINGS AT BORGO LE FERRIERE/SATRICUM
(8TH TO 6TH CENTURIES BC)

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ABSTRACT: The iron votive offerings from Votive Deposit I at Satricum (8th to 6th centuries BC) are presented in combination with the evidence for local iron production. The introduction of iron production in Central Italy is briefly discussed in order to establish a framework for the situation encountered at Satricum. This is supplemented by metallographic analyses of some of the 7th century BC iron artefacts from the settlement excavations. The paper is completed by an appendix recording all the iron artefacts known from Satricum.

KEYWORDS: Iron, production, iron votive offerings, Satricum, Italy, Orientalizing period.

1. INTRODUCTION

The proto-historic settlement at Borgo Le Ferriere, from now on referred to by its supposedly ancient name of Satricum, has been excavated since 1977 by the University of Groningen (Maaskant-Kleibrink, 1987: 1992). These excavations have revealed many data among which evidence for the production of iron artefacts from the middle of the 7th century BC onwards (Nijboer, in prep. a). This activity at the settlement cannot be linked directly to output or to a variety of iron objects since the number of iron artefacts from the settlement excavations is limited. Nevertheless, during diggings a century ago, many iron objects were excavated from both the Iron Age necropolis and Votive Deposit I (8th to 6th century BC).

The necropolis was recently published by Waarsenburg (1994). Unfortunately he did not document the iron artefacts comprehensively due to their state of preservation. Waarsenburg writes that “although the Northwest Necropolis has produced a fair amount of iron weaponry and utensils, most pieces have decayed beyond recognition” (p. 432). The complete content of Votive Deposit I, still awaits a final publication.

This paper intends to relate the evidence for the iron manipulation at the site with the iron artefacts actually known, since this would give some indications about the range of artefacts produced.

The distribution of the iron objects in the various contexts (votive deposit, necropolis and settlement: see appendix) in a period that iron was still considered valuable, is significant. In the settlement hardly any metal artefacts have been recovered, while in the Iron Age necropolis Cu-alloy artefacts are found side by side with iron objects though from 725 BC onwards iron weaponry was fairly common at Satricum (Waarsenburg, 1994: pp. 79, 89, 433). The majority of iron artefacts is found in Votive Deposit I (see figs 2 to 8).

Among the objects in Votive Deposit I are iron daggers, swords, knives, axes, sickles, spears, shafts, pins, bars, nails, rings, fibulae, pendants and bracelets. The amount of iron tools in this deposit is indicative for the prevalence of iron tools over copper alloy tools since hardly any copper alloy tools are recovered. Due to the fact that iron tools are outnumbering copper alloy tools by at least the middle of the 7th century BC, it can be concluded that by that period iron tools have replaced Cu-alloy tools at Satricum.

I will first briefly discuss the introduction of iron production in Central Italy in order to establish a framework for the situation encountered at Satricum. The second topic to be presented is the actual evidence for the manufacture of iron artefacts at Satricum. The smithing slags will be discussed in more detail and this section is supplemented by metallographic analyses of some of the iron artefacts from the settlement. This topic is followed by an actual account of the iron artefacts attributed to Votive Deposit I and an epilogue. The paper is completed by an appendix recording all the iron artefacts from Satricum.
2. IRON PRODUCTION IN CENTRAL ITALY

The development of iron technology can be described as three stages (Snodgrass, 1980: pp. 336-337):
- The first stage constitutes the production of iron ornaments;
- The second stage is marked by the introduction of iron tools with sharp cutting edges; however, in a smaller quantity than similar Cu-alloy tools;
- The third and final stage is identified by the prevalence of iron tools over Cu-alloy tools.

In the same article, Snodgrass continues in a review on the introduction of iron in various regions of the Mediterranean: “Etruriamay have movedtheadoption of iron somewhat later (from 800-760 BC onwards) than parts of southern Italy but in the end more comprehensively”.

Hartmann, who has examined the iron artefacts of southern Etruria from the 9th and 8th century BC, noticed that at Veii during the first half of the 8th century, iron was almost exclusively used for ornaments. He therefore accentuates the role of the 8th century BC iron ornaments not only from Veii but also from Tarquinia and Rome (Hartmann, 1985: pp. 285-289). In his opinion iron technology was introduced by the Greeks which he exemplifies by the excavation of a metal-working quarter at Pithekoussai dated to the second half of the 8th and the beginning of the 7th century BC (a.o. Klein, 1972: pp. 34-39).

The perception of the introduction of iron metallurgy in Latium is less definite due to the smaller amounts of iron objects recovered during excavations. According to Snodgrass (1980: p. 362), “the adoption of iron in Latium seems to have occurred detectably later: working iron is rare before the 7th century, and even then it only slowly displaces bronze as a practical metal”. This view can no longer be supported by the evidence from Satricum, nor from other sites in Latium like Castel di Decima, Osteria dell’Osca and Caracupa. The use of iron artefacts steadily increased in Latium during the 8th century BC and did not start with stage I (the production of iron ornaments). From the 8th century BC onwards iron knives were available as well as iron ornaments. This combined use of iron for both tools and ornaments, is also characteristic for the 7 century BC (fig. 2). The contents of the tombs at Castel di Decima, which date from the second half of the 8th century BC onwards, reflect the rapid development of the use of iron in Latium. Tomb 15, for example, which dates from just before 700 BC, contained knives, a sword, spearheads, a spit and parts of a chariot, all made of iron (Zevi et al., 1975: p. 251). Further evidence of the early use of iron in Latium are the artefacts that were found in the 8th and 7th century graves in the necropolis at Caracupa. These included knives, spits, daggers, swords and fibulae (Savignoni & Mengarelli, 1903: p. 289). For the distribution of iron artefacts over the extensive, latial Iron Age necropolis of Osteria dell’Osca, I refer to the well documented publication of Bietti-Sestieri (1992).

In order to study the introduction of iron as a separate material group at Satricum, the iron artefacts dated to the Iron Age and belonging to the three different archaeological contexts are presented in the figures 2 to 8 and in the appendix.

3. MANUFACTURE OF IRON ARTEFACTS AT SATRICUM

Many smithing slags were recovered during the excavations on the acropolis. These slags can be classified as (Sperl, 1980: pp. 14-19; Bachmann, 1982: pp. 1-6, 30-34; Tylecote, 1987: pp. 310-321):
- a. Plano-convex shaped smithing hearth bottoms, magnetic;
- b. Smaller, relatively light and porous, non-magnetic slags, metallurgical waste product of slag, ash and sand/vitrified fuel ash or cinder;
- c. Smithing slag lumps;
- d. Molten slag with traces of furnace/hearth lining.

The distribution of these slags on the acropolis at Satricum, is presented in figure 1. Two aspects have to be specified. First, that this map shows the concentrations of iron slags indicating three major concentrations, the oldest of which is dated to the second half of the 7th century BC. Secondly, I would like to mention the continuity of metallurgical activities at the site which is demonstrated by the various stratigraphical layers from which the concentrations originated. These could be dated from the 7th till the 4th century BC. However, most of the slags are found in the concentrations located at B11 and E19 and are dated to the late 7th and early 6th century BC.

Besides the smithing slags, the excavation of an area south of the temple (square B18) yielded a metal and pottery cluster. This cluster included a copper alloy vessel, bowl, bracelet and fibula, as well as iron axes, knives and a piece of raw, unworked iron (a bloom or billet). The associated pottery was bucchero, a black burnished carinated impasto bowl, fragments of a stand of impasto rosso, impasto jars and an impasto amphora decorated with a double spiral, all dating to the middle of the 7th century BC. These objects were recovered in the settlement area of the excavation, though the exact context is not yet published. However, the direct context of this assemblage, implies trade and production of metal artefacts (Nijboer, 1994: p. 9).

Several of the iron objects recovered at the settlement have been examined metallographically. Two knives and two axes were analysed as well as a raw iron nodule. With the exception of one knife, these items were part of the metal concentration in square B18 and are therefore dated around 650 BC. Knife S4607 is also dated to approx. 650 BC.

The core of knife S4607 did consist of a medium to high carbon steel with a hardness of 280 HV (Vickers
Fig. 1. Satricum, distribution map of iron slags excavated on the Acropolis.
micro hardness test). Two samples from the back of this knife had a lower carbon content and were less hard (150-167 HV).

Knife S5030 had a medium to high carbon steel cutting edge with a hardness of 292 HV.

The cutting-edge of axe S5030 was made of a medium to high carbon steel while the hardness varied from 245 to 290 HV. In one of the samples from this axe evidence for quenching was found. The blade and the socket did consist of either ferrite or phosphoric iron and were much less hard.

Axe S5099 had a low carbon steel and ferrite cutting edge and was relatively soft (135 to 187 HV).

On the basis of the metallographic examination it can be concluded that in the 7th century BC not all the parameters of smelting and smithing were fully controlled though the smiths were working with considerable skill. Various types of 'iron' were used for different parts of the objects. This can be observed best in knife S4607, where the core, tang (and most likely the cutting edge as well) consisted of a medium carbon steel (as these parts have to be hard) and the back of the blade had been constructed of phosphoric and ferritic iron, as this part had to be more flexible and tough. Nevertheless, a general absence of evidence for quenching was observed, though one sample (the above mentioned axe S5030) did indicate relatively rapid cooling.

The hardness of the artefacts was regarded sufficient for their function. Various parts of the iron artefacts that were examined, had a hardness around 280-290 HV, which is harder than is recorded for Cu-alloys (Scott, 1991: pp. 82-83; Coghlan, 1975: pp. 75-83). Quenched steel though, can obtain hardness figures up to 700-800 HV.

Analyses of the bloom/billet (S5030-3) showed that parts were of a hyper-eutectoid steel with more than 0.8% carbon while SEM-EDX analyses of two slag-inclusions in the bloom demonstrated that phosphorus (up to 2%) and manganese (up to 2%) were present in significant quantities indicating the use of phosphorus and manganese bearing iron ores (for a more complete report on the metallographic examination, see Abbingh et al., in prep.).

4. IRON ARTEFACTS FROM VOTIVE DEPOSIT I (8th to 6th century BC)

Votive Deposit I at Satricum has always been considered exceptional when compared with other early Votive Deposits in Latium. This is based on the enormous quantity of artefacts recovered, their high technical quality and the variety of objects. Therefore, the oldest Votive Deposit excavated at Satricum is considered to be one of the richest deposits of Latium (e.g. Satricum 1985: p. 97; Bouma, in prep.). Although this deposit was excavated about a century ago, it has unfortunately not been published completely.

Traditionally, Votive Deposit I is dated from 725 to 540 BC. This date is based on the early proto-corinthian pottery of the deposit (late 8th century BC) and the building of the first monumental temple, known as temple I (dated to approx. 540 BC). The traditional reconstruction of this votive deposit strongly rests on Greek secondary votive deposits which have been interpreted as a clearing of votives prior to the construction of a new sacred building. However, the field records, which were made by Fenelli during the excavation of Votive Deposit I at Satricum about a century ago, mentioned that the workmen were excavating at various places and depths near the temple. The objects which were recovered during this excavation were listed by him as belonging to the deposit. The artefacts were documented as groups according to the material they were made of. For example, the iron artefacts are listed as a separate group, are not recorded every day while the workmen were excavating as already stated, at various places and at several depths. This description does not suggest a secondary deposit but is more indicative for an open votive deposit in which at separate occasions votives became directly deposited in a pit in the sacred area. Moreover, this deposit did contain much local impasto pottery. A recent study has shown that items within this pottery group can well be dated before 725 BC (Maasak, in prep.). Therefore the character and date of the deposit is less clear than traditionally thought.

To some extent the iron artefacts from Votive Deposit I reflect the date of this deposit. In general, dating iron objects is difficult on account of various reasons like the endurance of tool and weapon forms and the ill-defined typology which is caused by the state of preservation of iron. Nevertheless, the initial phase of the deposit is indicated by some of the lance heads, axes, swords, sickles and daggers while the final stage is demonstrated by the iron rings and keys. For example the iron rings Nos 12 and 13 find parallels in copper alloy signet rings also found in Votive Deposit I and must be dated to the second half of the 6th century BC (Satricum 1985: p. 112). Most of the iron objects, however, should be dated to the second half of the 7th and the early 6th century BC. The dating of the various artefacts will be discussed in more detail further below.

This paper presents all the iron artefacts attributed to Votive Deposit I (figs 2 to 8). Momentarily, most of the iron objects shown in figures 2 to 8 are stored in the depot of the Museo di Villa Giulia in Rome, while a small selection is exhibited in the Satricum room of the museum. These objects are attributed to Votive Deposit I and are therefore presented as such in this paper. However, it is necessary to mention that about 10% of the artefacts, many of which are minor fragments, are registered as NN numbers. This means that at one stage, these objects have lost their inventory number. Therefore, they cannot be correlated directly with the field records and have been assigned to Votive Deposit I. Nevertheless
Fig. 2. Satricum, Votive Deposit I, iron ornaments.
Fig. 3. Satricum, Votive Deposit I, iron tools.
Fig. 4. Satricum, Votive Deposit I. Iron weapons.
Fig. 5. Satricum, Votive Deposit I, iron weapons.
Fig. 6. Satricum. Votive Deposit I, iron weapons, shafts and bars.
Fig. 7. Satricum, Votive Deposit 1. Iron keys, bars and nails.
the majority of the iron artefacts presented, are securely attributed to Votive Deposit I as is revealed in the appendix. A detailed report of the actual excavations of about a century ago and of the complicated post-excavation history is published by Waarsenburg in his thesis (1994: chapter 2).

The iron artefacts from Votive Deposit I, appear to confirm the singular character of the deposit. With respect to iron artefacts, I do not know of any comparable deposit in Central Italy, though the Archaic Deposit excavated at Anagni and which is dated from the 7th to the early 5th century BC, contained some comparable iron artefacts like a fibula, bracelet, lances and keys (Gatti, 1993: pp. 61-97). Another deposit in Central Italy with some related iron items, is the deposit of Brolio in the Val di Chiana. This deposit is dated from the late 7th to the early 5th century BC. Most of the artefacts are, however, dated to the late 7th and early 6th century BC. It contains some lances and axes which are similar to the ones found at Satricum in Votive Deposit I (Romualdi, 1981: cat. Nos 58 to 67). Though both the deposits at Anagni and at Brolio contain comparable
iron artefacts, they do not exhibit the quantity and variety of iron objects recovered at Satricum.

Votive Deposit I at Satricum can be correlated with the evidence for smithing in its vicinity and which is presented above. There are several other deposits in Central Italy with traces of smithing. For example, a votive deposit at Grotta Bella (Terni) contained slags and tools for iron-working such as hammers and a pair of tongs. It was proposed that artefacts were produced in the sanctuary for the use of pilgrims (Monacchi, 1988: pp. 75-99). Also in Rome various slags are documented from a layer with offering material found against the circular foundation platform of the Vesta temple. This layer was dated from the middle of the 6th cent. to the late 3rd century BC (Boni, 1900: pp. 172-183; Gjerstadt. 1960: pp. 310-320). However, these deposits did not reveal associated iron artefacts to the same extend as Satricum.

To my knowledge, the closest parallel both in quantity and context is a deposit at Philia (Thessaly). At Philia, dedications of iron artefacts as well as evidence for iron manipulation is documented (Kilian, 1983). The difference between both deposits is that at Satricum during the late 8th and first half of the 7th century a fair amount of ‘international’ imports were dedicated while the deposit at Philia must be considered a local or regional sanctuary.

Quite a few iron dedications at Philia, like tools, obeloi, knives, arrows, lances, butt-spikes, swords, semi-manufactured products, waste products and a bar (similar to the bar from Satricum No. 148; fig. 8) were excavated in the vicinity of the sanctuary. Waste-products of copper alloy manufacture are found as well as debris of a smithy. Some metalworking tools found near the sanctuary should be interpreted as belonging to workshops. Kilian mentions that for Greece, dedications of iron artefacts are fairly common in many geometric and archaic sanctuaries though unfortunately they are not often published. He associates these dedications with local production on account of accompanying evidence such as half-finished and waste products. Similar associations are likely to have occurred in Italy. For example the archaic votive deposits of Anagni and Satricum have revealed a large amount of iron dedications which for Satricum are also combined with waste products of smithing. This pattern may well have lasted into the republican period.

To a certain extent, the iron artefacts from Votive Deposit I can be correlated with the necropolis and the settlement of Satricum. Several tombs contained iron objects comparable with the iron objects recovered from Votive Deposit I.

Tomb II which is dated between 700/685 and 620, contained many lance heads with corresponding shafts and butt-spikes similar to the lance heads, butt-spikes and shafts from Votive Deposit I (figs 4, 5 and 6). The blades of the two swords from tomb II can be related to the blade of sword No. 58 (fig. 4). Similar blades of swords were excavated at Osteria dell’Osa in the tombs 54, 76 and 227 dated from 660 to 580 BC (Bietti Sestieri, 1992).

Tomb XIV for example, dated to approx. 675-650 BC, contained an iron sword which is similar to fragments 64 to 66 (fig. 4).

Several fragments of blades of swords and daggers found in tomb XVIII (dated in between 750/725-620/610 BC) are similar to the blade-fragments Nos 63 to 66 (fig. 4).

Some of the pendants from tomb XXV dated to approximately 640-620 are similar to the pendants 18 to 22 and 27 (fig. 2). This corresponds with the date of the iron pendants excavated at Osteria dell’Osa in tomb 401 (period IVA2: 660/650-630/620 BC; Bietti Sestieri, 1992). Several of the pendants found in this tomb are related to the pendants Nos 14 to 27 from Satricum (fig. 2).

Undoubtedly, more iron artefacts from the necropolis correspond to iron objects from Votive Deposit I. However, Waarsenburg did not fully document the iron artefacts from the Iron Age necropolis and consequently it was not possible to relate every iron item from the necropolis to iron artefacts from Votive Deposit I.

In the settlement, only a few iron objects were excavated. These objects can all be dated to the middle of the 7th century BC (see appendix). Both the knives and the axes from the settlement area are comparable with knife fragments and axes from Votive Deposit I (fig. 3).

The variety of iron objects recovered from Votive Deposit I, creates difficulties for the dating of the various objects. This diversity is unsurpassed in Latium and many artefacts are without parallels. Therefore they can only be dated on account of the general date given to the deposit. For example, the iron artefacts that look like spindle-whorls (fig. 2: Nos 32 to 37), can not be matched with similar iron objects from other sites nor can the bracelets with Cu-alloy inlay (fig. 2: Nos 28 and 30). The iron sickles (fig. 3: Nos 47, 48 and 49) are as far as I know, not attested in Central Italy (see items mentioned and registered by Hartmann, 1982) but are known in Southern Italy. At Francavilla Marittima several iron sickles have been found which all belong to the type with socket shaft and which are dated to the 8th century BC (Gualtieri, 1982: p. 163). However, the examples from Satricum do not belong to the type with socket shaft. Copper alloy sickles of the same form as Nos 47 to 49 were found in Central Italy, for example in the ripostiglio di Pariana (Bartoloni, 1989: p. 72, fig. 3.9). This deposit, however, is dated to the 10th century BC.

Another illustration of the complications encountered in attempting to date iron artefacts that are not recovered from closely dated archaeological contexts, is the group of axes from Votive Deposit I (fig. 3: Nos 50 to 57). These axes are relatively rare in Latium in the 7th though quite popular in Etruria during the 7th and 6th
...century BC (Stury, 1981: p. 181). This popularity is demonstrated by the deposit of Brolio in the Val di Chiana (Romualdi, 1981) and the tomba <dei flabelli di bronzo> (Minto, 1943: pp. 139-159, tav. XXXIII).

Axes, similar to the Satricum examples, were found in several necropolises in Central Italy with dates ranging from 760 to the early 6th century BC. Hartmann (1984) recorded two axes from Veii (dated 760 to 720 BC), one axe from Tarquinia (dated to approx. 725-700) and five from Vulci (mostly dated from 720 to 690 BC). For example, the axe from Veii tomb II JJ 19 (QF. 1963: pp. 210-212) is comparable with an axe from Satricum (fig. 3: No. 52).

The closest parallel in Latium is the tomba Bernardini in Palestrina where two square socketed axes (similar to fig. 3: Nos 50 and 52) and one shaft hole axe (similar to fig. 3: No. 57) were found (Canciani: von Hase, 1979: pp. 62-63). The tomba Bernardini is dated to the beginning of the 7th century BC. The square socketed axe from tomb 43 at Caracupa, dated around 650 BC, also resembles the axes from Votive Deposit I (fig. 3: Nos 50 and 51; Savignoni: Mengarelli, 1903: p. 325; Angle: Gianni, 1985: p. 200).

Examining the information available, I suggest to date the axes from Votive Deposit I to the 7th century. This is based on the examples from Palestrina and Caracupa and on account of similar axes in the settlement area of Satricum. Nevertheless, considering the character of Votive Deposit I, one can never exclude unconditionally both an earlier as well as a later date for these axes.

5. EPILOGUE

It can be deduced from the presence of iron artefacts in rich tombs in central Italy, that iron artefacts were still regarded as valuables during the 7th century and it is likely that this was still the case during the 6th century BC.

Reconstructing the development of iron technology in Greece, Pleiner states that iron remains a highly estimated material up to the beginning of the 5th century BC (Pleiner, 1969: p. 31). In order to be able to compare the development of iron technology in both Greece and Italy, it is interesting to present his view on the situation in Greece. Pleiner distinguishes two periods: the proto-Iron Age (12th-8th century BC) and the Early Iron Age (8th to beginning of 5th century BC). The proto-Iron Age was characterized by a gradual increase of iron objects. Individual tombs became equipped more extensively and contained iron swords, knives and tools. The 8th century BC must be considered as a period which brought many qualitative changes.

The Early Iron Age brought an ‘iron civilization’ with local metallurgy of iron and blacksmith’s crafts. Smithies were equipped with specialized tools while smiths mastered quenching techniques and the use of steel for manufacturing implements. Crafts without iron tools, agriculture without iron harvesting implements and woodwork without iron axes were no longer imaginable. The stage of specialized blacksmith work started from the 5th century BC onwards. There were several branches producing various sorts of artefacts like armourers, swordsmiths, cutlers and hoe-makers (Pleiner, 1969: pp. 30-31).

Though the development in Central Italy might to some extend be different, the presented data from Satricum match well with the description given by Pleiner for Greece during the 8th to 6th century BC since a large variety of iron objects can be observed. Satricum, however, is not the only proto-urban centre in Central Italy with evidence for the manipulation of iron (Nijboer, in prep. b).

For the initial phases of this development in Central Italy, we can examine the archaeological evidence from the Quattro Fontanili cemetery at Veii. The iron artefacts recovered from this necropolis indicate that there was a gradual increase in iron artefacts from onwards 800 BC with a marked development from 760 to 720. In that period both the number of iron objects as well as the variety of types increased sharply (Hartmann, 1984: pp. 59-61). In Vulci this development occurred in between 720 and 690 BC (Hartmann, 1984: p. 102). In Latium, the use of iron increased gradually during the 8th century while the 7th century displays an marked upsurge.

The technological evidence of this development, which is examined by metallographic analyses, corresponds with results from similar studies executed elsewhere in Europe. During the early period of iron technology, different types of iron were used (Pleiner, 1980: p. 388). In Central Italy some iron artefacts have been studied metallographically, the results of which can be compared with the analyses of the iron tools from Satricum. These studies were executed by Follo et al. (1988) and Panseri and Leoni (1960; 1961). Among the iron objects analysed are a dagger blade, an axe from Vetulonia and a sword. These objects are dated to the 7th and 6th century BC and are made of different types of iron as was also observed in the Satricum iron tools. Only the axe from Vetulonia (comparable to fig. 3: No. 52), was quenched with an hardness ranging from 560 to 125 HV depending on the different types of iron present (Panseri & Leoni, 1960).

The development of iron technology in Central Italy can, however, not be separated from the production of artefacts made from copper alloys. It is generally accepted that a labour division between copper/bronze-workers and iron-smiths had not yet occurred during the Orientalizing period (e.g. Pleiner, 1988: pp. 35-36; Hartmann, 1984: pp. 154-155; Ampolo, 1980: pp. 173-179). The combined use of copper and iron by the local ‘metallurgist’ of the Orientalizing period, could also explain the close parallels between objects made from either a copper alloy or iron. Moreover, there are several sites in Central Italy like Pithekoussai, Poggio Civitate...
and Acquarossa, where metallurgical manipulation of both copper-allies and iron appear simultaneously, while even on Elba and in Populonia copper and iron slags are found side by side (Nijboer, in prep. b; Crew, 1991: pp. 113-114; Fedeli, 1983: p. 177; Sperl, 1985: p. 49). This implies that if the output of the metallurgy workshop at Satricum is to be indicated, the number of Cu-alloy artefacts have to be considered as well. The evidence for the processing of copper alloys at Satricum is, however, circumstantial. There is indirect evidence for the casting of fibulae, since several of the fibulae types represented in Votive Deposit I, are identical and cast from the same mould. This suggests a local production from the 7th century BC onwards. Thus seven boatfibulae are exactly equal in size and decoration (No. 10658, Museo Villa Giulia), while sets of the same type of fibulae, each set decreasing in size, occur also in this deposit. Another indication of casting are droplets of copper alloy, specimens of which are occasionally found on the site. However, the difference between these droplets and the smallest aes rude is disputable. Nevertheless, the enormous amount of aes rude found at Satricum outside Votive Deposit I, may indicate a workshop area as well (Bouma, in prep.; Haeberlin, 1910: p. 3).

Considering the immense number of copper alloy artefacts in both the Iron age necropolis (Waarsenburg, 1994) and Votive Deposit I (e.g. Satricum 1985: pp. 95-116) and judging from the quantity of iron objects presented, it is possible to reconstruct full-time specialization for the production of metal artefacts, probably on a workshop level. Assessing the correlation between artefacts produced and the distribution of metal artefacts in the three archaeological contexts (sanctuary, necropolis and settlement), it could well be that at Satricum this metal-workshop was attached to the religious institutions.

6. NOTES

1. This paper would not have been possible without the kind assistance of various Italian authorities for granting me the permission to examine the Satricum material. Especially would like to thank dott. G. Scachiolone of the Museo Nazionale di Villa Giulia in Rome, the Soprintendenza Archeologia per il Lazio found the Comitato per l’Archeologia Laziale. Gratitude for their contribution, support and diligence, is also due to drs. J.W. Bouma, our draughtsman H. Waterbolk and my former students drs. J.W. Beestman and drs. G.R. Abbimg.

2. A full catalogue with descriptions of the iron artefacts from Votive Deposit I, which are presented in this article, will be published in my thesis.

3. The deposit at Brollo is recovered in 1863 and was originally considered to be a hoard of a metal workshop on account of the associated semi-manufactured products (expressed in a letter by Scipione Corradi printed by Romualdi, 1941: p. 64). Nowadays it is considered to be a deposit (Romualdi, 1981: p. 35).

4. I have intentionally left out the late 8th century BC, square socketed axe from Caracupa (tomb 1) since it is slightly different. Unlike the examples from Satricum it has a narrow eyelet underneath the shaft.

7. REFERENCES


GINGE, B., in prep. Italian excavations at Satricum (Borgo Le Ferriere) 1907-1910: Materials from the West necropolis, southwest sanctuary and the habitation area.


MAASKANT-KLEIBRINK M., 1992. Settlement excavations at...
In the appendix, the iron artefacts from the three archaeological contexts of the Iron Age/Orientalizing period at Satricum (sanctuary, necropolis and settlement), are described. These descriptions are based on the following literature:


**Votive Deposit I**

The iron artefacts are mentioned in the ‘Giornali’ by the custode Fenelli during the excavation of Votive Deposit I, from February 1st to May 4th 1896. The iron artefacts are listed as groups, and are not recorded day by day. The workers were excavating at various places and at several depths, which could be indicative for an open deposit and deposition as assemblages.

The original handwritten Italian text is for this purpose translated into English.

**February 1**
- Iron lance broken in four pieces, with traces of wood, length 440 mm;
- A similar lance broken in four pieces, with traces of wood;
- Another lance incomplete at socket, length 70 mm;
- Sterratore*, preserved length 75 mm;
- Another similar*, length 85 mm;
- Axe without socket, length 120 mm, width 95 mm;
- Part of another axe, length 135 mm, width 95 mm;
- Ring, preserved diam. 17 mm;
- Butt-spine without point, length 170 mm;
- Socket of a lance, length 160 mm;
- A circular ingot, in the centre of which there is a hole, may be to hold a stick, height 35 mm, diam. 45 mm;
- Many nails.

**February 4**
- Iron, a lance broken at the socket, length 70 mm;
- Two fragmentary nails.

**February 19**

A two amulets of iron sheet, one in the shape of a small circular case, closed on the upper side with a small bar, and the other of a semi-circular form;
- Fragments of a fibula di arco in pietra;
- Ring with rectangular bezel, diam. 16 mm;
- A circular ingot with a hole in the centre, diam. 55 mm, height 45 mm;
- A lance with incomplete point, length 320 mm;
- Some fragmentary nails.

**February 20**
- Iron *sterratore* fragmentary, length 140 mm;
- Axe, preserved length 150 mm;
- Circular iron nucleus with a hole in the centre, diam. 45 mm;
- Lance broken in two pieces and fragmentary point, length 180 mm.

**February 21**
- Iron, bracelet of cylindrical rod, bended, forming two coils, diam. 75 mm.

**February 22**
- Iron, circular nucleus with a hole in the centre, diam. 52 mm;
- Two fibulae without tongue and bracket;
- Lance without socket, length 200 mm;
- Another similar one without socket and fragmentary at point, length 140 mm;

**APPENDIX: IRON ARTEFACTS RECORDED FROM SATRICUM**

In the appendix, the iron artefacts from the three archaeological contexts of the Iron Age/Orientalizing period at Satricum (sanctuary, necropolis and settlement), are described. These descriptions are based on the following literature:


**Votive Deposit I**

The iron artefacts are mentioned in the ‘Giornali’ by the custode Fenelli during the excavation of Votive Deposit I, from February 1st to May 4th 1896. The iron artefacts are listed as groups, and are not recorded day by day. The workers were excavating at various places and at several depths, which could be indicative for an open deposit and deposition as assemblages.

The original handwritten Italian text is for this purpose translated into English.

**February 1**
- Iron lance broken in four pieces, with traces of wood, length 440 mm;
- A similar lance broken in four pieces, with traces of wood;
- Another lance incomplete at socket, length 70 mm;
- Sterratore*, preserved length 75 mm;
- Another similar*, length 85 mm;
- Axe without socket, length 120 mm, width 95 mm;
- Part of another axe, length 135 mm, width 95 mm;
- Ring, preserved diam. 17 mm;
- Butt-spine without point, length 170 mm;
- Socket of a lance, length 160 mm;
- A circular ingot, in the centre of which there is a hole, may be to hold a stick, height 35 mm, diam. 45 mm;
- Many nails.

**February 4**
- Iron, a lance broken at the socket, length 70 mm;
- Two fragmentary nails.

**February 19**

A two amulets of iron sheet, one in the shape of a small circular case, closed on the upper side with a small bar, and the other of a semi-circular form;
- Fragments of a fibula di arco in pietra;
- Ring with rectangular bezel, diam. 16 mm;
- A circular ingot with a hole in the centre, diam. 55 mm, height 45 mm;
- A lance with incomplete point, length 320 mm;
- Some fragmentary nails.

**February 20**
- Iron *sterratore* fragmentary, length 140 mm;
- Axe, preserved length 150 mm;
- Circular iron nucleus with a hole in the centre, diam. 45 mm;
- Lance broken in two pieces and fragmentary point, length 180 mm.

**February 21**
- Iron, bracelet of cylindrical rod, bended, forming two coils, diam. 75 mm.

**February 22**
- Iron, circular nucleus with a hole in the centre, diam. 52 mm;
- Two fibulae without tongue and bracket;
- Lance without socket, length 200 mm;
- Another similar one without socket and fragmentary at point, length 140 mm;
February 24
- Semi-circular, hollow pendant made of two sheets bended together and at one end with a bronze ringlet, length 70 mm.

February 25
- Iron, three lance heads, all fragmentary, length from 190 mm to 340 mm;
  - Lance head without point, length 150 mm;
  - Two *sterratore d'aratio*, length 95 mm and 140 mm;
  - Two fibulae *ad arco ingessato* fragmentary, length 35 and 45 mm;
- Another similar one, preserved length 23 mm;
- Iron pendant with attached bronze ringlet;
- Iron nucleus, hole in the centre, diam. 47 mm.

February 28
- One *sterratore d'aratio*, length 110 mm;
- Iron bracelet, diam. 50 mm.

February 29
- Iron fibula without tongue, length 40 mm;
- Two incomplete lance heads.

March 2
- Iron, open bracelet of cylindrical rod, diam. 66 mm.

March 21
- Iron, lance, fragmentary at shaft, length 58 mm.

March 23
- Iron, fragments of lances.

March 26
- Iron, *sterratore d'aratio*, length 110 mm.

Last entree of this campaign is made on May 4, 1896. Fenelli documented in 1896 about 65 iron objects from Votive Deposit I apart from remarks as *molto pochi informi, frammenti di lance e molti chiodi*. Figures 2 to 8 total 148 iron artefacts from this deposit. The omission of quite a few iron artefacts recovered from Votive Deposit I, can be explained by the simultaneous excavations of the necropolis area from April 7th. 1896 onwards. These excavations had to be documented by Fenelli as well, which created serious difficulties for the registration (Waarsenburg, 1994: pp. 45-46).

The descriptions by Fenelli are accurate and most objects he described, can be related to individual objects of figures 2 to 8.

"*Sterratore and sterratore d'aratio*: Fenelli used either of these designations seven times and I can not relate this term to any of the objects. The terms, when translated literally, would mean 'digger' and 'digger of plough'. He could have intended ploughshares, but none of the objects of figs 2 to 8 looks like one (see for an image of a ploughshare, the famous statue of the *Aratore d'Arezzo* in the Museo Nazionale Etrusco di Villa Giulia at Rome). Considering that Fenelli only gave measurements of the lengths when he used either of both terms, and considering the lengths themselves, I can only relate these terms to some of the metal points, figures 5 and 6: Nos 86 to 97.

Iron from the northwest necropolis at Satricum (the inventory numbers are the Villa Giulia numbers)
Tomb 11 (between c. 780/685 and 620)
The iron weaponry was in a poor condition already at the time of discovery; their present state no longer allows for an analysis of their shape; the *Gioriade* mentioned two iron lance heads with the relative butt-spikes from the west corridor: reconstructed from the *Gioriade* are seven or eight iron lances and seven butt-spikes; the inventorybook describes:
- Eleven lance heads, inv. 11985;
- Two butt-spikes *di forno allungata*, inv. 11986;
- Two butt-spikes *conici*, inv. 11986;
- Sword and sheath: double edged sword with ivory-clad hilt and wooden sheath, inv. 11988;
- Iron sword, fragment of blade; doublededgedsword, inv.Cer/sn-73: l. max. 7.9; w. 4.2-4.4;
- Circular plaque: thick iron plate consisting of two contraposted, circular plaques with convex sides, welded together; one side has centrally the join of a vertical shaft with quadrangular section (0.5), inv. Cer/sn-72: diam. 7.2; th. 0.4-0.7;
- Circular plaque: thick circular plaque with convex side, inv. Cer/sn-72: diam. 7.0;
- Spike of grip?: oblong fragment of iron with roughly rectangular section, inv. ii/unit 3/sn-8: 1.7x2.1x0.6.

Tomb III (c. 650 to 630 BC)
- Double edged sword with traces of wooden sheath: corroded beyond recognition, inv. 11995;
- Two lance heads: corroded beyond recognition, inv. 11996;
- Large bar, cylindrical in section, terminating in a massive ovoid knob; function undefined, inv. 11997; l. 53.0; w. 1.3-2.6; w. knob 4.5.

Tomb IV (c. 640/630 BC)
- Thick iron nail (diam. shaft 0.8), cylindrical section; hemispherical bronze head, inv. 12006; l. max. 3.9; head 1.5.

Tomb V (c. 650/640 BC)
- Elongated lance with straight sides, inv. 12018; l. 11.5; w. max. 3.0.

Amber burial, tomb VI: date c.650/640;
- Iron spindles, fourteen fragments: iron shafts covered with traces of reed or wooden sheathing, inv. 12066; l. max. 4.9; diam. shaft 0.6-0.7; rings: th. 0.9-1.9; diam. 0.3-0.7;
- Iron shaft with turquoise glaze, inv. 12067; l. 3.8 and 5.1; diam. 0.85.

Tomb XIV (c. 675-650 BC)
- Lance head, inv. 12145: l. max. 17.3; w. max. 3.9;
- Lance (?), inv. 12147: l. max. 13.6-6.4 (?);
- Sword, in fragments, recognizable are: parts of the blade: an iron knob, presumably representing the pommel of the hilt; and a hollow bronze sheet lentoid knob which formed the final of the sheath, inv. 12146: l. max. 13.6; estimated total length: 30; pommel diam. 6.6.

Tomb XIX bis (c. 690/675)
- Iron object, decayed; inventory book: *cuspide di lancia inferro*, inv. 12221: l. 18.0; w. max. 3.5.

Tomb XX (8th century ?)
- Two iron lance heads: beyond recognition, inv. 12222.

Tomb XXIII (c. 620)
- Lance head: leaf-shaped blade with straight sides; circular shaft, inv. 12230; total l. 28.8; diam. shaft 3.7.

Tomb XXV (c. 640/620)
- Five butt (?): oblong conical hollow tubes, inv. 12235: l. 5.2-7.4; diam. shaft 2.3-2.8.

AJN: these objects are pendants, for parallels see Votive Deposit I, fig. 2: Nos 18 to 22.
- Two hemispherical hollow knobs: circular to oval outline, inv. 12236; diam. 3.5; h. 2.1 and 2.3.

The multiple burial complex Tumulus C: the graves of Tumulus C contained objects ranging in date from the mid 8th to the late 7th century BC. The iron artefacts from tombs VII, VIII, IX and XVIII form part of Tumulus C.
Tomb VII: date c. 775/750
- Knife: short, broad blade with straight cutting edge; straight back, rounded towards the point; spine of grip with quadrangular section, inv. 12081: l. 15.6; w. 3.2;
- Utensil: oblong iron utensil; quadrangular in section, inv. 12079: l. 11.3; w. 1.3;
- Nail: iron shaft with cylindrical section, inv. 12080: l. 13.2; w. max. 1.5.

Tomb VIII: date c. 675/650-c. 630/620
- Sword: double edged blade. Reportedly found with traces of wooden sheath, inv. 12097: l. 9.0; w. 3.0-3.9; th. 0.6;
- Shaft: oblong iron object, rounded section, inv. 12099: l. 7.2; w. 0.6;
- Ring: circular ring, circular section, inv. 12098: diam. 8.4; section 0.9;
- Iron nail: pointed shaft circular section, inv. VIII/sn-1: l. 5.1; diam. head 0.6;
- Bronze-sheet cylinder with iron core: the object consists of a thin bronze sheet, wrapped over an iron core which appears to thicken towards the central part, inv. II.11990: est. total l. 18; l. frags. 9.0; 5.2; h. 3.2-3.4; w. 4.0-4.

Tomb IX: date 700/650 (C1); 640/620 (C2)
- Lance head(?): oblong rectangular piece of iron, with spine-like protrusion on one end, inv. 12105: l. 17.9; w. max. 3.7;
- Nail sheath, No. 1907.

Tomb XVIII: date c. 750/725-620/610
- Sword and wooden sheath: seven fragments of an iron sword, inv. 12216: l. max. 14.8; est. total l. 58; w. 1.4-6.7;
- Dagger with bronze-wire sheath: elongated blade, oval in section, in wooden sheath entwined with bronze wire. Hilt consisting of two bronze segments enclosing a bone or ivory grip segment, inv. 12217:1: total l. 37.4; l. blade 24.2; w. max. 4.2;
- Dagger or small sword with sheath: elongated blade with a central spine; wooden sheath entwined with bronze wire, inv. 12217:2: l. max. 6.8; w. max. 4.7;
- Two (?) lance heads: four fragments are preserved, two of which show the root of a tubular shaft, inv. 12215, (diam. 1.2-1.4).

Between 1907 and 1910, about 30 tombs were excavated from the northwest necropolis, which will be published by B. Ginge (1994). Of this group only the tombs containing iron artefacts are presented. Tomb 15: period IVb; fragment of iron; Tomb 22: period IVa; two pieces of iron weaponry; Tomb 25: period IVa and/or IVb: iron dagger with bronze-wire hilt; Tomb 30: period IVa: iron dagger with wooden sheath; Tomb sn-1: period IVb: iron knife, lance heads and a sword.

From the Iron age necropolis, approximately 65 iron artefacts have been registered in the study by Waarsenburg. This number consists partly of broken fragments and cannot be used as a definitive number. It gives merely an impression of the quantity of iron artefacts distributed over the excavated tombs.

Iron from the settlement
Cat. II No. 2087: fragment of iron knife, point of a knife, S4607 from Section dam lower level, full 7th century BC;
- Cat. II No. 2541: fragment of iron knife, part of knife which forms handle of a knife, S4233, Stratum Ia, artefacts found in part of the area of female activity of hut feature VII, first half of 7th century BC.

Both knife fragments are found in or near an activity area with associated finds as a stand, spools and bone and antler showing knife cuts (Maaskant-Kleibrink, 1992: pp. 69-70, 94-98).

In Square B 18 were recovered:
- S 5030: 2 socketed axes and a knife;
- S 5030/3: bloom/billet;
- S 5099: socketed axe.

This metal concentration included a copper alloy vessel, bowl, bracelet and fibula, as well as iron axes, knives and a piece of raw, unworked iron (a bloom/billet). These objects were recovered in the settlement area of the excavation though the exact context is not yet known. However, the direct context of this assemblage, implies trade and production of metal artefacts (Nijsboer, 1994: p. 9).