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FROM HOUSEHOLD PRODUCTION TO WORKSHOPS

Archaeological evidence for economic transformations, pre-monetary exchange and urbanisation in central Italy from 800 to 400 BC

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Archaeological evidence for economic transformations, pre-monetary exchange and urbanisation in central Italy from 800 to 400 BC

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In commemoration of my sister, Leny Nijboer-van Staaden.

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Albert Nijboer, Haarlem, December 1997

Preface

This thesis on social-economic transformations in central Italy during the period 800 to 400 BC, reflects my continuing curiosity in the material aspects of archaeology. The nature of this curiosity explains the structure of my research and thus neccessitates an account of the particular steps involved. The topic of research has had my interest for many years, beginning when I was an undergraduate student. My approach towards archaeology can be characterised as a combination of Humanities and Sciences. This approach is reflected in my *curriculum vitae* and in the present study.

As a consequence of my training at the University of Groningen, I became involved in the excavations at Borgo Le Ferriere, approximately 60 km. southeast of Rome. At this site, which is identified as ancient *Satricum*, information from three archaeological contexts is known, that is the necropoleis, temple precinct and the settlement. Due to the integral quality of the contexts and the longstanding and continuing research commitment, *Satricum* can be considered as an archetypal, classic site. The excavations at this site and the materials discovered, are the main point of departure for my research. This investigation evolved from the excavation at *Satricum* of pottery kilns, misfires and metal waste products which date from the 7th to the 4th centuries BC. The evidence for the production of pottery and metals was subjected to material analyses such as thin-sectioning of ceramics and metallographic examinations of iron objects. These investigations are incorporated and will be presented in detail.

In order to compare the situation at *Satricum* with corresponding settlements in central Italy, it became necessary to include information on industrustrial residues and structures from other sites. At this stage, the area of research increased rapidly which is mainly the result of a lack of technical information on primary production remains at archaeological sites. It eventually became necessary to present the archaeological evidence on technology and industry in both *Latium Vetus* and Etruria.

A complication while examining archaeological evidence on production and economy is the application of modern concepts to past conditions. Occasionally, terms such as urbanisation, market economy, demand, monetary units *etc*., are used for a society in which these ideas have another meaning when compared with our modern perception of the same concepts. Power, for example, was not based on capital but on land. The concept of capital had, therefore, a different connotation and some scholars even doubt if it existed at all in antiquity.[1] Moreover, theories on technology depend predominantly on changes occurring during and after the industrial revolution of the 18th and 19th centuries AD. For example, the ideas of Marx are based on an examination of capitalist societies and their advance from feudal ones while this thesis examines a society with only slightly increasing labour divisions. The concepts associated with a capitalist society characterised by an advanced rate of specialisation cannot be directly transferred to ancient Italy. Additionally, the techniques involved are fundamentally different in ancient societies when compared with the production technology in modern, capitalist societies. They appear fairly simple because automated machinery was unknown.[2] Therefore whenever possible I will define and specify the terminology used in order to relate these terms to the conditions encountered in central Italy during the period 800 to 400 BC. Nevertheless, all historical studies are subject to the problem that modern terminology is applied to past conditions. In a general sense I agree with Snodgrass who asked himself, when facing the same problem, how much does this matter? His reply was: '*Very little, I would argue*'.[3] At the same time, I have to stress that the economy during this period was embedded in social structures. As a consequence, the economic concepts applied only come

[1] *cf*. Finley 1981, 17-18, 185-91. However see: Morris 1994 b.

[2] *cf*. Hodges 1970, 144-205; Braudel 1979, *tome* 3, 469-70. For example, Braudel reports the technical feats in Ptolomaic Egypt but the constructed machinery was rarely employed for production processes.

[3] Snodgrass 1986, 47, 58.

alive when related to the prevailing social phenomena.[4]

The main topic of research are the technological and social-economic developments associated with the advance of the workshop mode of production. This may lead to the conclusion that too much emphasis is placed on functional facets of society. Though I am aware that religious and political aspects play a major role in more complex societies, these topics have not been fundamentally examined during my investigation. Whenever appropriate they have been included in order to illustrate a shift in demand or to explain specific circumstances but they are not discussed *per se*. It must be emphasised that a pre-industrial society is being investigated and that agriculture remained the solid base on which the development presented could ensue. The changes in craft specialisation should be considered as gradual changes with eventually major consequences. I will argue that a redirection of the production facilities is an intrinsic component of the centralisation processes occurring in central Italy from 800 to 400 BC. They are embedded in the transitions from village to towns, from communal to private property and from tribal to state formation. The advance of the workshop mode of production was an active component of these cultural transformations. It was both the result of past developments as well as agent of conditions to come. The increase in craft specialisation was, however, minor in terms of the percentage of the population who shifted their activities towards the production of commodities. By far most of the labour employed in central Italy during these four centuries, was still engaged in agriculture. This cannot be stressed enough since I do not want to impart the impression that I overestimate the extent to which the population of the proto-urban and urban centres in central Italy became engaged in industry and trade rather than agricultural activities.

This thesis, which has a strong materialist orientation, may also lead to confusion about my opinion on non-materialist issues which I would like to eliminate beforehand. The quote at the beginning of chapter I is a remark made by Braudel. He wrote that technique may be the body but not the soul of civilisations. The same could be said about the economy. Material development, techniques and economies are considered to be the substance of civilisations and these aspects elusively reflect the psyche of individuals and their world. Apart from the chapter on measurements and pre-monetary exchange, my main objective has not been to specify the relationship between the materialistic and ideational but to present the archaeological evidence for the advance of the workshop mode of production. My concern is how actual men shaped their material world with the means which were known to them. Whenever I digress on other than economic aspects I hope that I will manage to retain a balance between the general and the specific.

[4] Austin and Vidal-Naquet 1977, 7-8. These authors consider that '*one cannot apply the concepts and terminology of modern economies, for these apply only to the world for which they have been created*'. It follows that a presentation of the economy in antiquity is only appropriate when related to ancient social history.

Chapter I *FRAMEWORK*

'Mais la technique n'est peut-être que le corps, non l'âme des civilisations'.

Braudel 1979, *tome* 3, 55.

1.1 *Introduction*

My research describes the economic transitions in central Italy during the period 800 to 400 BC. It presents the development of the workshop mode of production and the means of pre-monetary exchange. Within this context the technological innovations of the 8th and 7th centuries BC are preeminent since they enhanced the process of craft specialisation. This chapter presents aspects which are essential for the rest of this study. It is basically incorporated to supplement the remainder of the text, to determine essential elements and to elaborate on the definition of the topic of research. The framework includes, for instance, theoretical background, chronology, method of study and agricultural foundations. In addition, an outline of the urbanisation process is presented as well as a general account of the economic, social and cultural development.

The period 800 to 400 BC is delimited by two historical processes. The upper limit of 800 BC represents the period prior to the arrival of foreign communities in Italy. By 400 BC Roman dominance in central Italy was well advanced and the centuries to come can be regarded as the preamble to the Roman Empire. With the fall of Veii in 396 BC and the incorporation of its territory in the *ager Romanus*, a new phase in the history of Italy is entered.[1] Thus, the period examined is historically defined though it is itself proto-historic due to a shortage of literary texts. Furthermore, the period 800 to 400 BC is considered to enclose the formative stage of the urban development in central Italy. The initial conditions of this process emerge during the 9th and 8th centuries BC while around the late 6th and 5th centuries BC this formative stage seems to be concluded. The length of the period that is four centuries, is related to the principle topic of examination which is the technological and economic transition that took place. Though the introduction of a new technique may be part of a specific moment in human history, the adaptation of the social-economic conditions of a cultural unit to this new production method, is subject to slower rythms. My research mainly deals with these slower rythms because the specific event of the appearance of a new manufacturing method is difficult to detect with archaeological means. Thus, the individual sites which are examined in the chapters II and III, each seem to illustrate a stage within a general social-economic transition.

The distinction between rythms of historical events was developed by Braudel who characterised three levels. The *histoire événementielle* entails the specific events in human history such as the list of foundation years of the Greek colonies in southern Italy. Beneath this level lie the slower rythms, the *conjonctures*, which includes the economic, agricultural and demographic cycles. Finally, there are the basic long term tendencies, the *longue durée*, which correspond with the almost unchanging landscape.[2] Within this framework technological adaptations have characteristics of *conjunctures* as well as *longue dureé*. Though the model by Braudel is important to understand the

[1] *cf*. Cornell 1995, 309-13.

[2] Braudel 1979, *tomes* 1 to 3. See also Attema and Hekman who discuss the influence of the *Annales* school on mediterranean Archaeology while reviewing some recent publications such as by Bintliff and by Knapp: Attema and Hekman 1993.

various time spans of historical events, as such it does not offer a theory for the process of culture change including the technological developments. These theories will be discussed in the next section of this chapter.

The study covers two distinct cultural regions, Etruria and *Latium Vetus*. Due to the different characteristics of both regions, which are reviewed elsewhere in this chapter, it may be possible to examine to what extent adjacent interacting societies modify one another at different stages in their development. The mechanisms of peer polity interactions can be detected in Etruria as well as *Latium Vetus* though they materialised differently in both regions. These mechanisms are reflected in warfare, competition, transmission of innovations and increased exchange of goods between the various autonomous units.

The vast cultural transition in both areas during the four centuries examined, entails economic, social, religious and political transformations. It is marked by an urbanisation process and by the development of early states. In economic terms a shift can be observed from societies with a predominantly subsistence economy to early civilisations with more varied forms of economy due to agricultural and craft specialisation. The material wealth of this period records the local application of new manufacturing techniques which made it for example, possible to copy prestiguous imports in ceramic or metal. Moreover, this wealth illustrates the significant increase in the local demand.

During the formative years of the Orientalising Period, there was a ready acceptance of innovation in consumption and production patterns. The adoption of new goods, ideas, people and techniques is an individual objective but when present as a characteristic of a society, it has considerable economic consequences. The open nature of the cultures of central Italy during the 8th to 6th centuries BC was stressed by Ampolo, Cornell and others.[3] Interregional contacts and alliances with Levantines and Greeks were comprehensive while Cornell underlines that the Etruscan influence in *Latium Vetus* is the result of a high degree of mobility and the amalgam of cultural traits.[4] Thus, the overall cultural transition in both regions is the outcome of acculturation. The presence of individuals with high status and prestige was essential for this process. It is in the burials of the elite that we find '*the most relevant evidence of interregional contact*'.[5] These contacts record the maturing transformations in which changes in consumption patterns resulted in increased demand for specific artefacts. Rathje for example, has emphasised the importance of the adoption of the *homeric* banquet during the 8th and 7th centuries BC. She based her observations on the extensive ceramic banquet service found at Ficana and architectural terracottas depicting banquet scenes. These banquets were marked by eating meat and drinking wine from a variety of newly introduced tablewares including the highly prized *keimelia.*[6] With a banquet, a host could assert his social position and express his wealth and authority. The competition which arose between the elite during the Orientalising Period from approximately 720 to 580 BC, induced the distinctive, conspicuous consumption as illustrated by the many high status tombs of the 7th century BC. This competition did affect other groups in society besides the elite. During the 7th century BC, the Etruscan tombs of individuals of intermediate status became gradually more elaborately furnished. Therefore the intensification of consumption reflects a significant economic evolution and is both a consequence of changes already established as well as the initiator of new developments. This is according to the adage that growth creates growth.[7]

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[3] *cf.* Ampolo 1976/1977; Cornell 1995, 157-9.

[4] Cornell 1995, chapter 6. He therefore considers the Etruscan rule of *Latium Vetus* a historical misconception. I will employ throughout this study the term Levantines when I am not able to distinguish the specific Syrian, Semitic, Phoenician or other cultural traits from the Levant. For diverse views on this problem I refer to: Röllig 1992, Niemeyer 1993, Strøm 1984 and Buchner 1982.

[5] Bietti Sestieri 1992 b, 220.

[6] Rathje 1983, 1990.

[7] *cf.* Braudel 1979, *tome* 3, 36-8.

The adoption of new production techniques during the 8th and 7th centuries BC is recorded by visible differences in the use of materials and the manufacture of artefacts. Evident changes were noticed in pottery technology and in metalworking while materials such as iron, gold and ivory became used on a considerable scale. The particular properties of the advanced technologies, stimulated local craft specialisation. To those familiar with this period, this does not come as a surprise. Nevertheless, it is essential to examine the various components of these technological transformations in detail because the perception of the steps involved is usually incomplete. The observed changes in manufacture have been commented upon but mainly as superficial remarks without a fundamental discussion of either the technology itself nor of its impact on society.[8] There are ample commendable publications which deal with the transitions in central Italy during this period but which mention the technological development as a fact which makes the correlations straightforward[9] or non-existent at all.[10] The number of studies which discusses a specific technique is much less. These investigations are usually restricted to one material only, while scarcely presenting the social-economic implications.[11] The present research tries to relate the technological development to the changing social conditions. The account is based on a comprehensive description of the archaeological evidence for the development of the workshop mode of production. For this purpose a distinction is made between the primary, secondary and tertiary sources:

- Primary sources in this thesis are industrial structures and waste products,
- Secondary sources are the manufactured artefacts while
- The ancient literary texts constitute the tertiary sources.

This distinction is necessary for a detailed reconstruction of the economic and social significance of the technological development. In the past, an inspection of merely the manufactured artefacts or the literary texts has led to reconstructions which do not correspond with the evidence from the primary sources. One of my objectives is to examine the development of the workshop mode of production basically with the assistence of primary sources. Related to this mode of production is an inquiry into the formation of a market mechanism. An analysis of the means of exchange prior to the employment of money is my second objective.

In general, technology can be described as the whole of knowledge, methods and means with which mankind manipulates his natural environment in order to provide his material needs.[12] Technology described as such, can be related to every artefact studied in archaeology including agricultural remains. Agriculture became diversified during the Orientalising Period but this study will not discuss comprehensively the introduction of various new crops such as grapes and olives.[13] The increase in agricultural output is of importance for the simultaneous population growth with all its effects. This forms the background for the specialisation process which mainly examines the introduction and development of new production methods such as the potters-wheel, more advanced kilns and the working of metals such as iron, copper alloys and gold. The research depends on activities which can be traced archaeologically. In central Italy the environment rarely leaves traces of organic materials such as leather, textiles and wood.[14] Essentially, I examine traces of production methods of potters and metalworkers because their

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[8] Moorey states in his preface of *Ancient Mesopotamian Materials and Industries* that: '*For over a century now students of ancient Mesopotamia, whether philologists, archaeologists, or ancient historians, have been relatively little concerned with systematic study of local crafts and industries. This is most surprising in the case of archaeologists, since the debris of manufacture is a primary source of information for them whether it be flint tools or pottery, copper weapons or faience ornaments*': Moorey 1994, v. This account equally applies to the situation in central Italy or other areas in the Mediterranean.

[9] *cf. Formazione* 1980; Meyer 1983; Anzidei *et alii* 1985; Bartoloni 1989.

[10] *cf.* Cornell 1995.

[11] *cf.* Formigli 1993; Cuomo di Caprio 1985.

[12] Bitter 1991, 83.

[13] *cf.* Anzidei *et alii* 1985, 213; *Formazione* 1980, 31-3, 128, 178. See section 1.5.

activities have been preserved and recorded.

The social position of craftsmen in central Italy from 800 to 400 BC is subject to a constant reassessment. Their social standing has been labelled by various authors as privileged court-craftsman[15], slaves[16], the socially inferior members of the plebs[17] and members of a middle class.[18] The designation of a servile status to craftsmen during the Orientalising Period is traditionally based on the elitist view of Classical Greece and the corresponding division between *agathoi* and *kakoi.*[19] This attitude derives from ancient literary sources which universally frowned upon manufacture and commerce. However the situation in central Italy during the 8th to 6th centuries BC requires more scrutiny and cannot be equated with circumstances in Classical Greece nor with conditions during the Roman Republic. All the above mentioned social positions need to be considered for the period 800 to 400 BC but not as a single, unambiguous attribution of class to artisans but rather as a range of possibilities. I stress, however, that one cannot ascribe craftsmen to a social class in a society that is being stratified itself. It is attested that social strata were defined in central Italy during the 8th and 7th centuries BC.[20] Thus within these centuries there is a transition from social differentiation which is based on personally achieved status to ascribed social class. It has to be acknowledged that the social position of craftsmen during the 8th and 7th centuries BC needs to be examined within this stratification process. I mean that one cannot assign a social position to craftsmen such as a middle class or a slave position, during a period in which these social strata were actually being established. The changing social position of those who were involved in industrial activities is another aspect I will touch upon. Their social transformation will be related to the products they made as well as to the layout of the workshops and the conditions in which they had to work and live. The internal development of communities has to be incorporated into the analysis of social change. For example, I doubt that craftsmen can be assigned to a servile status during the Orientalising Period if it can be established that they obtained during the 6th century BC a middle class position. This topic of the changing social prominence of craftsmen will be examined in more detail elsewhere in this study. At this stage I would like to examine some of the complications concerning social reconstruction from archaeological evidence.

A fundamental problem for the 8th to 6th centuries BC is to establish the advance of sedentary craft specialisation. Both the itinerant as well as the sedentary craftsman will leave similar archaeological traces such as

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[14] A list of textiles in central Italy is presented by Stage: Stage 1991. Artefacts from wood are preserved in waterlogged conditions and were for example, recovered at Pyrgi and at the Giglio shipwreck: Colonna *et alii* 1988/89, 111-21; Bound 1991. See also Tamburini on wood from Gran Carro: Tamburini 1995.

[15] Frederiksen 1979, 290.

[16] Colonna 1975, 184-190. Colonna ascribes two potters' inscriptions dated to the late 6th and 5th centuries BC, on onomastic grounds to slaves. He states that *Meistersignaturen* prior to this period do not refer to potters as slaves in the classical sense of the term though he considers them to be of lower rank.

[17] Alföldi 1975, 8.

[18] Cristofani 1993, 505.

[19] *Agathoi* are considered to be well-born and members of the Greek upper class whose position was based on the ownership of land while the *kakoi* are base-born opportunists who could be involved in manufacture: Starr 1977, 121-30. According to Finley, artisans had a lower status than a working farmer while slaves were widely used in manufacture: Finley 1981, 5, 15. The low status of craftsmen is, however, based on ancient literary texts from the 5th century BC and later. These texts have to be used reluctantly while describing conditions during the 8th to 5th centuries BC. The perception of manual labour in the history of Greek archaeology has been subject to anachronism: *cf.* Morris 1994 a. He discusses the history of the discipline while considering aspects such as elitist perspective, archaeology as *the handmaid of history* and the standing of ancient art. These aspects have had considerable impact on the development of Classical studies.

[20] *cf.* Bietti Sestieri 1992 b, 208-11, 241-2, 248-52.

furnaces and industrial debris. These traces require interpretation which cannot always be straightforward in proto-urban contexts. There is no unilinear development of initially an introduction of knowledge and techniques which subsequently became locally aplied thus leading to more centralisation and urbanisation. In archaeology, the dispute about the itinerant versus the sedentary craftsman is not restricted to central Italy between 800 and 500 BC. It is also encountered in other periods and regions during the initial phases of centralisation. For example, the interpretation of the production traces in the early medieval trading centres in Northern Europe such as Haithabu, Ribe and Birka, is closely connected with the reconstruction of initially the sites as a whole and secondly the nature of the activities of the craftsmen. These reconstructions are usually biased towards an interpretation which incorporates either part-time sedentary or itinerant craftsmen depending on the author and the craft discussed.[21] Thus, at Haithabu which was a major trading and production centre, the manufacture of antler combs is either reconstructed as a part-time specialisation[22] or as a craft performed by itinerant artisans.[23] Artisans in a pre-urban context might work with various materials and combine their craft with other activities. This is seemingly hard to imagine partly because of our present, highly specialised society but also because of the discipline of archaeology itself. The field of classical archaeology abounds in artefact studies dedicated to one specific material or to one particular style of decoration or artefact-type. This creates divisions in materials and artefacts which in reality probably did not exist.

A model advocated by Bonghi Jovino differentiates between mono-functional and poly-functional workshops and reflects conditions during the 6th and later centuries BC. In the mono-functional workshop, the craftsman primarily works with one material and applies a restricted number of techniques. The artisan is either a coppersmith, coroplast or potter. This may result in products of high quality. A poly-functional workshop is organised on a semi-industrial scale with a significant number of workmen who may handle various materials such as metals and clays.[24] Whether this specific model is supported by the primary evidence from central Italy has to be examined though the archaeological evidence of the 7th century BC strongly suggests the combination of materials such as copper alloys and iron in one workshop.[25]

A study of the degree of craft specialisation and the possible output of a workshop can help to assess whether the associated structures are related to itinerant or sedentary craftsmen. An illustration of this principle can be found at various rural sanctuaries in central Italy where traces of production were discovered. Some of these traces point to workshops throughout the existence of the sanctuary.[26] Thus small industrial centres might arise around sanctuaries in the countryside where part-time specialisation could be combined with farming, the preservation of the religious structures or other activities. Another option is the existence of itinerant craftsmen when it is not possible to infer additional production. Itinerant artisans might be involved in the manufacture of architectural terracottas especially in those cases where the fabric of the terracottas cannot be related to other wares at the site. In chapter II the production of ceramics and its implications will be examined in detail.

The complication of sedentary versus itinerant craftsmen evolves around the extent of the urbanisation involved. In proto-urban societies there are various options for craft centralisation. In these circumstances, diffusion can be

[21] Oltmanns 1995.

[22] Ulbricht 1978, 116-22.

[23] Ambrosiani 1981, 40-54.

[24] Bonghi Jovino 1990, 44-54. In Capua for example, she noticed for the 6th and 5th centuries BC a direct correlation between artefacts made from clay or from copper alloy.

[25] This topic is discussed in chapter III.

[26] *cf.* Edlund 1983; Bouma 1996, part III, 14, 55, 79-80. Bouma reports a workshop at Anzio and Minturno which produced amongst others ceramic votives while a sacrificial layer against the temple of Vesta in Rome contained evidence for metallurgical activities. Monacchi suggests that the tools among the finds of the votive deposit of Grotta Bella (Terni), may indicate manufacture at the sanctuary: Monacchi 1988, 83. It is noteworthy that these examples are all dated to the 5th and later centuries BC.

anticipated and is characterised by for example:
- combinations of crafts by a single artisan or
- economic centralisation with settlement patterns around
1. resources,
2. natural harbours, *emporia*,
3. sanctuaries or
4. homesteads of the elite.

On the other hand nucleation of workshops indicates market and urban conditions but nucleation is not feasible for some of the settlements which I examined. In the early stages of urbanisation it is common to find the options mentioned above, side by side, which implies that in certain instances there is not enough evidence to imply the existence of settled, full-time craftsmen. Therefore it is essential to study the accompanying archaeological contexts. This requires that the dispute about sedentary versus itinerant craftsmen is incorporated in the presentation of the selected sites which provided primary evidence for industrial activities.

Other topics of research that are a recurrent theme in this thesis, are quantification and the attribution of function to industrial structures. A study on economic transformations with hardly any quantification is a horror for modern economists but the possibilities for quantification are restricted within classical studies. Starr discussed the restrictions that resulted from this limitation for the economic development of ancient Greece. He reports, however, that quantification was rare until the 18 century AD. Moreover, an account of an economic development can rest heavily on qualitative evidence.[27] Occasionally, I introduce quantifiable information in order to provide an indication of scale. The size of the urban population, the number of craftsmen or the volume of output can be guessed but the figures presented cannot be considered literal. I present figures and numbers as a suggestion of range. A certain vagueness can also occur when function is attributed to industrial structures. The function of kilns and furnaces is evident but the function of the buildings associated with these structures is less clear. For example, one of the oldest architectural workshop structures in central Italy is the stoa-workshop at Poggio Civitate dated to the late 7th century BC.[28] This structure was extremely large and elaborately decorated with terracottas which might indicate that it served additional functions as well.

In general, the interpretation of the workshop remains as suggested by the various excavators, was accepted in this study though at intervals I considered a reinterpretation of the archaeological evidence necessary. I will indicate in the text where I have revised the reading of the archaeological findings.

Finally I will summarise in this introduction the purpose of this chapter. It was written in general terms in order to present a framework for my research objectives.[29] These objectives involve:

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[27] Starr, 1977, 13-4, 37-8, 45-6, 104-5. He suggests a threefold increase of the economy during the period 700 to 500 BC. For Athens the number of 30,000 adult males is given around 480 BC. The total population of Athens including slaves and metics might have been scarcely more than 150,000. For the 6th century BC it is suggested that 6,000 persons were involved in the industrial and commercial sectors including their wives and children.

[28] Poggio Civitate is discussed in sections 2.6.6 and 3.6.8.

[29] Though this chapter is written in general terms, aspects of the individual sections have not been published before. Thus in section 1.2, I argue that the field of technology is insufficiently incorporated into the theoretical framework of contextual archaeology. Therefore this theory can, in my opinion, not be considered as a general archaeological theory which includes all facets of the archaeological discipline. In section 1.3, I am able to present two sites in central Italy with high precission carbon-14 dates which indicate that a high chronology for the early Iron Age may be valid. In the sections 1.5 and 1.6, I emphasise for example, that the introduction of polyculture and the settling of the countryside around individual proto-urban or urban centres during the 7th and 6th centuries BC, must have lead to an increasing market function of these centres. In section 1.7, I present a hypothesis which relates the role of emporia to other regulating measures of the establishment in central Italy in the decades around 600 BC. The last example I would like to present here derives from section 1.8. I stress the significance of the slow pace of state formation processes in relation to the definition of private property. This definition is essential for the advance of a market economy since it

1. the examination of the development of the workshop mode of production by analysis of the primary industrial evidence;
2. a study of the means of exchange, and
3. a reconstruction of the changing social position of artisans by an inquiry into the artefacts they made as well as their working conditions.

The length of the framework is due to my opinion that the economic transitions that took place in central Italy during the period 800 to 400 BC, can only be studied and understood within the context of the general change of society. The organisation of production intensified significantly during these centuries. An account of this intensification in relation to the lasting social-economic and cultural transition, is at present not available for this interval that bridges prehistory with a more historical period.

1.2 *Theoretical background*

The history of archaeological thought can be summarised as firstly form and period, secondly, function and process and recently, meaning and context.[30] In the theoretical debate about the direction of archaeological studies these three stages are often presented as opposites while archaeology as a discipline is essentially promoted when all aspects are incorporated. The following section of the framework deals with the theoretical background of this study while specifying the position of technology and economy in the different theories. This has led to a selection of theories in which these aspects are emphasised. Grand schemes such as Marxism, the processual approach and contextual archaeology are discussed first.[31]

Marxism

A theoretical model for cultural change was advanced by Karl Marx who influenced archaeologists from the 1930s onwards. The Marxist approach has contributed extensively to an understanding of the correlations between techniques and society. Technology was examined both in theory and as a formative and foremost vehicle for social transformation. According to Marx, the organisation of labour is of key importance for determining the social structure. This organisation is directly influenced by the introduction of new technologies. However new technologies do not only bring about social and political changes but are themselves the result of specific social conditions. The existing social structure moulds the innovations feasible. Marxist archaeologists claim that change in societies is based on the resolution of internal differences. Therefore social change in complex societies derives from internal contradictions and conflicts. This principle indicates that individuals act as manipulators of resources and people in order to strenghten their own position within their social group and society. The emphasis on contradictions is based on theories of Hegel who proposed as an 'eternal principle for historic events', the existence of thesis and anti-thesis which resolves in a synthesis creating in turn its own dispute. One of the characteristic conflicts according to Marxist explanations, is based on the friction between the forces of production and the relations of production while being at the same time reciprocal. The forces of production include all forms of technology and resources whereas the relations of production indicate the ways individuals are organised in order to produce and distribute artefacts or labour. Therefore the relations of production incorporates mainly economic, but

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facilitates exchange activities between the different classes because it brings together craftsmen, merchants and consumers irrespective of their social position unlike reciprocal and redistribution mechanisms which rely more on social-economic interdependence.

[30] Bloemers and van Dorp 1991, 72.

[31] The presentation of the theoretical background to this study is primarily limited to the principles of Marxism and the systems theory because in both theories technology is a basic component. In recent archaeological thought which is directed towards meaning and context, technology is insufficiently incorporated as will be indicated in this section.

also aspects of social, behaviour. The conflicts which arise between these forces create change within a society and emerge as a struggle between the various classes.[32]

There is a dispute about hierarchy concerning the impact of technology on cultural development. Can technology be considered primary in social change, do the social relations of production dominate or do they interact mutually?[33] This debate cannot be resolved in this study but again, I can scarcely detect any reason to deliberately favour one feature of society over another when it is agreed that they are strongly interrelated. The debate on hierarchy is an example of theoretical controversy which creates opposite extremes of matters which are essentially composites.[34] Thus at one stage, traditional Marxism considered the whole system of knowledge and belief of a society to be substantially directed by its economic base while nowadays Marxists argue that the social relations of production are primary or at least interrelated with the forces of production.[35] The correlation between a society and technology is especially significant in pre-industrial, non-capitalist societies because these societies are structured along other lines rather than primarily on economic activities. According to Marx, the ultimate goal of an unadultarated capitalist system is that societies become structured along economic activities by exploitation. This will not have been the conscious goal of most pre-capitalist, early state societies.

Systems theorie

Another model for cultural change in which technology was recognised as one of the principal facets was advanced by Renfrew. Based on previous publications of for example, Wiener, Binford and Clarke, Renfrew described in *The Emergence of Civilisation* the process of culture change as changes in subsystems. He distinguished five aspects which are the subsistence, technological, social, symbolic and trade/communication subsystems. One of the characteristics of these subsystems is their interrelation. Each subsystem is, therefore, semi-autonomous because some of its features can be related to other subsystems while others remain distinct.[36] Change in one of the subsystems can be counteracted in another. When one part of the system changes, the others adjust and conform to return to *homeostasis*. Thus, the various subsystems tend to be in equilibrium which is based on negative feedback because the resistance to change in one subsystem establishes stability. Homeostasis is a reflection of the conservative tendencies in civilisations. With progressive change, the subsystems interact positively resulting in growth and development. Thus, some of the activities in one subsystem are relevant to those in other subsystems. The general development of a culture is the result of conditions in which innovations in the various subsystems reinforce each other. Positive feedback between at least two subsystems amplifies and interlocks the transformations. This can be considered as a multiplier effect which is the mutual interaction in different fields of activity.[37] Central Italy, especially during the period 800 to 500 BC can be examined as one of the examples of a society in which the multiplier effect was in operation due to the vast transformations in the various subsystems.

Though the systems approach incorporates a communication and trade subsystem, it usually relates to a specific cultural unit. It is in practice primarily a model that explains changes within a unit. Renfrew, however, stresses that transformations are not only caused in a endogenous and interpretation mode but that they are also the result of

[32] *cf*. Renfrew and Bahn 1991, 412-5; Trigger 1989, 216-27, 242-3, 259-63.

[33] *cf*. Hodder 1986, 57-61, 91; Hodder 1992, 25; Trigger 1989, 220-1, 290-4, 340-3, 401-4.

[34] Renfrew and Cherry summarised the debate on hierarchy in their preface: '*In our view it should not be necessary to make a choice between an approach favouring the symbolic and the stylistic on the one hand, and one favouring the material and the technological on the other. Both aspects are seen as acting and interacting within a specific social matrix*': Renfrew and Cherry 1986, viii.

[35] Renfrew and Bahn 1991, 414.

[36] Friedman and Rowlands 1977, 203.

[37] Renfrew 1972, 19-28, 476-504.

exogenous change through contacts between neighbouring cultural units or polities.[38] The changes in the technological subsystem in central Italy during the period discussed, is mainly the result of exchange of information between neighbouring polities. The extent to which these technological changes are applied within a polity can be considered an endogenous transformation.

As a model the systems approach has been criticised since it subdivides a culture into separate aspects which in turn forms an unit as if the whole equals the sum of its parts.[39] The systems theory reduced to this level, will indeed present a mechanical view of culture since individuals and their contexts scarcely seem to be involved. Societies appear to be studied as an utilitarian set of cause and effect without taking into account the individual behaviour. According to this view the application of the systems theory will eventually lead to reconstructions of cultures without accounting for what really happens within societies for it is primarily concerned with the functional correlations between various subsystems.[40] This comment is acceptable for those studies which do not incorporate the autonomous development within subsystems. Autonomous developments might occur on an individual level such as the adaptation of a technique by a specific artisan. This individual level is to a certain extent included in this research by presenting particular archaeological contexts. The examination of these contexts covers not merely techniques and crafts of individual artisans but also their surroundings and social-economic condition. However archaeological interpretation based on the behaviour of individuals can result in severe fragmentation. Additionally, man makes choices and a constant conjunction of events will be rare when individuals are involved. This aspect of choices which are made with respect to technological changes, has been the topic of a publication in the series *Material Cultures*. The guiding principle in this book is the idea that societies select new technologies which means that they can adopt these techniques or reject them. This selection depends mainly on cultural values and social relations and much less on the intrinsic advantages of the new technique itself. In *Material Cultures* various anthropological and archaeological examples are recorded which indicate that technological changes are subject to considerations that are not technical in character.[41] These examples make the debate whether change can be regarded as caused by external factors or by internal development[42], theoretical since they coincide in many cases. Cultural development can be analysed from an internal point of view which stresses systemic interdependence and continuity rather than the discontinuity induced by diffusion. With respect to technology, changes can be triggered off by external factors or by internal developments but they cannot be applied successfully by individuals without:
- being the result of specific social-economic conditions and,
- some additional changes in society.

This complies with the theory of Marx and the systems theory.

Other criticism of the systems approach concerns the balance between specific and general explanation. For some scientists, the systems approach is associated with generalisation because it explains patterns of events. Hodder for example argues in favour of a greater emphasis on the specific archaeological context and seeks to know more about the surrounding particular information.[43] Nevertheless, in reality it is difficult to conceive any explanation of cultural transition which does not incorporate specific information as well as general outline.[44] Moreover, this study is based on the complex transitions associated with the urbanisation process and the

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[38] Renfrew 1986 a, 5-6.

[39] *cf.* Gibbon 1989, 111-4.

[40] Renfrew and Bahn 1991, 422.

[41] Lemonnier 1993.

[42] *cf.* Gibbon 1989, 112-3.

[43] Hodder 1986, 146.

[44] Renfrew and Bahn 1991, 415-6.

development of markets. For intricate processes such as these, it might be valuable to differentiate occasionally between the specific subsystems.

Both theories, the systems approach and the principles of Marxism, are concerned with change in societies as a whole. Both seem to view societies as arrangements which contain tendencies that promote and oppose change. The main difference lies in the perception of the dynamism behind transformations. The systems approach is based on *homeostasis*, the adaptive responses while the Marxist approach emphasises the internal conflict within societies. In reality it is hard to imagine transformations which do not incorporate both tendencies. Societies with merely internal conflicts and without self-correcting mechanisms are bound to change by revolution and force whereas sudden radical transformations within a culture are comparatively rare in history, especially in the history of technology and economy. Therefore I would like to differentiate between economic and political revolutions. Economic revolutions such as the industrial revolution are usually long-term events affecting the social organisation and, therefore, culture in general while political revolutions are often characterised by incidents with considerable consequences. The period 750 to 650 BC has been specified for Greece as the Orientalising revolution.[45] The Orientalising Period in central Italy is characterised by comparable events but with simultaneously the acculturation of Greek traits. However both periods in Greece and in Italy represent long-term phenomena lasting about one century or more. Therefore this formative stage illustrates essentially a social-economic transition accompanied by cultural modifications. These are primarily based on adjustments which coincide with the prevailing acculturation process.

Contextual approach

A third general theory is proposed by Hodder who can be considered to be the representative of the archaeology of meaning and symbols. He wrote that '*Structures of meaning are present in all the daily trivia of live and in the major adaptive decisions of human groups. Material culture patterning is formed as part of these meaningful actions and it helps to constitute changing frameworks of action and belief*'.[46] On a theoretical, general level this cannot be denied but on a practical, archaeological level, many questions remain unanswered. In view of the present study it remains puzzling how to relate these structures of meaning to the various, explicit processes of technological transformations. Traditionally, technology is a component of many archaeological studies due to its materialistic affiliation. Proportionally, technology and economy have been more widely examined than for example, other subsystems of society such as the aspects idea and belief. On the other hand the lack of detailed technological research makes many of these discussions *gratuit*.

The quotation from Braudel at the beginning of this chapter implies that the link between the materialistic and ideational remains enigmatic. Hodder affirms that '*both as archaeologists and ethnoarchaeologists we need to have the confidence to delve into the practical world of technological operations in order to build theories about the embodiment of meanings and thus about the relationship between material practice and conceptual structure*'.[47] He concludes that even for the early periods, productive processes are well known to archaeologists and that this forms the basis for interpretation. '*The only limitation here is our lack of theoretical knowledge about the way in which*

[45] Burkert used the phrase 'Orientalizing Revolution' to describe the Near Eastern influence on the comprehensive social-economic changes in Greece during the period 750-650 BC: Burkert 1992. It is thus a 'revolution' which lasted about a century. His book pursues the idea that the Greeks were influenced by eastern models to a significant degree. The title of the English translation of Burkerts' originally, German book is *The Orientalizing Revolution* and is inspired by Boardman who wrote that '*the true Orientalizing revolution on the Greek mainland which was widespread and lasting, was a phenomenon of the 8th century and it was created by exposure to the techniques and products of North Syria and beyond, rather than those of Phoenicia. It is a material revolution accompanied by influences of a broader cultural nature, in religion, myth, literature, science and perhaps law*': Boardman 1990, 185. This description of events could also apply to central Italy: *cf*. Markoe 1992, 79-84.

[46] Hodder 1992, 25.

[47] Hodder 1992, 211.

savoir-faire, know-how, everyday practical knowledge is organised and related to higher levels of abstract symbolic thought'.[48] This still leaves the theoretical relation between the symbolic and economic structures to be defined. Because this relationship has not been an integral part of this research, I doubt whether I can contribute to this debate. It is my conviction that occasionally it is possible to relate both structures on a factual level for specific contexts. Either the archaeological contexts are revealing or the sites involved have a near complete set of information. A reconstruction of the activities performed at such sites has to be holistic and does incorporate among others, both the technological and the ideational subsystem. Such reconstructions will demonstrate the correlation between both fields as has been illustrated in the publication in the series *Material Cultures* which is mentioned above. In this publication, entitled *Technological Choiches, Transformation in Material Cultures since the Neolithic*[49], various ethnoarchaeological, ethnological and even modern examples are presented which invariably emphasise the close relationship between the technological subsystem and other aspects of society, especially the subsystem of ethics and ideas. This relationship finds a present-day analogy in the discussions about information-technology and genetic manipulation. The various examples in *Technological Choiches* also confirm the hypothesis that patterns between the technological and ideational, are extremely diverse. This makes it dubious whether both can be related on a general, theoretical level. My doubts are also expressed by Trigger who has formulated that '*it is no longer possible to maintain that symbolic aspects of material culture are merely a passive reflection of more pragmatic behaviour. Yet how can the archaeologist determine in specific cases, except pragmatically, whether the relationship is one of reflection, inversion, or contradiction*'?[50] Lemonnier who is eager to attribute meanings to technological developments, is even more explicit: '*we are obliged to admit that, in fact, we do not know much about these systems of meaning in which artefacts and technical processes are involved*'.[51]

The discussion of the grand schemes of Marxism, systems theory and contextual archaeology positions technology in a wider framework. They examine the theoretical place of technology within the evolution of societies or within specific contexts. A correlation between these theories and the methodology of the archaeological discipline in connection with technology and economy, is indispensible. One method was formulated by Hawkes who emphasised the primary study of technological features.[52] *Hawkes' hierarchy* or ladder is a theoretical grading based on the discipline of archaeology itself. His model is a scale of ascending difficulty involving limitations of the archaeological evidence. This evidence is foremost suitable for reconstructing prehistoric technology and economy. Subsequent stages involve the study of socio-political organisation and religious beliefs which should be based on a detailed description of prehistoric technology and economy. Technology is, therefore, an elementary feature of the model presented by Hawkes. Renfrew and Bahn do not accept the argument that technology should be studied first because it can be related directly to the artefacts excavated. According to them the study of the social organisation has priority.[53] Trigger, however, emphasises the intrinsic value for archaeologists of the methodological ladder devised by Hawkes, because human behaviour is essentially directed by external constraints.[54] In my opinion, the term hierarchy has led to confusion about Hawkes' intentions and should not be applied to his ideas. In his article, he does not use the term hierarchy but is primarily concerned with the organisation of archaeological research. His

[48] Hodder 1992, 211-2.

[49] Lemonnier 1993.

[50] Trigger 1989, 351.

[51] Lemonnier 1993, 17.

[52] Hawkes 1954.

[53] Renfrew and Bahn 1991, 150-1.

[54] Trigger 1989, 392-6.

considerations concentrate on the relation between matter and culture. Most archaeologists will not deny that their primary information is material and factual. This makes it relevant to describe them. Hawkes suggests that the technological aspect needs to be incorporated in this description. The translation of the actual facts to other aspects of civilisation can be miscellaneous and random. As mentioned above, these relationships are extremely divers and, therefore, difficult to reduce to a general, theoretical level. For every culture and period it may be necessary to develop a specific model for the relationship between production, social organisation and religion.[55]

Hawkes' model is based on his optimistic view that the nature of both technological studies as well as material sciences is straightforward. This opinion is not supported by the present lack of systematic examinations of the technological subsystem. The implementation of technology is not a process involving successive steps of static practicalities requiring common knowledge. Besides, it is unrealistic to suppose that archaeologists are familiar with the variables of technological procedures. For example, a key question in archaeology is the provenance of raw materials. An examination of raw materials is commonly established by archaeological science, that is archaeometry.[56] A scientific relationship between artefact and raw material is often complex and for many archaeological substances even impossible. Although advance in archaeometry has been made, a substantial number of archaeological questions concerning origin remain unresolved because these studies require substantial resources and fundamental research.[57] Thus, the superficial basics of resources, processing techniques and finished artefacts might be understood on an abstract level but the relationship of a specific cluster of artefacts to its material provenance and the exact manufacturing process, remains in most cases unknown.

Hawkes considers that not only provenance studies, but also technological investigations are a component of archaeometry and thus science based. These sciences produce figures, tables, appendices and other external, hard information which requires a more comprehensive interpretation, especially when the results need to become relevant for archaeologists. However this interpretation involves usually an approach which derives from the humanities. These considerations are inextricably related to the multidisciplinary character of archaeometry but may result in a confusion of arguments unless the communication between scientist and archaeologist is transparent.[58] I, therefore, dispute the idea of a hierarchy in which technology is placed on the 'lowest' level *because the reasoning employed is basically simple.*[59] This may apply to the descriptive phase of archaeology but not when technological developments are positioned within a wider context. For this type of research, a characterisation in lower and higher echelons is inappropriate because:

- the correlation between technology and economic implementation is intricate which is illustrated by the random nature of technological rejections and adoptions[60] and by the manifold specific variations in craft specialisation,[61]
- the archaeological discipline has not provided an adequate corpus of technological evidence. Archaeologists have neglected this aspect to such an extent that nowadays simplistic views on technology prevail. An illustration of this situation is presented by the technological studies of early iron artefacts. Pleiner states that: '*the shortage of archaeological iron objects and the very limited technological investigations carried out on them makes it essential*

[55] Godellier 1977, 10.

[56] For this argument I oppose the Sciences to the Arts.

[57] Tite 1991.

[58] In his publication Tite mentions the necessity of communication between scientists and archaeologists several times while presenting arguments for this prerequisite: Tite 1991.

[59] Hawkes 1954, 161.

[60] Lemonnier 1993, 6-9.

[61] see section 1.6.

to turn to literary sources'[62] and Kilian wrote in 1983 that iron has been rarely published.[63] Both authors refer to the situation in Greece but a similar account can be presented for Italy or other regions. The present study will almost double the available technological information on early iron tools in central Italy while employing metallographic methods. Even with this increase it has not been possible to present a comprehensive account on specific smithing techniques that had been mastered by the smith around 600 BC.

This discourse on Hawkes' ladder is followed by additional considerations concerning the methodology of technology in archaeological studies.

The technological subsystem has been characterised by Renfrew as '*the activities of men which result in the production of material artefacts. The components are men, material resources and finished artefacts*'.[64] Technology itself has been described in general terms as the whole of knowledge, methods and means with which mankind manipulates his natural environment in order to provide his material needs.[65] A specific technology consists of a collection of artefacts, behaviours and knowledge which is transmitted from generation to generation. The technological knowledge involves three aspects:

- procedure of actions,
- teaching structure and
- physical-chemical consciousness.

The physical-chemical consciousness implies for pre- and protohistory that craftsmen attempted to solve certain problems by trial-and-error.[66] Experiment and technological experience increases the practical knowledge of an artisan. This knowledge is his exclusive property and is transmitted through instruction. The physical-chemical consciousness and teaching structures are usually not included when archaeologists examine the technology of a society. Technology is often restricted to the procedure of subsequent actions from raw materials to finished product.[67] The sequences of actions or *chaines operatoires* have been formulated by a number of French academics as a series of ideas.[68] The actions are guided by three types of knowledge. The general knowledge or *connaisance* classifies, correlates and signifies artefacts and their functions. This general knowledge can be distinguished from actual know-how, which incorporates knowledge of material properties and the ability to evaluate the manufacturing process. This know-how is subsequently translated by the artisan in generative know-how or *savoir-faire,* which involves the motor skills and the sequences of hand movements.[69] Thus the process of manufacture starts with a concept of the artefacts to be made and the materials to be used, followed by the actual production steps.[70] A transformation of the technological knowledge of craftsmen may be caused by:

- a change in demand concerning the function of artefacts. This change can involve mechanical, social or ideological

[62] Pleiner 1969, 20.

[63] Kilian 1983, 131.

[64] Renfrew 1972, 22.

[65] Bitter 1993, 83.

[66] Schiffer and Skibo 1987, 595.

[67] Hawkes was mainly concerned with this aspect of technology. The supposed hierarchy within his model is neither supported by the presented subdivision of technological knowledge because some of the aspects of technological knowledge are difficult to assess such as the trial-and-error experiments.

[68] *cf*. Pelegrin 1990; van der Leeuw 1993, 238-44.

[69] Pelegrin 1990; Hodder 1992.

[70] van der Leeuw 1993; Nijboer 1993.

function,
- trial-and-error experiments,
- economic processes such as competition which stimulates the development of techniques and experiments, the manufacture of artefacts for specific functions, the development of more effective production processes and standardisation of style.[71]

For central Italy these three motives can be recognised especially for the 7th and 6th centuries BC. The competition between individuals and social groups in Etruria and *Latium Vetus* as well as a change in demand concerning the function of artefacts, were deduced from transformed consumption patterns and the elaborate furnishing of tombs. These aspects which will be examined in the next chapters, testify for the close relationship between technological and cultural transitions.

The role of technological change in economic development is acknowledged as activator since technological progress increases efficiency as well as advances the development of new products and sevices.[72] The factual introduction will be only touched upon in this study. The primary production features discovered by archaeology usually represent a stage in the development of the economic application of a given technique. The adaptation of an economy to a new technique is one of a continuing process of fluctuations. These fluctuations include the accompanying settlement patterns. Thus primary evidence of production can relate to individual, household, workshop or even village industries while the production activity can be on a part-time or full-time base or executed by an itinerant or sedentary craftsman. A rudimentary distinction between the various techniques examined in this thesis evolves around a ranking of its economic implementation. Fundamental changes in techniques or the introduction of new materials which involve common, everyday artefacts such as pottery or iron tools ultimately have more impact on society than changes in techniques which involve luxury goods and precious materials such as gold. The new production techniques introduced in central Italy during the 8th century BC were originally used for the production of wealth items and status markers. Some of these new production techniques eventually became employed for the manufacture of subsistence goods. For example, iron changed from precious to base metal during the period 800 to 500 BC.[73] This transition had far reaching consequences for the relations of production, that is the social organisation of labour.

New technology that affects the essential needs of individuals is crucial for a general development of societies. These essential needs involve food, shelter, clothing and tools used for the production and preparation of food. They are the necessities which are required for personal survival. A distinction of techniques can, therefore, be based on a ranking of the materials and artefacts involved in combination with its eventual rate of implementation. This ranking is reversed to the grading commonly applied by archaeologists who consider materials such as ivory and gold more indicative for maintaining and generating status than more common, everyday materials such as iron tools or common household pottery. Thus, the introduction of the granulation technique in goldworking in central Italy during the late 8th and 7th centuries BC caused little social-economic change since it involved status markers and is concerned with existing social stratification. Only the strife for such status markers increases the demand which may cause economic change. Competition within the elite group can affect society considerably especially when it occurs at the expense of the lower social echelons. Debt bondage did occur but it appears that the general economic growth from the 8th to the 5th centuries BC could accomodate the differentiated though intensified material needs of a considerable group of people in central Italy.[74] Social-economic change is more affected by the gradual introduction

[71] Schiffer and Skibo 1987.

[72] Inkster 1991, 2-3.

[73] see section 3.4.

[74] This topic is discussed while evaluating the archaeological data on workshops in chapter V.

of techniques involving the manufacture of common subsistence goods. These techniques include new pottery production techniques such as wheel-turning, modelling with moulds and the employment of advanced kilns. The application of the granulation technique involved few artisans while a restricted number of people were capable of acquiring their products. The local application of the granulation technique can be considered as confirming existing social hierarchy. The introduction of iron as the main metal for tools, and thus replacing copper alloy tools, also occured during the 8th and 7th centuries BC. This transition did have a profound effect on society for various reasons. Agricultural labour for example, could become more effective because iron tools have improved working properties when compared with copper alloy tools. Besides, the manufacture of workable iron is more time consuming than the production of copper alloys whereas the demand increased. The associated rise in labour required a different organisation in order to meet the demand. The development of the use of iron between 800 and 400 BC in central Italy is a typical example of the introduction of a fundamentally new material and production technique which subsequently became a subsistence good and thus vastly common. This led to lower costs. The rapid decrease in the value of iron has been observed for both Greece and the Near East[75] and can be attested for Italy by archaeological means.[76] Therefore the introduction of new techniques and materials which became applied to subsistence goods instigated growth of production and labour which consequently transformed the social-economic structure of central Italy significantly.

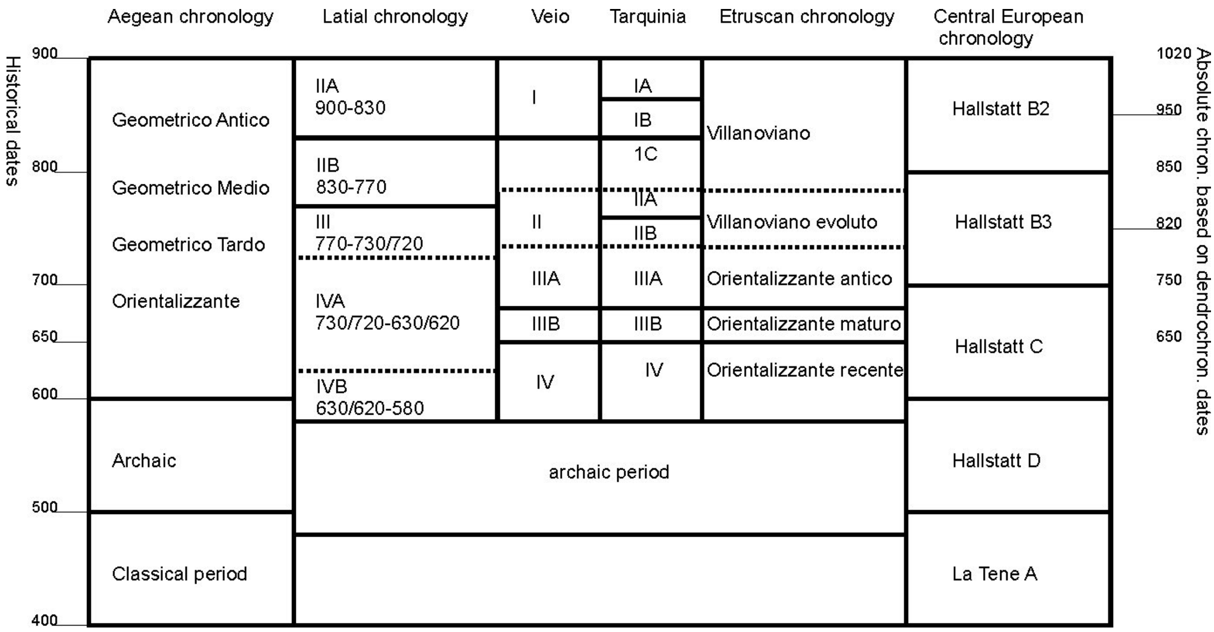

Fig. 1. Chronological chart of central Italy, the Aegean and central Europe with an indication of the historical dates as well a the dendrochronological dates.

1.3 *Chronology*

The chronological framework applied in this study, is predominantly based on absolute dates. The period discussed is protohistoric and, therefore, these dates represent stages and not distinct years.[77] The absolute dates derive from

[75] Pleiner 1969, 15-7, 29; Moorey 1994, 287-91.

[76] Aspects which are related to the introduction of iron will be discused in more detail in section 3.4.

[77] I will seldom employ historic years in this study. Exceptions are 474 BC in which the Battle at Cumae was fought or 396 BC in which,

excavation reports and were adopted instead of the characteristic periods of individual sites or cultures because these periods are not uniform (Fig. 1). For example, period II at Veii corresponds approximately with period III in *Latium Vetus*. An account of the economic development in central Italy which is based on the periods of the individual sites or cultures would have become complicated and, therefore, I prefer to present absolute years. I do, however, employ general terms such as Orientalising or Archaic period because these classifications coincide with specific stages in Etruria as well as in *Latium Vetus*. The Orientalising Period is commonly dated from 720 to 580 BC while the Archaic period roughly corresponds with the 6th and early 5th centuries BC.

It can be deduced from Figure 1 that the major problem for the absolute chronology of the Italian Iron Age, is the dating of the 9th and 8th centuries BC. Differences between on the one hand the traditional dates and on the other hand the chronology based on dendrodates of central Europe, escalate to more than a century. Consequently, the chronology of the Iron Age in central Italy will be examined in more detail.

Chronological studies in archaeology can be subdivided into relative chronologies based on typological seriation of artefacts, mainly pottery, and absolute chronologies derived from historical evidence as well as scientific dating techniques such as carbon-14 and dendrochronology.[78] Relative chronologies result in the demarcation of cultural phases. The sequence of relative chronologies is correct but the association of relative to absolute chronologies has become controversial. The mutual dependence between various European cultures is elementary for chronological studies in archaeology. Imports from regions with a 'high culture' such as Egypt, Mycene or the Near-East create a traditional chronological framework for prehistoric European societies. For prehistory, the correlation is basically constructed from the Egyptian astronomical chronology and its dating. In recent years a discrepancy has emerged between the absolute dating of the Egyptian historical chronology and the results from the scientific dating techniques. The Egyptian chronology is passionately debated in relation with the Thera eruption that has a historical date and discrepant scientific dates which derive from various archaeometric techniques.[79] The discussion is, however, not restricted to the Aegean middle Bronze Age but also concerns later periods. The absolute dates for European cultural phases during the late Bronze Age and early Iron Age are neither secure. On account of C-14 and dendrochronological dates from central Europe, Randsborg wrote that '*it might be necessary to change the absolute dating of the Greek ceramic chronology for the first half of the last millenium BC*'.[80] In particular the Geometric period presents opportunities for readjustments.[81] In 1994, Peroni published chronological charts which relate the historical Italian chronology to dendrochronological dates from central Europe.[82] These charts suggest several periods of inconsistency but are based on scientific datings from central Europe but not from central Italy. Therefore they require substantiation with high quality radiocarbon or dendrochronological datings from Italy itself. Such datings are scarce. Calibrated radiocarbon datings which support a high chronology for the Iron Age in central Italy are presently available for *Satricum* and Fidene.[83] At *Satricum* a difference of at least 50 to

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according to Livy, Veii was destroyed by the Romans: *cf.* Prayon 1981; Cornell 1995, 1-30, 119-27.

[78] *cf.* Parkes 1986, 1-127. I refer to Parkes for an introduction of the various scientific dating techniques. Handbooks on dendrochronological and radiocarbon dating were published by the European Science Foundation: Eckstein 1984; Mook and Waterbolk 1985. As far as I know, there are unfortunately no dendrochronological dates for central Italy during the period 800 to 400 BC: Fasani and Martinelli 1994, 39.

[79] *cf.* Hardy and Renfrew 1990.

[80] Randsborg 1991, 93.

[81] A high chronology for south Italian early Geometric pottery is suggested by radiocarbon dates published by Whitehouse and by Herring: Whitehouse 1994, 93-4; Herring 1993.

[82] Peroni 1994, 199-216; Figs. 79, 80. Fig. 80 is included in Fig. 1 of this section.

[83] Skeates published a list of nearly 1000 radiocarbon datings for prehistoric Italy: Skeates 1994. These datings are, however, not interpreted and this makes comparison arduous. The datings referring to the early Iron Age are scarce because there are complications with the callibration curve. Within this curve there is a plateau around 750 to 400 BC which makes Carbon-14 unsuitable for dating archaeological contexts from this

100 years between the traditional datings and the carbon-14 datings has emerged for some settlement features of the 8th century BC.[84] In order to test this discrepancy, Bietti Sestieri was so kind as to provide me with some carbon samples from the Iron Age building at Fidene.[85] The building is traditionally dated by pottery to around the middle of the 8th century BC. It was destroyed by fire and carbon samples, probably from structural wooden elements of the building, were dated with the conventional radiocarbon technique. The results of these four datings imply a high chronology in line with the dendrochronological dates from central Europe. However the datings might derive from beams of long life span which themselves cause a time difference of several decades to more than 100 years. This is known as the *old wood effect* and complicates the interpretation of radiocarbon datings because the organic age of a tree can give a radiocarbon age which is significantly older than the cutting date.[86] To confirm the conventional carbon-14 datings from Fidene, two samples which derived from carbonised seeds in the building, were dated with the Accelerated Mass Spectrometer (AMS) of the Centre for Isotope Research at the University of Groningen. Seeds, twigs, leather, bone and outermost tree-rings are not influenced by the *old wood effect* and, therefore, eliminate a time difference caused by wood of long life-span. Regardless of the *old wood effect*, the radiocarbon datings of the seeds from Fidene correspond with the other carbon-14 datings of the same hut. As a result there are six, closely related radiocarbon datings from one, well preserved feature at Fidene. The datings range from 2820 to 2760 ± 50 BP which corresponds with a calibrated date between 1115 to 808 BC.[87] The radiocarbon datings are consistently at least 50 years older than the traditional datings based on pottery sequences and historical datings. This implies a higher chronology for the early Iron Age which coincides with the revised chronology of central Europe and the chronological charts of Peroni. It appears that the Iron Age in central Italy may start earlier than previously thought. However only two sites in central Italy with evidence for a higher dating of the Iron Age, that is *Satricum* and Fidene, cannot construct a revised chronology for central Italy.[88] The far reaching consequences of a new, absolute chronology for central Italy cannot be evaluated in this study. It probably does not alter the sequence of relative chronologies and might eventually result in a revision of the dating of the substages of the Greek Geometric period. If the Greek Geometric period cannot be adjusted to a higher chronology than this would affect the reconstruction of the historical Greek colonisation process. In addition it might indicate that the social-economic transitions in central Italy during the 8th century BC were less abrupt because in absolute years the Iron Age in central Italy until 725 BC extends by about 100 to 150 years. Inspite of the evidence presented for a high chronology during the 9th and 8th centuries BC, this study will employ the traditional absolute datings. The absolute datings from the late 8th century BC onwards are considered to be relatively secure though prior to about 700 BC,

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period. The datings from *Satricum* and Fidene are not included in the list by Skeates.

[84] Olde Dubbelink and van der Plicht, 1989; 1990.

[85] Bietti Sestieri *et alii* 1992; 1995.

[86] Waterbolk 1971. The age of the timber was given as an explanation for the time difference that was recorded between the traditional historical and radiocarbon datings at Luni sul Mignone. There is however, one radiocarbon dating from Luni sul Mignone, Tre Erici (St. 1340, 2 σ 1368-832 cal BC) which supports a high chronology for the Iron Age because the carbon sample derived from a hearth which is a context that is less susceptible to the *old wood effect*: Östenberg 1967, 58, 62-64, tabella 1; Skeates 1994, 246.

[87] The callibrations give a confidence level of 95.4% (2 σ confidence level). There is a 95.4% change that the actual date of the sample lies within the date range. The AMS radiocarbon datings of the seeds (GrA-5007 and GrA-5008) give a range between 1032 to 816 BC (2 σ confidence level) while the four conventional radiocarbon datings (GrN-20125 to GrN-20128) range between 1115 to 808 BC (2 σ confidence level).

[88] It is suggested by Carafa that the dendrochronological dating of the *Tomb of Midas* at Gordion might raise the dating of tomb 871 at Veii, the Bernardini and Barberini tombs at Palestrina and the Regolini-Galassi tomb at *Caere*, by about 50 years. These tombs might not be dated to the middle of the 7th century BC but to the late 8th, early 7th centuries BC: Carafa 1995, 265. Randsborg, however, considers that the absolute chronology from the late 8th century BC needs no readjustment: Randsborg 1991, 101.

the cultural reconstruction of central Italy might change in the near future.[89]

1.4 *Method of study*

In this section, the method of study for investigating the material record for industry and technology is presented. In the introduction of this chapter a distinction was made between direct and indirect, primary, secondary and tertiary evidence. The direct evidence incorporates industrial structures, waste products, manufactured goods, scientific examinations and the geological perspective. The indirect evidence concerns analogies, experimental archaeology and ancient literary texts. Principally, the method of study involves an examination of the primary, archaeological evidence for manufacture and of the secondary information which are the artefacts themselves. For the interpretation of this direct evidence, the information can be submitted to a number of additional approaches which comprise ethnography, archaeometry, experimental archaeology, geological perspective and ancient literary texts.

Ethnography for comparative information

For a social-economic reconstruction it may be possible to employ, by analogy, ethnographic records for substituting missing correlations of the archaeological evidence. Analogy with respect to technological methods is mainly focussed on ethnography and experimental archaeology. Ethnographic studies have traditionally been important for ceramics.[90] By cross-cultural analysis these studies resulted in the construction of models for the development of the pottery craft by various scholars such as van der Leeuw, Peacock and Arnold.[91] Peacocks' model is employed in chapter II to describe the development of the pottery production in central Italy. Ethnographic analogies are less developed for a reconstruction of the metal craft.[92]

Archaeometry

Archaeometry represents the field of scientific techniques for establishing the manufacturing processes as well as the identity and, possibly, the provenance of the raw materials.[93] The basic scientific techniques which I applied, are predominantly thin-sectioning of ceramics and metallographic examination of metals. Thin-sectioning of ceramics is essential for the characterisation of fabrics with coarse inclusions. Moreover, the mineral inclusions can be related to geological regions in order to determine their provenance.[94] Metallographic examinination can clarify the manufacturing process as well as the material characterististics of copper alloys and other metals.[95] Occasionally, other scientific techniques are reported such as X-ray Fluorescence (XRF) or Scanning Electron Microscope-Energy Dispersive X-ray (SEM-EDAX) analysis. The results obtained with these techniques will be examined and related to

[89] The absolute chronology of the early Iron Age in Italy is a research topic of the Department of Archaeology of the University of Groningen in collaboartion with dr. A.M. Bietti Sestieri and dr. ir. H. van der Plicht. Momentarily Bietti Sestieri, van der Plicht and the author are preparing a detailed paper on the datings from Fidene. Moreover, it is designed to date bones from the early Iron Age necropolis of Castiglione in *Latium Vetus*. In addition, C-14 dates from Bronze and Early Iron Age settlement features at Francavilla Marittima which are excavated under the direction of Prof. Dr. M. Kleibrink, are presently interpreted and prepared for publication.

[90] Shepard 1956.

[91] van der Leeuw 1976; Peacock 1982; Arnold 1989.

[92] *cf* Mc.Naughton 1993.

[93] *cf.* Parkes 1986. For an account of the historiography of material studies see for example, Tite and Riederer: Tite 1991; Riederer 1987, 13-4.

[94] *cf.* Jones 1984; Jones 1986, 54-6.

[95] *cf.* Scott 1991.

their archaeological significance. For an explanation of various archaeometric methods, I refer to Parkes.[96]

Experimental archaeology

Experimental archaeology provides detailed information on the artefacts, the skills of the artisan involved, the investment of time, the division of tasks and the manufacturing process. Like the information obtained by ethnography, experimental archaeology can be correlated to ancient technology by analogy because the data are only indirectly related to prehistoric societies. Experimental archaeology involves the reconstruction of tools and processing techniques according to presently recorded conditions in antiquity.[97] Experiments may also involve the examination of variables resulting in particular properties of materials such as the heating effectiveness or the thermal shock resistence of ceramics.[98]

Geological perspective

The geological perspective provides an inventory of the resources.[99] Ethnographic studies have established that the raw materials for the ceramic industry are predominantly located near the pottery producing community.[100] Therefore it is crucial for provenance studies of ceramics to examine the geological resources nearby before investigating resources further away. This restriction is less valid for the exploitation of metal-ores. Copper ores are relatively rare but iron ores are widespread. The geological distribution of metal-ores in central Italy has been focussed on Etruria.[101] The distribution of ores is, however, not restricted to Etruria though this region is extremely rich in mineral resources. Iron ores are, for example, also reported in *Latium Vetus.*[102] Whether these iron ores might have been exploited in antiquity will be examined in chapter III;

Ancient literary texts

The ancient literary texts give an account of the role of artisans in social and economic life. The ancient Roman texts refer minimally to craftsmen and economic aspects. They seem scarcely relevant for the period discussed because they were written centuries later.[103] Nevertheless, some texts are based on accounts which originated in previous centuries. These fragments are incorporated in this research because a proto-historic period is examined which implies the rudiments of textual-historic evidence and signals an allusion to historic order.[104] Important in this

[96] *cf.* Parkes 1986.

[97] *cf.* Coles 1979; Fansa 1990.

[98] *cf.* Schiffer and Skibo 1987, 601-9.

[99] *cf.* Jones 1986, 5-12, 103-5; Zifferero 1991.

[100] The clay and temper resources are located within the neighbourhood, preferably at the distance of 1km or less. Of the pottery producing communities that were examined by ethnographic studies, 33% obtained their clay at the distance of 1 km or less. For the temper this percentage rose to 52%. The clay came from a distance within 7 km for 84% of the communities while 97% of the sample obtained their temper within 6 to 9 km: Arnold 1989, 32-57.

[101] Rasenna 1986, 120-4; Bietti Sestieri 1992 b, 22-5.

[102] See section 3.5.

[103] Consequently, I disagree fundamentally with Cornell who states that: '*The most important evidence for the early history of Rome comes from literary sources - that is books written during the classical period and published in manuscript form*'; Cornell 1995, 1. This may be partly true for the 4th and 3rd centuries BC but, in my opinion, these texts do not constitute the most important evidence for the period 800 to 400 BC. It was necessary to classify ancient literary sources as tertiary evidence for this research on the intensification of the organisation of production. See section 1.1.

[104] *cf.* Hawkes 1954, 159-60.

context are the Twelve Tables which were conceived around 450 BC. These laws have been preserved incompletely in the works of later authors but still contain important information on social-economic distinctions during the 5th century BC.[105]

These five additional approaches augment the archaeological information. They reduce some of the limitations related to the material evidence. The interpretation of this evidence is the main purpose for including these approaches in the methods of study. Therefore this research incorporates information which originated from diverse disciplines such as archaeology, ethnography, scientific analyses, experimental archaeology, geology and ancient literary texts. A combination of these disciplines creates opportunities with which it becomes feasible to reconstruct the social-economic development of proto-historic central Italy.

The introductions to theory, chronology and method of study, require an additional presentation of slightly less abstract concepts such as agricultural foundations, urbanisation, craft specialisation, trade and cultural development. These concepts are subject to reflection and a discussion is essential for an outline of the technological and economic transitions. As mentioned in section 1.2, the economic development of central Italy could not have been that comprehensive when not supported by other transitions.

1.5 *Agricultural foundations*

Throughout antiquity the economy depended predominantly upon agriculture. From the 8th to the 5th centuries BC, society in central Italy developed from practically self-sustaining peasant communities with scarcely any craft-specialisation except for metalworking, to early towns with separate crafts and a segregation into classes. Nevertheless, by the end of the 5th century BC these towns were still largely dependent on the products of a rural hinterland. Social distinction into classes was sustained by a differential access to resources. The inequality in agricultural landholding probably accelerated the transition to a stratified, urban society for stratification is characterised as unequal control over subsistence resources.[106]

The distinction between primary and secondary agricultural products is one of increasing specialisation. Primary products can be directly obtained from plants and animals such as grapes, olives, meat, horn and skins. Secondary products are the result of more elaborate processing techniques. Examples are wine, olive oil, cheese, linen and leather.

Leatherworking was mentioned by Plutarch as one of the earliest crafts established at Rome.[107] This could imply a specialisation in cattle-raising for *Latium Vetus*. Cattle dealing may have been one of the original functions of the *Forum Boarium* which is considered to be the oldest of Romes' markets.[108] Animal husbandry was important

[105] Cornell discusses the Twelve Tables extensively: Cornell 1995, 242-92. A distinction has to be made between the Greek literary sources and the Roman texts. The economic and technological development in Greece during the period 800 to 400 BC is to a certain extend discussed in the ancient literary sources: *cf.* fragments in Homer, Hesiod *etc*. These texts were the point of departure for scholars such as Finley, Starr and Bakhuizen: Finley 1981; 1985; Starr 1977; Bakhuizen 1976. Similar sources are almost non-existent for central Italy. Consequently, the archaeological data are essential for a reconstruction of the economic transitions in central Italy during this period. As mentioned in the introduction, the social-economic conditions that were described by the Greek and Roman authors can not be transferred to conditions in central Italy during the 8th till 5th centuries BC. They may hint to specific circumstances during these centuries but require a reading within an archaeological context.

[106] Wason 1994, 53.

[107] Plutarch Numa, 17.

[108] Coarelli 1988 a, 127-36; Smith 1996, 179; Cornell 1995, 48.

for the economy of the region around Rome and is attested from the late Bronze Age in southern Etruria.[109] The faunal remains of *Latium Vetus* from contexts which are dated to the 8th and 7th centuries BC show a high incidence of cattle, followed by pigs and sheep.[110] Low percentages of wild species indicate a developed subsistence level. This can, however, vary from site to site. In Etruria, for instance, it has been suggested that the inhabitants of the rural settlement of *Macchia del Monte* near *Lago dell'Accesa* which is dated to the 6th century BC, supplemented their meals with game and fish.[111]

The sacrifice of domesticated animals is of early date and may be correlated to the protection of animal husbandry.[112] The simultaneous offering of a sheep, a cow and a pig is attested at *Satricum* from at least the early 5th century BC. The archaeo-zoological remains at the site record the sacrifice of a *suovetarilia* in votive deposit II.[113] A different kind of offering is recorded at necropoleis. The offering of meat in graves is reported on the Roman Forum and at Osteria dell'Osa and dates from the early Iron Age.[114]

The cultivation of plants is reflected by sporadic finds of cereals such as barley, spelt, emmer and bread wheat. They are encountered in combination with faunal remains which indicates a combination of agriculture and animal husbandry from an early period.[115] The typical Mediterranean polyculture (the cultivation of olives, vines as well as cereals) became established in central Italy during the late 8th and 7th centuries BC though an earlier introduction cannot be excluded.[116] The establishment of polyculture signals an expansion in agricultural production because it supplemented the traditional agronomics. This resulted in an increased diversity of food products which probably advanced stability, agricultural specialisation and exchange.[117] Moreover, the cultivation of olives and vines necessitates substantial resources. Vineyards demand intensive care while an investment in time is required before the vines and olive trees produce crops. Polyculture reveals long-term scenarios and probably private landholdings.[118] It contributed significantly to the social-economic transformations recorded for the region.

The manufacture of Etruscan transport *amphorae* from the second half of the 7th century BC onwards signifies the production of agricultural surplus as well as some kind of adminstration.[119] The early 6th century BC merchant vessel discovered in the Campese Bay near *Isola del Giglio*, demonstrates that these *amphorae* could contain resin and olives as well as wine. The cargo of the wreck included, besides other merchandise, about 130 Etruscan transport *amphorae*. Some of these *amphorae* transported pitch while numerous olive pips testify that others

[109] Bietti Sestieri 1992 b, 35.

[110] De Grossi Mazzorin 1989. For *Satricum* see: Bouma *et alii* 1995, 187.

[111] van Dommelen forthcoming; Camporeale 1985, 135; section 3.6.6. For *Satricum* see: Bouma *et alii* 1995, 187.

[112] Smith 1996, 116.

[113] Bouma 1996, 278-81; 441-4.

[114] Bietti Sestieri 1992 b, 61, 155.

[115] Bietti Sestieri 1992 b, 34-5, 61-2.

[116] Anzidei *et alii* 1985, 190; Barker, 1981, 217-9. Some scholars suggest that vines and olives might have been cultivated in central Italy from an earlier period: *cf*. Bartoloni 1989, 51, 188-9.

[117] See for example, Renfrew and Greene for the effects of the introduction of polyculture: Renfrew 1972, 304-5, 481; Greene 1990, 72-3, 87.

[118] I discuss the slow rythms of appropriation of resources in combination with early state formation, in section 1.8. Private landholdings might have developed during this period though a system of nominal ownership with tributary rights probably existed as well.

[119] Rizzo 1990. Docter records the existence of transport *amphorae* made in central Italy from the 8th century BC onwards. He also mentions a limited production of transport *amphorae* which might derive from *Latium Vetus*: Docter 1997, 192-215.

contained olives. The wreck is dated to 590-580 BC and reflects the commercial exploitation of pines and olive groves in Etruria from an early period.[120]

The attested surplus production and its export indicates both an increase in and a regulation of, the agricultural yield. This can be related to an expansion of the exploitation of the agricultural hinterland during the 7th and 6th centuries BC which was recorded by various surveys. The population was by the 9th and 8th centuries BC large enough for the establishment of early nucleated settlements while being simultaneously small enough to live from the land that immediately surrounded these centres. With a further increase in population, more fields and also more distant fields had to be exploited. The distances may have become unprofitably large and thus farmers had to settle the countryside.[121] This account of the development appears unilinear because the increase in population is presented as a prime mover. It is suggested that the increase of population leads to intensification of agriculture, and to the need of greater efficiencies and economies of scale.[122] However a unilinear account is not suitable as an explanation for the considerable transformations that took place in central Italy. Furthermore, an increase in population is sustained by cultural developments. One of these developments is the economic bond of the emerging centres with its territory. In order to exemplify this bond, some illustrations from field surveys may suffice. At Crustumerium, for instance, the scatter of sherds is sufficiently dense in the 9th century BC to specify the outline of the emerging settlement. The occupation of the country becomes apparent in the 7th and early 6th century BC.[123] A survey around Fidene by Quilici and Quilici Gigli presents a comparable development (Fig. 2).[124] Figure 2 illustrates an increase in the exploitation of the countryside around Fidene from the early Iron Age. Similar patterns were established elsewhere, in South Etruria and the Pontine region.[125] For example, an increasing bond between settlements and hinterland was demonstrated for the Pontine region during the 7th and 6th centuries BC. Nevertheless, the quality of the agricultural soils must have influenced the settlement patterns considerably. The good soils became settled first and were more densely populated. This selection caused differential, agricultural exploitation.[126] Judging from the surveys, it appears that the countryside of the southern part of *Latium Vetus* is less densely populated than Etruria or the area around Rome. The poorer natural resources of this region must have curtailed its social-economic development.[127]

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[120] Bound 1991, 203-11; Cristofani 1995, 131.

[121] I refer to Chisholm for an account on the concept of distance in relation to various kinds of settlement patterns; Chisholm 1979.

[122] Renfrew and Bahn 1991, 419. The framework which is presented in this chapter, records enough information in order to state that a unilinear account will not be sufficient.

[123] Quilici and Quilici Gigli 1980, 273-94; Ross Holloway 1994, 124-7.

[124] Quilici and Quilici Gigli 1986, 365-98.

[125] Potter 1976, 23-7, 303-4; Attema 1993, 218-26.

[126] See for an illustration of this aspect the survey by Enei in the territory of *Caere*: Enei 1993.

[127] Bietti Sestieri 1992 b, 25-7. The pedologist Arnoldus-Huyzendveld considers the soils in *Lazio* to be in general as potential as those in Etruria: personal communication.

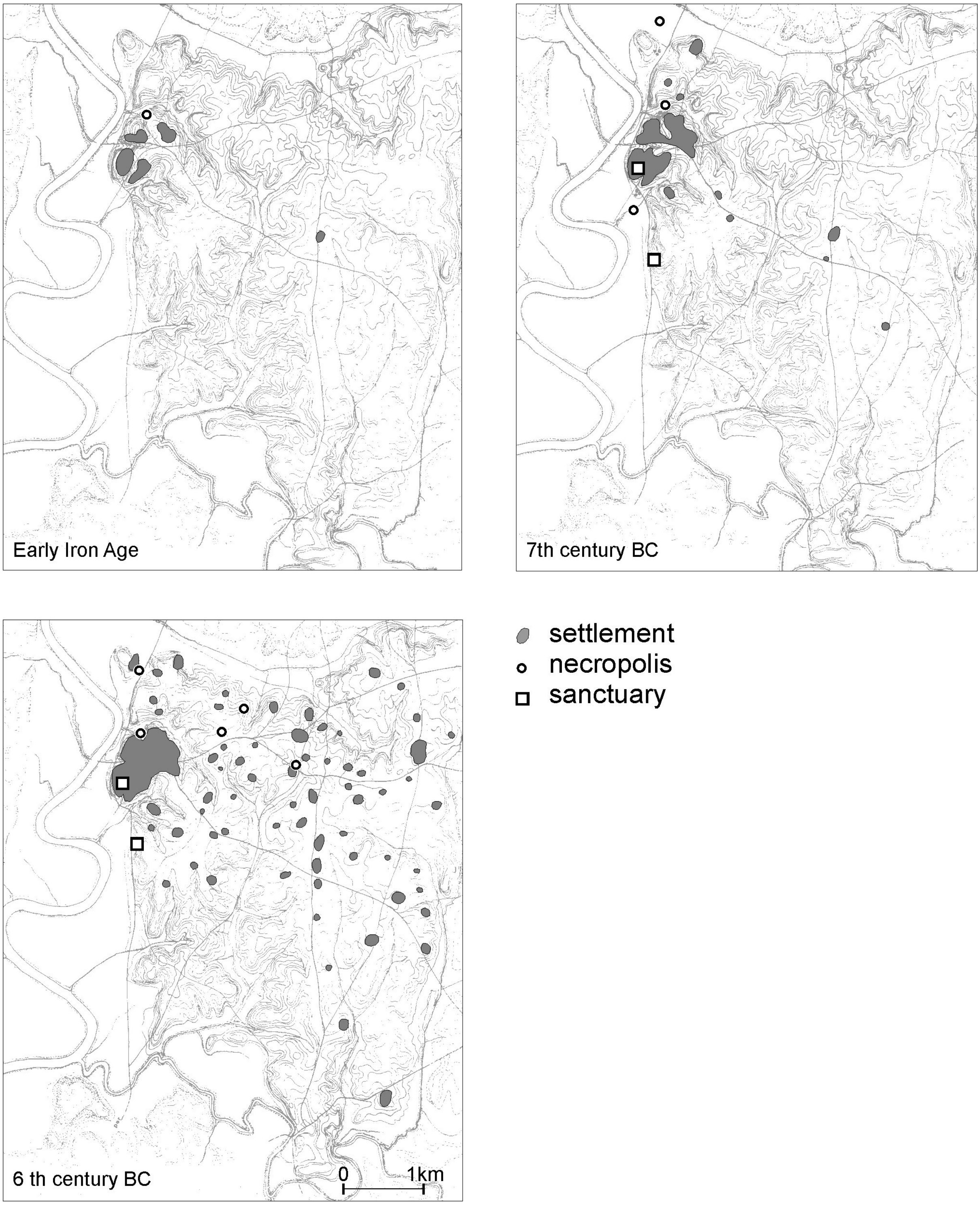

Fig. 2. Settlement patterns in and around Fidene from the early Iron Age to the 6th century BC.

1.6 *Urbanisation*

The development of urban centres is predominantly the result of morphogenesis in a more or less self-organising system with increasing size of the population. Thus, it is observed that in central Italy the development of advanced labour division and urbanisation coincide. In order to assess the role and position of craftsmen within this evolution, I consider it essential to look into the urbanisation process. This process is essentially a centralisation process in which the urban centre becomes in many aspects the focal point for its surrounding territory.[128] In Etruria the centralisation or concentration can be observed as an intentional clustering of villages during the early Iron Age. This nucleation must be read as a planned act of some of the communities inhabiting the emerging Etruscan polities.[129] The plateaux on which the future towns were established, were originally inhabited by separate, interdependent settlement units, probably each with distinct cemeteries. With continuing progress these nucleated settlements could form urban centres. Centres with urban characteristics appeared in Etruria during the late 8th and 7th centuries BC as proto-urban settlements.[130] This phase is marked by early buildings with stone foundations and the appearance of communal structures such as sanctuaries. Occupation was thinner in *Latium Vetus* and settlement nucleation did not occur on one large plateau but appears to have been more dispersed. The urbanisation process developed later when compared to Etruria.[131] Moreover, the Latin towns seem to be less well-defined which may be due to lower population levels and density as well as to the scattered nature of the urban territory.[132] Contrary to this is the quality of the archaeological record. At present settlement excavations have proceeded on a more extensive scale in *Latium Vetus* than in Etruria.[133] This may lead to a distortion while discussing the primary evidence for the workshop mode of production in both regions. As a result, it has been difficult to demonstrate the process of workshop nucleation for a major Etruscan town. Nevertheless, it was essential to include one of these towns in the presentation of the archaeological evidence in the chapters II and III. Otherwise an evaluation of the process of craft specialisation in central Italy would have been incomplete.[134]

The process of urbanisation is represented by a number of features. Wheatley considers that the emergence of urban centres depends on the following aspects:[135]
a. economic bond with the hinterland;
b. the emergence of a market economy;
c. political, religious and social relation with the hinterland;
d. the urban way of life;
e. the spatial development of the urban centre.
Combining these aspects Starr defined the town as a political, religious and economic centre for its surrounding

[128] *cf.* Rowlands 1987, 4-5; Snodgrass 1986, 47-8; Morris 1992.

[129] Bietti Sestieri forthcoming.

[130] *cf.* Bonghi Jovino and Treré 1987, 59-91.

[131] I refer to Bartoloni and Bietti Sestieri for a description of this process: Bartoloni 1989; Bietti Sestieri 1992 b.

[132] *cf.* Kleibrink 1997.

[133] *cf.* *Grande Roma* 1990; Ross Holloway 1996.

[134] I choose for this study *Caere* to represent a major Etruscan town since this site has relatively much primary evidence on local production when compared to other major towns like Tarquinia, Vulci and Vetulonia. Still I had to resort to secondary data for *Caere* in order to supplement the deficient primary evidence. See section 2.6.4 and 3.6.3.

[135] Wheatley 1972. The individual aspects are presented by: Morris 1992.

region.[136] These aspects can be studied separately but it has to be stressed that they are strongly interrelated and mutually reinforcing which is indicated by the morphogenetic character of the urbanisation process.

As mentioned above, the increase in craft specialisation is inherent to the development of urban centres. This aspect needs to be added to the criteria mentioned by Wheatley since it establishes both the economic bond with the hinterland as well as the emergence of a market economy. Moreover, the increase in craft specialisation can be identified with archaeological means for it has a material connotation.

Economic specialisation is division of labour between households which eventually makes the craftsman and his family dependant on the production of food by other families. In the period discussed this is a very gradual process since there are quite a few sites where part-time specialisation can be identified. Furthermore, the rate of specialisation can be assessed by the investmenst in technological instruments and infrastructure. The factors favouring the development of crafts are listed by Renfrew while discussing the emergence of the Aegean Bronze Age cultures.[137] Most of these factors are also relevant for central Italy between 800 and 400 BC and are recorded here because at various stages in this study one of these elements will be examined. Renfrew mentions that craft specialisation is enhanced by:

- increased agricultural production;
- concentration of resources by redistribution;
- increased population passing the population treshold for craft specialisation;
- new materials and artefacts;
- trade;
- religious representation and the decoration of living spaces.

Another aspect which will advance craft specialisation is competition. Production will increase when artefacts are recognised as forms of visible wealth which in turn provokes competition and conflict. This feature is essential for the developments in central Italy.

These general factors are supplemented by an examination of the characteristics of the process of craft specialisation. This process is described by Brumfiel and Earle as a complex concept that involves a number of variations. These are:[138]

a. the relationship of the specialist (independant or attached);
b. the nature of the product (subsistence goods, wealth items or services);
c. the intensity of specialisation (part-time or full-time);
d. the scale of the production unit (individual industry, household industry, workshop industry, village industry or large scale industry);
e. the volume of output per individual specialist.

Other variations can be added which relate more directly to the archaeological discipline:[139]
f. the investment in technology which can, for instance, be deduced from the construction of a kiln or the provisions needed for the preparation of clay;
g. the variation in form, decoration and function of the artefact. The production of larger quantities can increase standardisation of specific products but can also lead to an increase in decoration and the manufacture of products

[136] Starr 1977, 98.

[137] Renfrew 1972, 492.

[138] Brumfiel and Earle 1987, 5.

[139] *cf.* Peacock 1982.

with specific functions. In central Italy, the production of larger quantities predominantly lead to an increase in standardisation[140] while in Athens for example, the production of large quantities of fine wares is distinguished by an increase in decoration which is exemplified in the production of the Black- and Red-Figure vases.

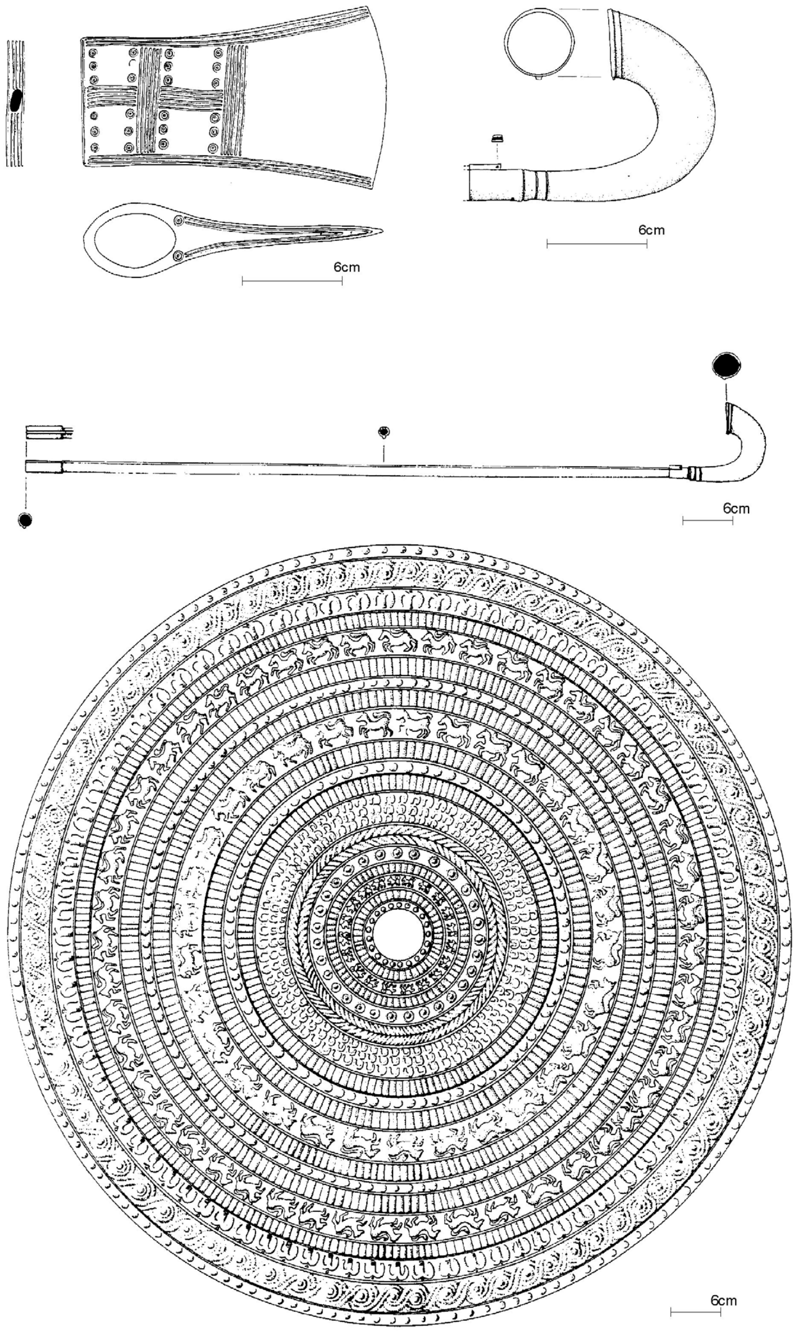

Fig. 3 Copper alloy axe, lituus and shield which were deposited at Tarquinia.

[140] The standardisation of the pottery production in central Italy is discussed in chapter II. The introduction of measures is presented in chapter IV.

These dimensions will be examined in detail in the following chapters. The relationship between the different variations is that increase in craft-specialisation is expressed by an increase in manufacturing time and subsequently by the expansion of number of artisans working in the workshop. This is related to a growth in transactions and leads to an intensification of investments in technological infrastructure.[141] The character and number of transactions directs the relationship between market and craft-specialisation. This relation is fundamental for the economic transition examined in this book which makes it necessary to evaluate the market conditions in proto-historic central Italy. These markets are hard to recognise as an architectural manifestation, that is as an *agora* or *forum*. I consider the market conditions in central Italy rudimentary which is partly based on the lack of coinage of small denominations or small change. These coins indicate that one could obtain everyday commodities on a market. However small change was not available in central Italy before the 3rd century BC.

A distinct indication for the emergence of market conditions is the nucleation of workshops.[142] This nucleation can develop in urban or in rural contexts but the transfer of the products of these workshops depends on sufficient demand and, therefore, urban markets. Settlement excavations can reveal nucleation of workshops and this in itself would record urban conditions and some sort of market regulation. In theory the process of urbanisation could be identified by nucleation of workshops. It is one of the features which will be examined in the sections of chapter II and III where the individual sites are presented.

The concept of specialisation in services will not be discussed in detail though the simultaneous development of *collegia* of both industries and services is validated. The upsurge and legitimation of religious institutions in central Italy during the 7th and 6th centuries BC implies the existence of *collegia sacrificia*.[143]

Another group which provided services were performers. The list of early crafts mentioned by Plutarch includes musicians. New musical instruments became available in the region during the 7th century BC. Some of these instruments have been actually excavated. An outstanding copper alloy *lituus*, a sort of trumpet, was deposited at Tarquinia together with an axe and shield of the same material (Fig. 3). The artefacts are exquisitely made and are dated to the early 7th century BC. Besides implying the existence of musicians, the objects signify the artistry of the Etruscan coppersmiths. The *lituus* is about 145 cm long and weighs 610 g. Some components of the instrument are cast while others are hammered. Its manufacture is intricate in order to manipulate the sound which would have been suitable to accompany chanting.[144] Early wooden pipes were recovered from the wreck at Campese Bay, *Isola di Giglio* and are dated to 590-580 BC.[145]

Musicians with instruments such as flutes, horns, trumpets and zithers are depicted on architectural terracottas, mural paintings in tombs, funerary urns and vases.[146] Judging from the ancient illustrations, musical instruments were employed to attend symposia, processions, combats and dances. The terracotta frieze plaques from Poggio Civitate which are dated to 600-590 BC, and the 6th century BC plaques from *Velitrae*, Rome and Palestrina

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[141] Bitter 1991, 89.

[142] Peacock 1982. Peacock considers that a workshop is an enterprise with more than one full-time craftsman. A manufacture employs more than 12 labourers.

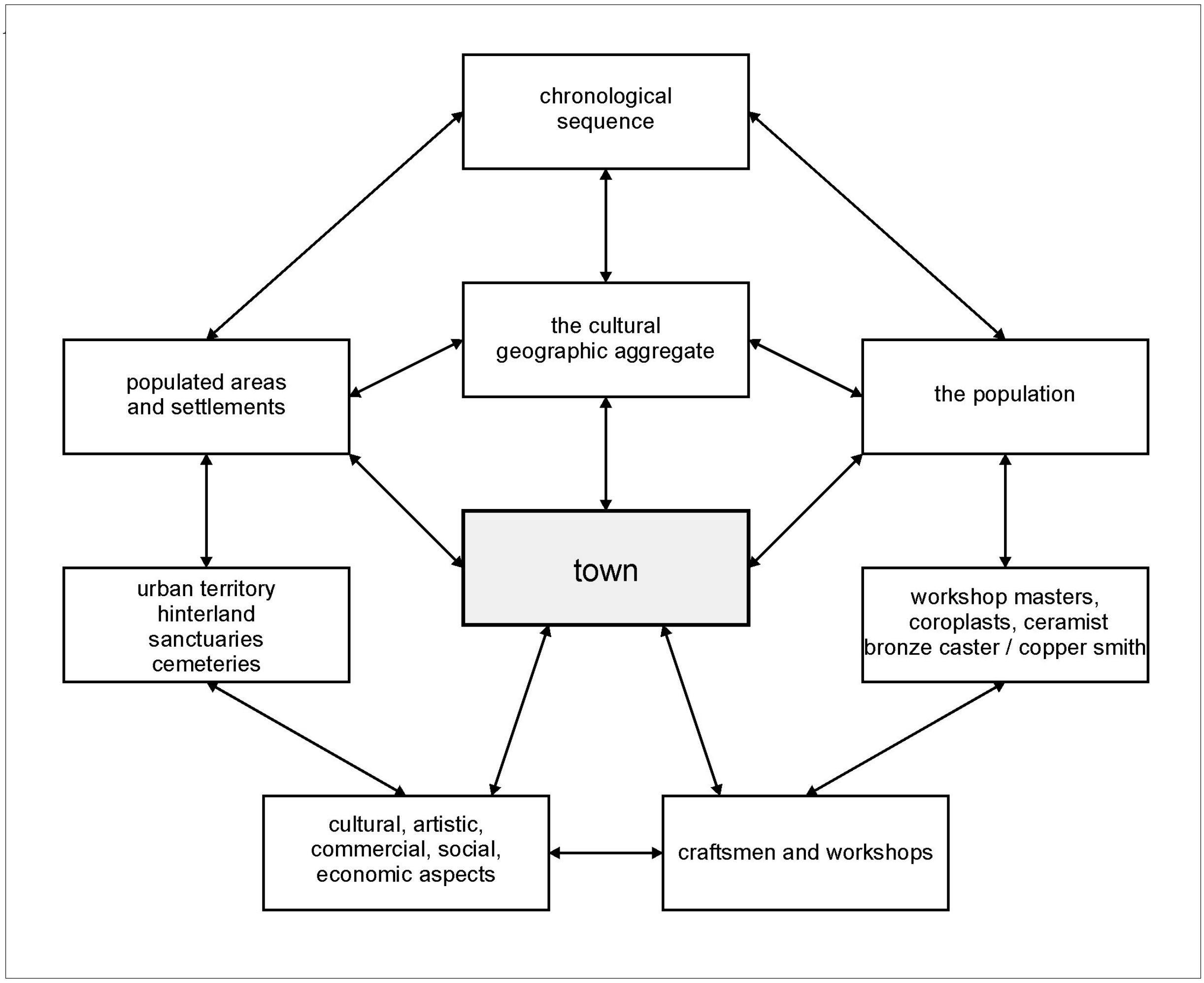
[143] For a discussion of the *collegia* see section 2.7. *Collegia sacrificia* are for example, examined by Cornell: Cornell 1995, 233-6, 251-2.

[144] Bonghi Jovino and Treré 1987, 63, 72-7. Other *litui* are dated to a later period. One specimen is exhibited in the *Museo Gregoriano Etrusco* and was recovered at Vulci. Another *lituus* was offered to Sotheby's: Blanck and Proietti 1986, 24-5, 42. In their publication Blanck and Proietti also examine depictions of musical instruments in central Italy.

[145] Bound 1991, 232-4.

[146] *cf.* Weber-Lehmann 1985. Weber-Lehmann examines some symposium scenes which are illustrated on late Archaic mural paintings in tombs at Tarquinia. It is noteworthy that the musicians are rendered differently in dress and composure when compared to the portrays of servants.

illustrate some of the occasions which were attended by musicians.[147] The nature and the number of occasions implies that in the major centres of central Italy, companies of musicians might have existed from the 7th century BC, providing their services whenever required.



The process of craft specialisation has to be reconstructed as a measured process varying with the size of the settlement and the demand. In the beginning, craftsmen may have worked with various materials and could have combined crafts with agricultural labour. In addition they may have provided services and some of them could even have travelled depending on the market and the required, technological infrastructure. For the Orientalising Period, it is generally accepted that a division between copper- and iron-smiths had not yet occurred.[148] Correspondingly, a division into gold- and silver-smiths is not probable. Concerning the ceramic craft, the evolution towards specalisation must have been gradual with a continuation of domestic production well into the 6th century BC side by side with the manufacture by potters of more standardised and technologically advanced pottery. The major towns in central Italy will have matured at an early stage into the model presented in Figure 4. This model presents a

[147] For Poggio Civitate, see for example: Rathje 1988, 86-8 and *Case e Palazzi d'Etruria* 1985, 122-7. For the terracotta plaques at *Velitrae*, Palestrina and Rome, I refer to: *Grande Roma* 1990, 93-4, 166-8, 204.

[148] Pleiner 1988, 35-6; Hartmann 1984, 154-5 and Ampolo 1980, 173-9. Both materials were worked in the same workshop. An internal division of labour in metal workshops might soon have developed depending on the demand.

correlation between town and hinterland in which the workshop masters, the craftsmen and the individual workshops are related to other features of town and hinterland.[149] Smaller centres will never have reached this rather advanced stage of craft specialisation which is characterised by individual workshops, each with a master and his assistants.

1.7 *Economic development*

An economy consists of producers, distributors and consumers or to speak in terms more familiar to the period in question craftsmen, traders and customers. Their actions and interactions create an economy. Some aspects of the economic development in central Italy such as the agricultural foundations, were introduced above. The producers, that is crafts and industries were presented in the introduction and in the section on urbanisation. They will be examined comprehensively in the chapters II and III. This section is devoted to some other features of an economy. It will start with a discussion on the size of the population for this directs the demand. Subsequently, the resources, means of transport, local production, trade and exchange mechanisms are introduced.

The correlation between supply and demand is essentially regulated by the size of the population. An increase in the number of people modifies the relationship between supply and demand. As long as demand favours production and *vice versa* it will sustain increasing social-economic complexity.[150] Whenever, this mechanism falters it may cause severe friction between the different social units. Increasing population densities associated with decreasing mobility and growth of complexity of subsistence, will result in more centralised coordination.[151] Population growth is controlled by factors such as improvement of living conditions thus lengthening peoples lives, rise in the number of childbirths and immigration. For central Italy during the period 800 to 400 BC, it is reasonable to assume that in general, the growth rate of the population in Etruria was higher than in *Latium Vetus*. This is reflected by the increasing number and size of the settlements.[152]

A calculation of the actual size of the population has been feasible for a limited number of sites. The number of residents in various centres in *Latium Vetus* was listed in the *Dialoghi* and is chiefly based on the size of the settlements.[153] These numbers cannot be regarded as indicative because the density of houses at the individual centres is not established. It seems unlikely that during the 7th to 5th centuries BC, the defended settlement centres in *Latium Vetus* became densely populated over the whole settlement area considering the dispersed nature of the individual nuclei recorded at some of these settlements.[154] More representative are the numbers given for those sites were the necropoleis were excavated.

Bietti Sestieri considers that at Osteria dell'Osa during the period 900 to 770 BC, the size of the community did not exceed a figure of between 100 and 300 people.[155] The settlement during this period reflects a ranked society

[149] This model incorporates many of the features that were mentioned by: Wheatley 1972 and Morris 1992. An aspect which sofar has been hardly examined, is the distribution of products of urban workshops over the urban territory. This hampers somewhat a full reconstruction of the economic transitions in central Italy.

[150] Renfrew 1972, 494.

[151] This aspect was one of the principles in a work by Fried who examined the evolution of political society from egalitarian, to rank and stratified societies, to eventually the state organisation: Fried 1967.

[152] see section 1.5.

[153] *Formazione* 1980, 24-30.

[154] *cf*. Kleibrink 1997.

[155] Bietti Sestieri 1992 b, 102.

with increasing competition among extended families which were organised in kingroups. The settlement was nucleated and a concentration of power developed around the male family heads.[156]

On account of the number of necropoleis and the density of the graves it is reasonable to assume that by 800 BC Veii inhabited more than 1,000 people.[157] With a population of this size, it is probable that proto-urban conditions emerged.

The civic character of *Caere* around 600 to 500 BC is expressed by a population of roughly 25,000.[158]

Based on the density of houses on the plateau of Acquarossa, it is estimated that during the first half of the 6th century BC between 4,000 to 7,000 people inhabited the site.[159]

A calculation of the number of inhabitants at Rome during a specific period is more complex because of the scattered archaeological evidence. Cornell considers that a figure of 35,000 inhabitants is feasible for the late 6th century BC but this figure seems to apply to the whole territory of Rome.[160]

The population size which derives from the necropoleis at *Satricum* dated to the 5th and early 4th centuries BC presents not an urban centre but dispersed nuclei. The south-west necropolis contained about 400 graves covering a period of approximately 100 years. The average age of the deceased has been determined as 21 years. The calculation results in a mean population of about 80 people.[161] Another necropolis of approximately the same period was located on the temple hill which implies that this hill was not or sparsely inhabited.[162] This necropolis may have been the burial ground of a specific group of inhabitants. In addition, it is recorded that there are at *Satricum* three different votive deposits dated to the 5th and 4th centuries BC. In combination with the nearby necropoleis this could indicate that the settlement was occupied by three extended families each with their own sanctuary and burial ground with a total population of a few hundreds of inhabitants for the whole settlement.[163]

The figures presented are conjectural but represent a seemly order of magnitude. They exemplify the variation in the nature and size of the settlements. This variation elucidates some of the differences encountered when examining the process of craft specialisation. In this context it is relevant to quote a famous passage by Xenophon:
'*In small towns the same workman makes chairs, doors, ploughs and tables, and often this same artisan builds houses, and even so he is thankful if he can find employment enough to support him. And it is, of course, impossible for a man of many trades to be proficient in all of them. In large cities, on the other hand, inasmuch as many people have demands to make upon each branch of industry, one trade alone, and very often even less than a whole trade, is enough to support a man: one man, for instance, makes shoes for men, and another for women; and there are places even where one man earns a living by only stitching shoes, another by cutting them out, another by sewing the uppers together, while there is another who performs none of these operations but only assembles the parts. It follows therefore as a matter of course, that he who devotes himself to a very highly specialised line of*

[156] Bietti Sestieri 1992 b, 209-11, 234-235.

[157] Bartoloni *et alii* 1994. See also: Berardinetti Insam 1990, 22-4.

[158] Huergon 1961, 176; Cristofani *et alii* 1988, 85. The actual calculation and the evidence for this figure is discussed in section 2.6.4.

[159] Wikander, Ö. 1993 a, 137-9; Person 1994, 293-4.

[160] Cornell 1995, 204-8. It seems that this figure is based on the whole *ager Romanus* of the late 6th century BC which is given as *c*. 822 km^2. His argument becomes vague when he compares the figure for *Caere* with that for Rome because both figures represent different areas. The figure for *Caere* is based on the necropoleis around the town and not on its territory which was approximately 1,500 km^2, thus roughly twice as large as the territory of Rome at that period.

[161] Gnade 1992; Knoop and Waarsenburg 1990, 39-40.

[162] Maaskant-Kleibrink 1992, 101-5.

[163] Kleibrink 1997; Nijboer *et alii* 1995.

work is bound to do it in the best possible manner'.[164]

After this account of the size of the population in various settlements in central Italy, I will discuss the exploitation of resources. The communities in this region exploited the resources nearby as far as their location was known and the processing techniques understood.[165] This is a main premiss for this study because production and consumption, are in my opinion, primarily directed by internal distribution and not by imports or exports through seaborne trade. A specification is required for the metals which are not commonly available. I will discuss metallurgy in detail in chapter III but at this stage it is necessary to outline that trade in metals had established a strong tradition of organised long-distance exchange in Italy from the Bronze Age onwards for which the exploitation of the ore deposits in Etruria were essential.[166] This tradition was still active and developing during the Iron Age. Thus, except for metals and other sought after goods such as amber and ivory, most of the resources must have derived from the hinterland of individual centres. The quantities of raw materials which travelled over long distances are considered small in proportion to the total production. The merchants' ships found in the Mediterranean and dated to this period, support this idea. They carry a range of products and transportation in bulk has been seldom attested for the early stages of seaborne trade.[167] There is some controversy about the early exploitation and subsequent shipping of iron ores from Elba.[168] Based on a nodule of Elban iron ore discovered at *Pithekoussai*, it was suggested that iron ores were transported over large distances during the early Orientalising Period. This view has been accepted by many scholars because it presents a convenient, direct correlation between the rich metal resources of Etruria and the commercial interest in this region by Levantines and Greeks.[169] There are, however, several arguments which dispute the idea of the early transfer of ores. The nodule found at *Pithekoussai* was found in the acropolis dump on Monte di Vico in a disturbed context which dates from the Middle Bronze Age to the first century BC.[170] Secondly, iron-smithing has been attested at *Pithekoussai* during the early 7th century BC but not the smelting of ores.[171] Thirdly, ores are predominantly processed near the mine and subsequently transported as ingots or metal bars. This is recorded by the evidence from sites where ores were smelted but also by the merchant vessels.[172] The fourth

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[164] *Cyropaedia* VII.2.5. Translated by W. Miller, Harvard University Press, reprint 1989. Xenophon lived from about 430 to 359 BC.

[165] Resources were introduced in section 1.4 under geological perspective. A general account of clay resources and the location of metal ores in central Italy is presented in sections 2.2 and 3.5.

[166] Bietti Sestieri forthcoming. See also chapter III.

[167] Parker presents a catalogue of shipwrecks recovered in the Meditarranean and dated from 2200 BC to the 15th century AD. The Hellenistic/Roman seaborne trade was balanced between 'bulk' and compound cargoes: Parker 1992, 20-1. The ships that are dated from 800 to 400 BC, list primarily transport amphorae as cargo but those wrecks which have been excavated and documented more extensively, demonstrate that they had a wide range of commodities on board.

[168] *cf.* Zimmer 1990, 19.

[169] *cf. Rasenna* 1986, 123. It is not my intention to dispute the relation between the metal resources of Etruria and this commercial interest but to question the implication that raw materials were transported in significant quantities over large distances during the Orientalising period. This corresponds with the doubt on bulk trade in minerals expressed by for example: Boardman 1990, 185.

[170] Buchner 1971, 66; Ridgway 1992 a, 84-5, 91, 99-100.

[171] Buchner 1971; Klein 1972. The smelting of iron requires substantial quantities of iron ores and charcoal: see section 3.4. This implies bulk transportation of iron ores to *Pithekoussai*.

[172] Smelting of ores and sites where smelting is attested, are discussed in chapter III. Parker lists 113 ships with ingots of some kind against 8 which contained ores: Parker 1992, 18-9. Ingots are frequently documented in wrecks dated to the Bronze Age. Only one of the eight vessels which contained ores amongst other commodities, might have been dated to the period that is examined in this thesis. Near Bajo de la Campana in Spain, merchandise was recovered which included lead ore: serial number 83 in Parker 1992. However, the goods might have belonged to

argument depends on an assessment of the economic conditions. Transport of raw materials over long distances is related to the type of material as well as to the scale of the economy. The transport of luxury raw materials such as ivory, ostrich eggs etc. is less affected by market restrictions than bulk shipment of base resources such as ores, grain or building materials. The transfer of these base resources is associated with the organisation of territories and states. Thus, the importation of grain in substantial quantities became feasible for classical Athens and mid-Republican Rome at a stage when the size of the population could no longer be maintained by the agricultural yield of their territories.[173] In relation with the Elban iron ores, transport by sea is recorded but occured at a stage later than around 700 BC. Seaborne trade of these ores has to be correlated to the scale of industrial activities, the economic organisation of the Etruscan city states, the quality of the Elban ores as well as to the possible deforestation of the woodlands on Elba.[174] Transportation of these iron ores is indicated from the 6th century BC onwards to Populonia and during the 5th century BC to Genoa.[175] At the moment there is no evidence that the Elban ores were transported before this period.

There is one example of bulk transportation of building materials for Rome. A new city wall was constructed during the first half of the 4th century BC. It was constructed with tuff that came from the *Grotta Oscura* quarries. These quarries are located near the Tiber, 15 km upstream in the newly won territory of Veii.[176] The motivation for the Romans for employing *Grotta Oscura* tuff might lay in the assertion of their control over this territory and its resources. Before the conquest of the territory of Veii, the Romans used stone which was quarried locally.[177]

The type of control over the resources is crucial for various reasons. Command over basic resources specifies social differentiation as well as the mode of exploitation. During the 8th and 7th centuries BC authority over resources was transformed fundamentally. This is related to the transition from ranked societies to early states. In a ranked society, land and resources may be nominally owned by chiefs but these chiefs also have to ensure that other members of the community have sufficient access to the same resources. Thus, there is a difference between:

1. owning while responsible for access and
2. actual control over basic resources which creates political power of an entirely different dimension. During the transition from step 1 to 2, the basic resources are transformed into capital resources. Wason considers that '*the main defining feature of social stratification is differential access to essential resources. A likely way of restricting access is through control of capital resources required for production such as agricultural land and mining areas. Stratification is unstable without mechanisms for its maintenance. Under a stratified system people experience differentiation in standard of living, security and even life expectancy far beyond distinctions in egalitarian or rank society. This requires unprecedented means of justification and enforcement*'.[178] The account by Wason is valuable

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more than one wreck. Among the finds were amphorae which cannot predate the 2nd century BC and 13 elephant tusks with Phoenician script that are dated to the 5th/4th centuries BC. It is not documented in which wreck the ore was transported.

[173] Starr 1977, 164-5, 176; French 1964, 107-10; Cornell 1995, 385.

[174] Deforestation is discussed by: Wertime 1983.

[175] The subject of provenance and early use of iron ores in Antiquity requires more examination, both experimental and theoretical. Populonia is discussed in section 3.6.7. For Genoa I refer to: Giannichedda 1996, 70-1.

[176] The transport of ores from Elba to Populonia and of tuff from the Grotta Oscura quarries to Rome occurred by water transport over relatively short distances and thus represent instances which are far less expensive when compared to bulk transport over land over the same distance. See the following pages of this section.

[177] Blake 1947, 27-9; Coarelli 1988 b, 328; Ross Holloway 1996, 18-9, 91-102. DeLaine presents quantified data for the supply of ordinary bulk building materials to the city of Rome during a later period. She relates these building materials to data from the local geology: DeLaine 1995.

[178] Wason 1994, 57-8.

as a design for the transitions in central Italy from 800 to 400 BC but is too rigid. His description of the transition from communal to private ownership of resources scarcely allows for intermediate stages. It is recorded that the actual appropriation of resources only occurs with advancing state formation. During the early stages of this process, social inequality is elaborated but this stratification appears not to be immediately translated into private ownership of resources.[179]

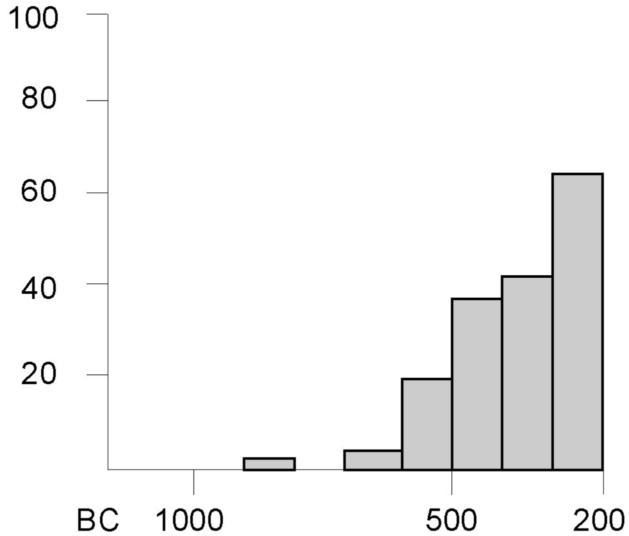

Fig. 5. Ancient Mediterranean shipwrecks from 1000 to 200 BC, grouped in centuries

The exploitation of resources is closely related to the means of transport which is indicated above since the means of transport dictate the expenses involved. The cost of transport overland far exceeded transport by water. For the Roman empire, detailed figures for sea, river and land transport are recorded. The ratio of the cost of transport by sea, river or land is 1:5:28.[180] For the period 800 to 400 BC, the transport costs will have been quantified indirectly but the ratio for the Roman empire presents an order of magnitude of the efforts involved. Labour expenditure severely restricted bulk transportation overland. The ethnographic record confirms this principle since it has been reported that clay sources may be located further away when they can be transported by raft or canoe.[181]

An intensification of all means of transport is recorded during the four centuries discussed in this study. The development of tracks and roads is presented in the maps of the individual sites examined in chapter II and III. It is evident that the various centres in central Italy were connected overland and that the increase in communication enhanced the use of the interior and interregional routes.[182] Moreover, the ancient routes connected the coastal areas with the sites in the interior. The commodities may have been carried by men, pack animals and carts.[183] The *Via Salaria* as well as the Tiber have been decisive for the development of proto-urban centres such as Ficana, Rome, Antemnae, Fidenae and Crustumerium. The control over the saltpans on the coast and the transport of salt along the *Via Salaria* inlands contributed much to the development of Rome.[184]

[179] Claessen and Skalník 1978, 641-5. See also section 1.8.

[180] Greene 1990, 39-42.

[181] Arnold 1989, 38-55.

[182] Early roads are discussed by: Quilici 1990, 12-5; Maaskant-Kleibrink 1987, 12-3; Bietti Sestieri 1992 b, 72-5 and Bartoloni 1989, 152-4.

[183] A cart for processions is illustrated on a terracotta plaque from Poggio Civitate: Cristofani 1975, 15. In addition a ceremonial cart is recovered in the Tomba Bernardini: Emiliozzi 1988. Less elaborate carts for the transfer of commodities have not been excavated.

[184] Giovannini 1985.

Apart from the Tiber, major rivers in central Italy are the Arno and the Volturno. Numerous minor rivers such as the Ombrone, Fiora, Astura and Carigliano bisect the interior. Most of these smaller rivers were navigable in antiquity and were used as waterways which ran from the coast to the interior.[185] Rafts, boats and dugouts must have been employed for navigation.[186]

An increase in seaborne trade is implied by Figure 5 which presents the number of ancient shipwrecks by century during the period 1000 to 200 BC. A steady growth in the interregional trade in the Mediterranean is suggested from the 7th century BC and later. In addition, Figure 5 gives an impression of the proportion of seaborne trade during the period 800 to 400 BC in relation to previous and later periods.[187] The steady increase was based on the incorporation of the western Mediterranean into the general trade networks. This is reflected by the considerable increase in the number of wrecks reported along the Italian and French coasts from the 7th century BC on. Parker listed about 60 wrecks for the period 800 to 400 BC of which more than 50% were discovered along the shorelines of Italy and France.[188] The evidence from the shipwrecks demonstrates the existence of directional trade from Etruria to the south coast of France.[189] Detailed accounts on the Giglio shipwreck and the Porticello wreck illustrate that the cargo was of mixed provenance.[190] The increase in seaborne trade and the importance of the communication routes between the seaside and the interior is reflected in the development of centres such as Lavinium, *Caere*, Tarquinia, Vulci and Vetulonia which are located nearby the Tyrrhenean coast. Populonia and *emporia* such as *Pyrgi*, Gravisca and Regisvilla are located directly on the coast. These entrepôts developed during the 6th century BC and were highly ritualised. They restricted the access of foreigners to the interior communities.[191] During the 5th century BC there is a general decline of foreign imports into central Italy as well as a dimunition of the Etruscan seaborne trade.[192] After the battle of *Cumae*, Etruscan trade concentrated on central Italy itself, regions in northern Italy and on territories to the north of the Alps.[193] Maritime trade appears to be confined to the northern region of the Tyrrhenean coast and is substantiated by the exchange of ores and metals in which Elba, and towns such as Aleria and Populonia, participated.[194]

The account of the means of transport necessitates a description of the trading patterns. As mentioned above, a premiss of this study is the domestic redistribution of resources. The internal orientation of the economy is also reflected by the trading patterns. There are, however, long-standing controversies over the working of the domestic economy and the position of external trade.[195] It is not my intention to deny the role of external or international trade

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[185] *cf.* Segre 1986; Guidi 1986. See also the other contributions in *Tevere e Le altre Vie d'Acqua del Lazio Antico* (*Archeologia Laziale* VII,2, Quaderni di Archeologia Etrusco-Italica 12, 1986, esp. p. 30-156). The papers in this publication discuss primarily the development of the settlement patterns along the Tiber.

[186] Bonino 1981; Quilici Gigli 1986, 82-9.

[187] An aspect which is not incorporated in Figure 5 is the enlargement of the shipload in time.

[188] A substantial number of these wrecks were not excavated. They have not been documented in detail and the reports might be based on the recovery of some transport *amphorae* by divers and fishermen.

[189] Bouloumié 1982, 52, 58-67.

[190] *cf.* Parker 1992.

[191] Arafat and Morgan 1994, 113. For Regisvilla I refer to: Morselli and Tortorici 1985.

[192] *cf.* Rasenna 1985, 125-39; Martelli 1985; Gran-Aymerich 1991, 23; Prayon 1981; Hannestad 1988. See, however, also: Cristofani 1984.

[193] *cf.* von Hase 1993, 194; Shefton 1995; Pearce 1995.

[194] Cristofani 1995, 133.

[195] The restricted significance of imported ceramic table wares in trade is recently stressed by Gill and Vickers. They argue that the value of Greek painted pottery is overestimated. According to them the reference for the Attic pottery caused a distorted view of the importance of pottery

but it was marginal when compared with the internal commodity flow. Access to foreign commodities was regulated in central Italy by the elite and was thus by nature restricted. The impact of this curtailed trade was nevertheless considerable but can be related to the relatively open disposition of the communities in central Italy during the 8th to 6th centuries BC. The general transition during this period has led to diffusionist concepts but these notions do not account for the long-established and comprehensive internal networks, the thoroughness of the development described nor for the fast growth of the regional markets. The internal distribution and trade stimulated ultimately the urban growth in central Italy and not the external trade. In my opinion the internal trade can be reconstructed as a redistribution exchange combined with a modified, limited market exchange. The existence of an accounting system using standardised quantities will be substantiated in chapter IV but the extent to which this system was applied appears to be confined. This is one of the arguments for limited external exchange. Other arguments for this proposition are recorded by the distribution of the locally produced, decorated pottery, the control over the *emporia* and by the exchange mechanisms.[196] These aspects are discussed separately starting with the distribution of locally produced pottery.

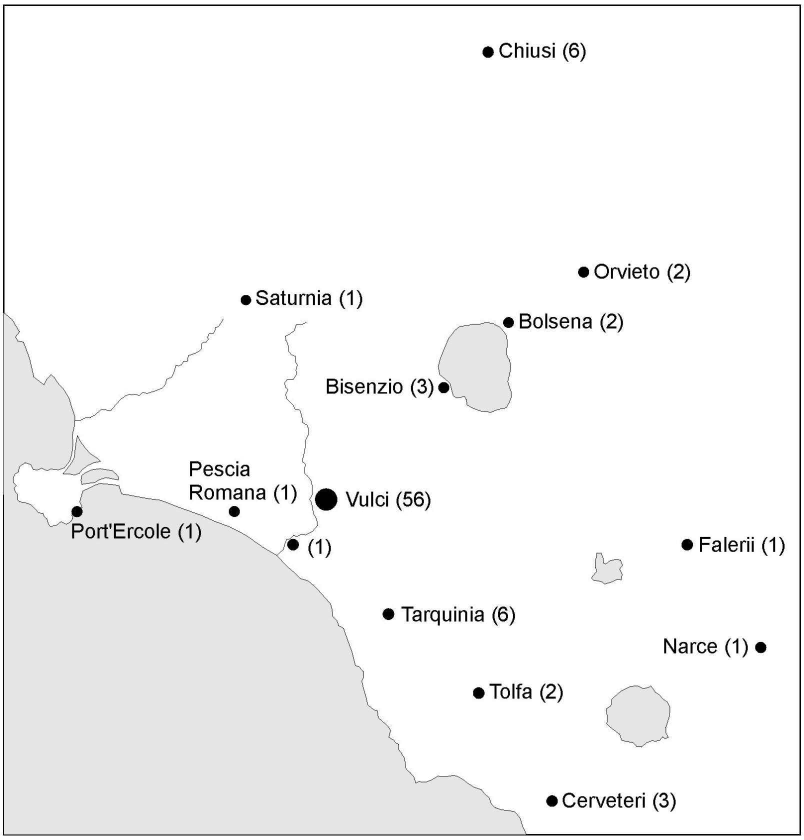

Fig. 6. The distribution of vessels which are assigned to the Micali painter and his followers

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in trade: Gill 1994; Gill and Vickers 1990. Their remarks can be seen as a reaction against the Hellenist tradition in classical archaeology: *cf.* Morris 1994 a. This tradition and its consequences for central Italy is illustrated by a remark that was made by Hemelrijk while discussing the 'Greek' potters who made the *Caeretan* hydria in or near *Caere*: '*Many of the vases they produced seem to have been made for Greek immigrants; after a while there is a certain decline in the mythological interest and intelligibility of the scenes which may perhaps be explained by the influence of the Etruscan customers who were of course, far less literate than the masters and their Greek friends*': Hemelrijk 1984, 193.

[196] *cf.* Arnold 1989, 20-60. Arnold examines the resources for ceramic production. The *emporia* are discussed in this section on *Economic development*. The exchange mechanisms are primarily examined in Chapter IV.

The locally produced pottery can be subdivided in coarse and fine wares. The coarse wares, that is the *impasto* production far excedes in quantity the fine wares. This statement is based on figures from settlement contexts. The recent excavation on the plateau of *Caere* demonstrates that the *impasto* production outnumbers the quantity of fine wares.[197] The predominance of the *impasto* pottery has also been quantified for Rome and *Satricum*.[198] It is generally assumed that *impasto* pottery is locally produced and distributed. A study of the reallocation over the hinterland of *impasto* fabrics which can be related to a specific workshop, is not available. Traditionally, research has concentrated on fine ceramics, especially the decorated fine wares, preferably imported from Greece. Fine wares are proportionately better represented in tombs and sanctuaries but in most cases still do not outnumber the coarse wares. It is important for the rest of this study to stress that the *impasto* production in quantity excedes the other wares for it exemplifies the internal production and distribution mechanisms.

The exchange of fine ceramic table wares is also dictated by the demand within the individual centres. Regional trade in these wares was limited. The production of *amphorae* with double spirals and the subsequent production of *bucchero* is related to the indigenous tradition of craft specialisation. Various production centres of fine *impasto* vessels have been identified, one of which is located at *Satricum*. On account of uniformity of technical characteristics, morphology and decoration, Beijer demonstrated that fine *impasto amphorae* are produced locally in the decades around the middle of the 7th century BC. The quality of these vases is distinctive because the artisan pre-treated the clay, used a wheel and thus could produce thin walled *amphorae*. The distribution in *Latium Vetus* of the *amphorae* which were made at *Satricum*, was restricted.[199]

During the late 6th and early 5th centuries BC, the inter-regional distribution of fine wares was still limited. Hemelrijk for example, assigns the provenance of most of the *Caeretan* hydriae to *Caere* itself.[200] Figure 6 illustrates the distribution of the vessels assigned to the Micali painter and his followers. They are predominantly found in Vulci and its territory (about 70 %). The remaining vessels were discovered in Etruria (28 %) and the Faliscan territory (2 vessels).[201] Although Spivey assigns these 86 vases slightly differently over the Etruscan countryside when compared with Figure 6, the conclusion remains that '*the Micali painter worked chiefly to fulfil a local demand at Vulci and only secondarily exported surplus to destinations for the most part already established within the trading patterns of archaic Etruria*'.[202] Even at Gravisca, the ancient entrepôt of Tarquinia, the local pottery outnumbers the imports. The imported, black-glazed Attic pottery accounts for about 1/3rd of the excavated ceramics while 2/3rds of the pottery is attributed to various Etruscan workshops.[203]

These examples from *Satricum*, *Caere*, Vulci and Gravisca demonstrate, in my opinion, that the internal demand created a market for the local pottery workshops and thus encouraged craft specialisation. The close connection between pottery workshops and distinct proto-urban and urban centres makes it less likely that these potters were itinerant.[204] This conclusion agrees with ethnographical evidence which demonstrates that the use of the

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[197] Cristofani 1992, 174-7; Cristofani 1993, 273.

[198] *cf*. Carafa 1995, 254-62; Bouma *et alii* 1995, 189-92.

[199] Beijer 1991 b.

[200] Hemelrijk 1984, 164.

[201] Rizzo 1988, 85.

[202] Spivey 1987, 76.

[203] Valentini 1993, 263-5. A definite attribution to specific Etruscan production centres remains difficult but some of the workshops are located at Tarquinia and *Falerii Veteris*.

[204] The debate on itinerant versus settled potters is discussed in chapter II which also examines the processes which enhanced the local demand.

potters' wheel generally requires '*a fixed installation housed in a workshop*'.[205]

Another argument for the strength of the internal market is that the imported pottery is widely imitated in central Italy. The imported pottery was copied for internal consumption almost immediately after an initial period of external trade.[206] The influence of external models can be detected in both the production techniques and in the typology. The transfer of form and function was probably initiated by immigrant craftsmen. The local imitation also illustrates the limits of the seaborne trade in fine table wares.

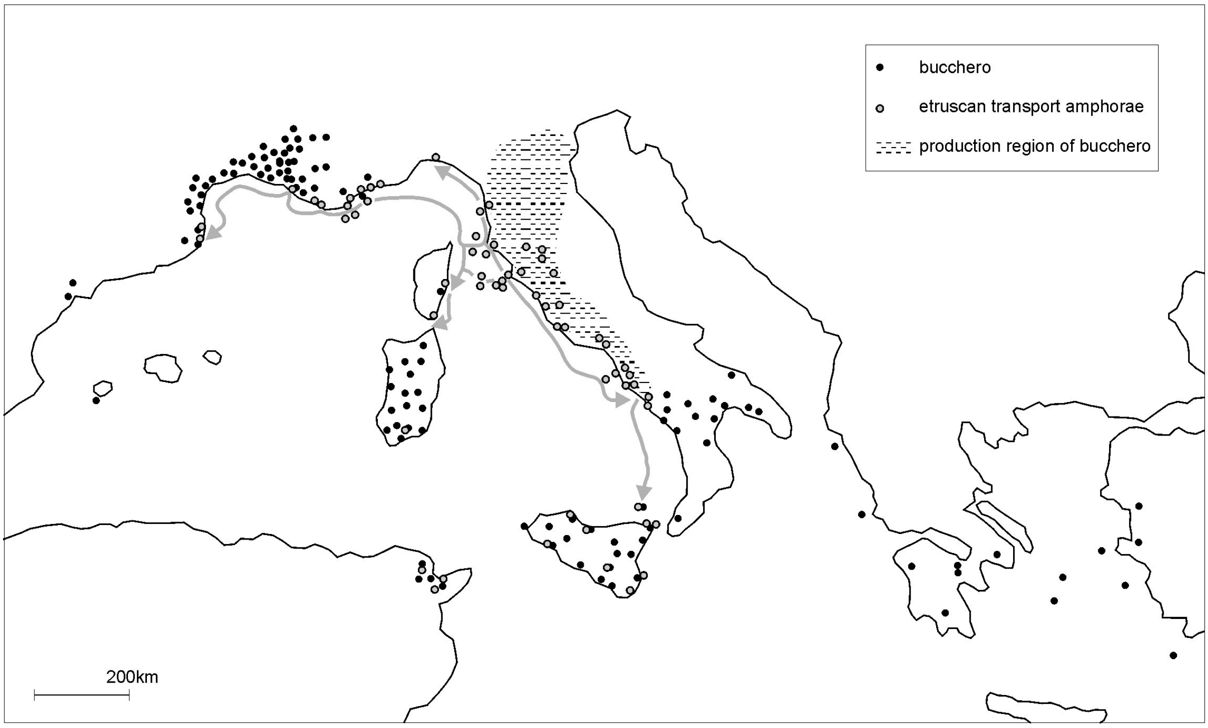

Fig. 7. Find spots of Etruscan amphorae and bucchero

The internal distribution can be compared with the seaborne trade of the ceramics made in central Italy. The export to other regions is predominantly directed towards the west Mediterranean, especially to areas in Italy itself and to the south coast of France. The Greek presence in France is of a later stage. Bouloumié considers that the Greek competition with the Etruscan traders emerged from the second half of the 6th century BC.[207] Directional trade from Etruria to France is indicated by the presence of Etruscan *amphorae* in at least 90 sites. Saint-Blaise might even have been an entrepôt because more than 400 Etruscan transport *amphorae* are reported from there.[208] The distribution of Etruscan artefacts over the Mediterranean region is presented in Figure 7. It demonstrates that the communities in central Italy had to cooperate within a trade network that also involved the Phoenicians and their satellites in the western Mediterranean. This cooperation is reflected in the treaties between Carthage and towns in central Italy from the 6th century BC.[209] Early exchange with Carthage is recorded by recent research of the

[205] Peacock 1982, 28.

[206] *cf.* section 2.1.

[207] Bouloumié 1982, 64-7.

[208] Bouloumié 1982, 58-60. Directional trade is the transfer of commodities from the production centre to specific destinations.

[209] *cf.* Cornell 1995, 210-4; Cristofani 1984.

University of Hamburg (Germany). The settlement excavations demonstrate that the Italian imports dominate particularly during the late 8th and 7th centuries BC. Noteworthy is the suggestion that some of the oldest transport *amphorae* derived from central Italy. These were found in layer IIa1 which is dated by the Hamburg team to the late 8th century BC.[210] This implies early contacts between the communities of central Italy and the Levantines and finds its counterpart in the Phoenician transport *amphorae* found in *Latium Vetus.*[211]

The quantity of Etruscan artefacts in Greece is confined. The importance of early Etruscan bronzes found at Olympia and a few other important Greek sanctuaries, is a subject of controversy. Some scholars imply that these artefacts are spoils from military raids in central Italy.[212] Others, such as Kilian, suggest that the Villanovan copper alloy artefacts in Olympia and Delphi signal precolonial contacts between communities in Greece and central Italy.[213] These Villanovan metal goods match the Early Greek imports in central Italy, such as the Geometric pottery found at Veii.[214] Considering on the one hand the internal strenght of the Italian social-economic relations during the early Iron Age, and on the other hand the upsurge of *Pithekoussai* and the Greek colonial movement in southern Italy during the late 8th and 7th centuries BC, one should allow for some precolonial contacts.[215]

In later centuries the evidence for Italic goods in Greece appears to have been even more limited. Some Etruscan *bucchero* pottery dated to the 6th century BC, was found in Corinth and a few other sites in Greece.[216] The number of artefacts involved does not suggest directional trade from central Italy to Greece. They might have been brought from Italy by Greek merchants returning to their homeland.

An intriguing feature of the trade networks in central Italy are the *emporia* or entrepôts.[217] Some of these trading posts are well defined, such as the *emporia* at *Pyrgi*, Gravisca and Regisvilla. Others, such as the *Forum Boarium* in Rome or the extra-urban sanctuary of *Sol Indiges* near the mouth of the *Numicus* at Lavinium, remain ambivalent.[218]

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[210] Niemeyer and Docter 1993, 230-4. The early date by Niemeyer and Docter of Italian imports to Carthage is associated with imports from other regions than central Italy: Niemeyer and Docter 1993, 226-30; Docter 1997, 192-215. Von Hase considers that trade between Etruria and Carthage is documented from 660/650 BC onwards. He listed 64 *bucchero* vessels which were recovered in tombs and reports that this outnumbers other sites outside Etruria: von Hase 1993.

[211] Botto 1990.

[212] Hermann, 1983, 284-90; Niemeyer 1993, 341. Hermann catalogues 21 fragments of copper alloy shields which he dates from about 750 to 650 BC.

[213] Kilian 1977.

[214] Ridgway 1992 a, 29, 129-38.

[215] *cf.* Bietti Sestieri forthcoming. See also section 3.6.1. As mentioned above, I consider the almost immediate imitation of imported pottery in Italy to be an argument for the strenght of the internal market. Imitation records, in my opinion the increasing demand of the indigenous communities and not their backwardness as is implied by those favouring a Hellenocentric account: *cf.* Gill 1994; Gill and Vickers 1990; Morris 1994 a and Hemelrijk 1984, 193.

[216] For the information on *bucchero* in Greece I would like to thank my colleague Marja Vink. *cf.* Weinberg 1948, 214 and MacIntosh 1974. MacIntosh catalogued 30 *bucchero* sherds from Corinth. In addition some *bucchero* is reported at Perachora and at Emporio (Chios): MacIntosh 1974, 43. Lawall who studied imports of transport *amphorae* to Athens during the 5th century BC shows that the economic contacts are predominantly directed towards Greece and the eastern Mediterranean: Lawall 1995.

[217] *Emporion*, gateway community, entrepôt and port of trade are in this study used as synonyms.

[218] The *Forum Boarium* is interpreted as *emporion* by La Rocca, Coarelli and Cornell: La Rocca 1977; Coarelli 1988 a; Cornell 1995, 69, 109-12, 162. See also: Bartoloni 1989-1990. The sanctuary of *Sol Indiges* at Lavinium is included as a possible location for a trading place on account of its geographic position, its nomenclature with its Aeneas connotation and on account of the quadrangular precinct with sides of 110 m each in which a building is situated. Details on this site are scarce but the circumstances can be compared with those found at other trading places: Fenelli 1984, note 7; *Grande Roma* 1990, 184; Bouma 1996 part III, 52-3. One could even construct an argument to incorporate *Satricum* with the temple of *Mater Matuta* into the *emporic* model on account of the finds and the association of *Mater Matuta* with trading

A description of the characteristics of *emporia* justifies consideration for it supports an interpretation of the exchange mechanisms. A hypothesis for early exchange in central Italy has to incorporate the following aspects:
- Levantine and Greek imports;
- imitation of technology and typology;
- conspicuous local consumption;
- standardisation, and eventually
- the local manufacture in workshops of commodities which are transferred within a restricted market system.

Hodges distinguishes three stages for gateway communities which may not directly apply to the situation in central Italy but which present some interesting ideas.[219] In his model, *emporia* of type A are strictly controlled import centres exchanging products during fairs. Foreign traders may visit these sites but they did not settle. Type A gateway communities remain enigmatic for they are difficult to detect with archaeological means.[220] They are associated with *ad hoc* or semi-permanent structures such as huts. Hodges remarks that '*not surprisingly ... the inception of type A gateway communities coincides with inflation in the destruction of goods in a highly conspicuous burial rite*'.[221] This could reflect conditions in central Italy during the Orientalising Period and it is noteworthy that in his description the exchange activities are strictly controlled.

Gateway communities of type B are described as partly controlled centres for trade and production which develop into free markets, attract foreign merchants and stimulate competition. They maximise the hitherto periodic exchange and are distinguished by planned streets and dwellings. Increased numbers of foreign traders inhabit the site as well as a considerable native workforce. The emergence of this second stage has considerable socio-economic implications. They are commonly the product of trade agreements with great economic potential for they stimulate the regional exchange mechanisms which is transformed into a more commercial system.

The third stage of *emporia* reflects a decline in exchange activities. The *emporion* is either abandonned or continues to function within the regional economy. The native workforce may maintain a partially commercialised production level. As a result of this economic transition there would be few imports.[222] This could actually reflect a strategy because long-distance trade may have become a threat once the scale of it crossed a certain threshold. The strategy could involve sumptuary laws or the legal confinement of the *emporia* to some neutral location along the

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posts. To my opinion *Satricum* rather illustrates that sanctuaries attract consumption and production which could lead to early markets. As such these sanctuaries can be considered as incipient *fora* especially when there are no primary indications for foreign activities as for instance, Phoenician or Greek inscriptions: see section 4.6.

[219] His model is based on the situation in north-west Europe during the period 600 to 1000 AD and benefited from an anthropological approach: Hodges 1982; 1988 a. A readjustment of the model for the situation in Denmark which included the minor sites, was presented by Crumlin-Pedersen during the 18th *Kroon-Voordracht:*; Crumlin-Pedersen 1996, 25-7. The arrangements in central Italy from 800 to 400 BC are probably less distinct than in early medieval north-west Europe.

[220] Prior to the establishment of type A, 'silent trade' may have occurred as was described by Herod. His report on the trade between Phoenician/Punic merchants and north African tribes illustrates the beginnings of trade between dissimilar communities: '*The Carthaginians also tell us that they trade with a race of men who live in a part of Lybia beyond the Pillars of Heracles. On reaching this country, they unload their goods, arrange them tidily along the beach, and then, returning to their boats, raise a smoke. Seeing the smoke, the natives come down to the beach, place on the ground a certain quantity of gold in exchange for the goods, and go off again to a distance. The Carthaginians then come ashore and take a look at the gold; and if they think it represents a fair price for their wares, they collect it and go away; if, on the other hand, it seems too little, they go back aboard and wait, and the natives come and add to the gold until they are satisfied. There is perfect honesty on both sides; the Carthaginians never touch the gold until it equals in value what they have offered for sale, and the natives never touch the goods until the gold has been taken away*' (Herodotos: 307; translated by A. de Selincourt).
Under these conditions acculturation will be kept to a minimum and structures along the coast cannot be excavated. It is probably that in these conditions the natives give the goods they have acquired another function than intended by the manufacturers.

[221] Hodges 1988 a, 44.

[222] Hodges 1982, 50-2, 65, 197.

coast. I consider it possible that this concept may actually apply to the situation around 600 BC in central Italy. In both regions a restriction of external trade can be reconstructed. In *Latium Vetus*, the Levantine and Greek imports are curtailed in line with restrictions of the conspicuous funerary practice. In Etruria this period reflects the marked development of entrepôts such as *Pyrgi*, Gravisca and Regisvilla which became the gateway communities for long-distance trade of the Etruscan early states respectively of *Caere*, Tarquinia and Vulci. These highly ritualised entrepôts controlled foreign access to the markets of central Italy and functioned as an institutional method to restrict the zone of commodity exchange. Internal distribution of commodities may have been structured along other lines. The spheres of exchange for prestige and subsistence items are likely to have been separated. This separation can, however, never be absolute. Appadurai states that '*many societies create specialised arenas for tournaments of value in which specialised commodity tokens are traded, and such trade, through the economies of status, power or wealth, affects more mundane commodity flows*'.[223]

According to Hodges the three types of gateway communities are summarised as:
Type A which represents import trade,
Type B which is characterised by import trade in combination with local production while
Type C exemplifies a production centre with internal, regional exchange.[224]

These distinctions can be related to the change in the Levantine and Greek commodity flow to central Italy during the decades around 600 BC. Prior to this period, type A and B gateway communities probably existed because import and local production which aimed at imitation is attested for central Italy from the 8th century BC. It is likely that import and manufacture took place at early coastal settlements such as *Caere*, Tarquinia and Vulci. Such a design was also suggested for the *Forum Boarium* with its location outside the sacred boundary of the city and close to the river harbour.[225] These activities would have assisted the development of the emerging centres along the coast of southern Etruria and along the Tiber.

There may have been type A gateway communities along the coast of central Italy well before the middle of the 8th century BC. *Pithekoussai* can be considered a type B *emporion* because commerce and workshops are attested while Phoenician merchants were attracted to the Euboean settlement.[226] Until about the late 7th century BC, a steady increase in foreign imports is shown by the funeral accessories and the votive deposits of central Italy. Eventually, this increase may have resulted in a certain threshold and threat to the existing socio-economic conditions which neccessitated a response. The decline in foreign imports to *Latium Vetus* after 600 BC has been acknowledged in relation to the changes in funerary practice.[227] The custom of burying valuable imported objects with the dead or their deposition at sanctuaries assisted their removal from circulation as well as the demand for these imports. Demand became confined with the transition in funerary rite around 600 BC. This change has been interpeted as a legal restriction which was probably a consequence of altered political and ideological concepts.[228] It is reflected by the definite shift during the 7th century BC from 'personal' hoards, exemplified in the rich burials, to 'institutionalised' hoards, exemplified in the wealth of some of the votive deposit.[229] Thus the elite of *Latium Vetus*

[223] Appadurai 1986, 50.

[224] A similar outline of emergence, *floruit* and decline is presented by Torelli for the archaic *emporia* in central Italy: Torelli 1983, 483-4.

[225] La Rocca 1977; Coarelli 1988 a.

[226] Buchner 1971; 1982; Deriu, Buchner and Ridgway 1986. The nature of the settlement at *Pithekoussai* is disputed. It might have been an *emporion* or a colony (*apoikia*), though probably displays features of both: Ridgway 1992 a, 107-9. One aspect which is mentioned by Hodges as characteristic for type B *emporia*, has not been identified at *Pithekoussai* which is the native workforce. However, it has been suggested by Buchner that the settlers married native wives: Buchner 1979, 135; Coldstream 1994. See also section 3.6.1.

[227] *cf*. Colonna 1977; Ross Holloway 1996, 168-70.

[228] Cornell 1995, 105-8.

[229] Nijboer 1994, 11-2. See also Bartoloni for an inventory of the sanctuaries at Rome: Bartoloni 1989-1990.

could remain the custodian of restricted exchange because they controlled the sanctuaries. Around 600 BC, it seems that the religious authorities directed the exchange mechanisms. These authorities probably derived from the same families which in the previous decades furnished the tombs of their ancestors with such extravagance. The interregional exchange from Etruria to *Latium Vetus* appears to have been less affected by trade regulations.[230]

The situation in Etruria was different which is marked by a dissimilar regulation of external trade. My hypothesis is that in Etruria foreign merchants and maybe even migrating craftsmen, became confined to a neutral location along the coast in order to counteract their adverse effects. The founding of these *emporia* may be the result of trade agreements between the local establishment and foreign representatives. An argument in favour of this theory would be the absence of settlement traces before approximately 600 BC in *emporia* such as *Pyrgi*, Gravisca and Regisvilla. There is some evidence which supports this idea.

The settlement at *Pyrgi* dates back to the early 6th century BC. The buildings appear to be aligned on a grid plan and the site was not occupied at the time of its foundation.[231] Phoenician/Punic and Greek merchants resided in the port but it has not been established whether the settlement contained any workshops. The sanctuary is famous for its gold tablets with Etruscan and Phoenician script and its fabulous wealth.[232] The tablets testify the existence of trade agreements between Carthage and *Caere* by the end of the 6th century BC.[233] The Greek coins which were hoarded at the sanctuary imply a strict seperation of exchange mechanisms because these coins were subsequently not reminted nor distributed in the local economy.[234] This must have been a deliberate policy because coins did not circulate in central Italy during this period though they were evidently accepted at the *emporia*.

In the entrepôt at Gravisca, the port of Tarquinia, a sanctuary was established in the early 6th century BC which was dedicated to Hera. A substantial quantity of imported pottery dates from around 600 BC and implies that during this period the site became frequented. Much of the pottery found at the site is of Ionic origin. In addition, the names of merchants are recorded in the dedications and these names show that most of them came from the eastern Aegean. For example, the well-known merchant Sostratos of Aegina dedicated a stone anchor to Apollo at Gravisca. The traders stayed here but it has not been confirmed whether immigrant craftsmen produced commodities in the *emporion*.[235]

Regisvilla, the trading port of Vulci, was intensely frequented during the late 6th and 5th centuries BC.

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[230] *cf*. Beijer 1995, 61-2; Bouma *et alii* 1995, 192-3.

[231] Colonna 1981, 13-20. For a general account on Pyrgi, I refer to: Serra Ridgway 1990. Colonna *et alii* have documented small quantities of prehistoric finds at Pyrgi: Colonna *et alii* 1970; 1988/89. This pottery indicates that the area was frequented before the establishment of the *emporion*. The excavators have however, not reported any structural remains prior to about 600 BC.

[232] Dionysios of Syracuse plundered the sanctuary and took away a thousand talents of coins in addition to statues and other votives; Pyrgi, *Notizie degli Scavi* 1959, 261-3 and Prayon 1981.

[233] The tablets can be related to an account of Aristotle (4th century BC), who referred to treaties between Carthage and the Etruscans as a particular type of trading agreement in which mutual rights and privileges were laid down: *Politeia* 1280a36.

[234] Nine silver tetradrachms of various provenances dated to 440 BC and before, remained at the sanctuary after the plunderings in the 4th century BC and the ritual dismantling during the first half of the 3rd century BC: *Santuari d'Etruria* 1985, 139-41 and Colonna *et alii* 1970, 263-6.

[235] Torelli 1977; 1982; Torelli *et alii* 1971, 195-9; *Santuari d'Etruria* 1985, 141-4; Boldrini 1994, 253-64 and Valentini 1993, 263-9. On Sostratos: *cf*. Herodotos (4.152) and Gill 1994, 99-101. Torelli presented a short note on hut and sheltering structures which he dates to the beginning of the 6th century BC: Torelli 1977, 400-1. Moreover, he mentions two early *pozzi* that from his description might be explained as levigation tanks but which are not interpreted as such by the excavator: see section 2.3 for the levigation process. In one of the *pozzi* a Greek inscription was found. I consider it feasible that at Gravisca there is some evidence for pottery production by immigrant potters. Unfortunately this is not supported by the publications since a strict religuous interpretation of the data is preferred. For me it remains peculiar that so far in central Italy no *emporia* of type B are reported. It is disturbing that the oldest *emporion* in Italy at *Pithekoussai* has presented a considerable corpus of primary data on manufacture, while the gateway communities in central Italy so far only testify exchange within a ritual context.

Foundation walls of two buildings were found which can be related to other Archaic remains. The evidence suggests a regular plan while the quantity of imported pottery demonstrates its commercial character. A sanctuary or workshops are not reported. In the upper strata about 40% of the excavated pottery derives from transport *amphorae* most of which are of east Greek origin. Etruscan and Phoenician/Punic *amphorae* are also present in notable amounts.[236]

The three *emporia* at *Pyrgi*, Gravisca and Regisvilla imply that from approximately 600 BC, foreign merchants had restricted access to the Etruscan communities.[237] This hypothesis is substantiated by the evident separation of exchange mechanisms since Greek coins were accepted but not distributed internally. Due to the limited excavations which have not revealed any industrial structures, the three gateway communities are so far monumental examples of type A *emporia*. I consider that regulation became necessary around 600 BC at the height of the trade with merchants from eastern Greece and increasing commerce with Athens.[238] It seems that there was less demarcation of trading activities during the Orientalising Period.

In *Latium Vetus* the foreign trade was curtailed by adjusting the destruction of material goods at funerals while in Etruria restriction was obtained by the *emporia*. Both regions reacted differently towards the possible threat of uncontrolled consumption. The threshold and the reaction will have been directed by the difference in the quality of resources in both areas. In combination with a model that was formulated by Niemeyer, one may be able to identify the features of this threshold.

Niemeyer distinguished the Phoenician and Greek trading patterns on the basis of differences in settlement characteristics. It is possible that there was an initial period of coexistence between Levantines and Greeks in Italy.[239] After this period both groups diverged. Phoenician *emporia* were established near the centres of metal trade. These Phoenician/Italian gateway communities are perceived as factories and commercial centres of type B *emporia* in accordance with the other Phoenician entrepôts in the western Mediterranean. The Greek settlements in southern Italy were marked by an agrarian colonisation. Comparing the Phoenician with the Greek trading model, it is likely that the crux for the elite in central Italy became the control of agricultural land and other natural resources as well as the protection of the internal distribution network. It is probable that they confined foreign commerce to neutral locations along the coast in order to prevent further cultural erosion by protecting the internal conditions as well as by restraining foreigners from owning land and other subsistence resources. I, therefore, suggest that in the decades around 600 BC, the establishment in central Italy took measures for economic regulation. This does not imply that imports ceased or that the process of acculturation terminated. Nevertheless it signals the beginning of a deliberate preservation of the internal social-economic conditions and, therefore, records a notable stage in the early state formation of both regions.

In essence, the distinction made by Niemeyer is the difference between co-operation and control. There are many indications that the establishment of central Italy co-operated in politics and economics with the Phoenicians/Carthaginians rather than being controlled by the various Greek communities. In this context, the alliances formed between Carthage and communities in central Italy to challenge the expanding trading interests of Greek *poleis* and their colonies, are symptomatic.[240]

[236] Colonna 1977, 210-3; Morselli and Tortorici, 1985. Other *emporia* along the coast such as Punicum and Alsium are not discussed in this section.

[237] *cf.* Torelli 1983, 482-5; Arafat and Morgan 1994, 110-3 and Martelli 1985, 178, 181. In my opinion, restricted access does not necessarily imply that foreign merchants and craftsmen were completely excluded from integration into the communities of central Italy.

[238] Martelli 1985; Hannestad 1988.

[239] This first stage is exemplified by the excavations at *Pithekoussai*. Niemeyer 1990; 1993.

[240] Prayon 1981; Cristofani 1984 and Cornell 1995, 210-4. This statement is made while acknowledging the influence of Greek culture in central Italy as well as on other regions in the Mediterranean. It is not my intention to participate in the popular reaction against the hellenocentric bias in previous generations of scholarship. Formal co-operation between Greek *poleis* and Etruscans is attested by the

The discourse on *emporia* is closely related to the means of exchange. These means varied considerably during the period 800 to 400 BC but depart from the process of commoditisation. Hart has described this process as a sequence of characteristic '*stages in the progressive abstraction of social labour*'.[241] This sequence merits presentation since it provides a context for the range of possibilities in central Italy. Moreover, it is crucial for the interpretation of the evidence on pre-monetary exchange by quantification examined in chapter IV. The sequence of commoditisation involves the following steps.[242] The evolution of a commodity is described as:

1. A thing produced for use, an object standing outside the producer;
2. Alienated, an object made for the use of another, someone outside the unit of production;
3. The product of divided labour. Specialisation requires and enhances social interdependence: an interlocking system for the provision of individual and social needs necessitates organisation of mutual rights and obligations. The founding principle of divided labour is sexual;
4. Circulated by means of exchange, reciprocal transfer is a common, but not the only, way of circulating products of divided labour;
5. Exchanged through the market mechanism. A significant step in the abstraction of social labour is the determination of quantitative exchange value often in a customary setting;
6. Crystallised as pure exchange value, i.e. money. Money is a commodity whose only use is as a means of exchange.[243]

As mentioned above, Greek coins were excluded from internal distribution and only had exchange value in the *emporia*. In central Italy, Greek coins returned to the state they effectively represented, that is bullion. In chapter IV I will argue that commodities could have been any of the steps 1 to 5 but that exchange was directed by steps 4 and 5. For instance, the production of pottery during the period 800 to 400 BC, is a revealing example of step 3 and involved a shift from female potters to male craftsmen. This process will be examined in detail in chapter II. Steps 4 and 5 introduce means of exchange which includes the three principles of economic exchange which are reciprocity, redistribution and the market mechanism. The three principles usually coexist on various levels and for different commodities though on the whole an economy is characterised by the predominant principle.

Reciprocal exchange is locked into patterns of social relationships and consists of the deliverance of goods and services in return for comparable goods and services in value. Equivalence is the basis of a reciprocal economy rather than loss and profit. It includes gift-exchange between recognised social partners. Gift exchange involves exchange of valuables as acts of negotiation. It substantiates obligations and requires regular confirmation. Balanced reciprocity can incorporate economic trade of commodities.[244]

Redistribution occurs in many societies with chiefdoms and other structures of centralised, ruling power. It can be interpreted as obligatory payments to central political or religious authorities. Thus the surplus of goods and services are tranfered to this authority and redistributed according to status and occupation. The redistribution

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establishment of a treasury by the *Caeretans* at Delphi and the Greek sanctuaries in Etruscan *emporia*. However, these signs of social economic co-operation are in my opinion less significant than the signs of collaboration between Carthage and central Italy. In the following chapters the amalgam of cultural features from the Levant and Greece will be a recurring theme. However, the adoption of foreign cultural traits is not equivalent to supremacy as is denoted by the different trading patterns of Phoenicians and Greeks which both lead to acculturation but which did ensue in dissimilar repercussions.

[241] Hart 1982, 40.

[242] The presentation of the sequence is almost similar to the account given by: Hart 1982, 40-1.

[243] Hart presents a total of 10 steps but the following steps 7 to 10, do not apply to the economies which are examined in this thesis. Hodges applied this sequence to the process of commoditisation during the Carolingian period in NW Europe: Hodges 1988 b.

[244] For a description of the three economic principles of exchange see for example: Fried 1967; Greene 1990, 45-8 and Enckevort 1991.

pattern is often based on tradition. Social and political considerations are on the whole more important than economic analysis. In this system craftsmen can concentrate on their profession without having to trouble about subsistence farming. Usually, the quality of their work is of a high standard. Examples of a redistributive economy are the early empires of the Near East and the Minoan palace economy.

A market economy is a form of integration. Production and distribution of goods and services are regulated according to supply and demand. The market system does not have to depend on coinage. Other forms of currency or even barter can obtain the same function. The market system brings together craftsmen, traders and consumers irrespective of their social position unlike the two other economic principles. The setting involves an authorised, sanctioned location where goods can be sold and currencies acquired. Before our century in which the market mechanism appears to be predominant, economies were based more on social and political interactions and capital markets were of secondary importance.

In central Italy during the 9th and early 8th centuries BC, trade in commodities was probably subsistence oriented. It was based on domestic production and consumption. Subsistence generated trade is usually seasonal and does not involve specialist traders, markets, currencies nor set rates of exchange. The reciprocal obligations prevent the accumulation of wealth. Trade in these conditions will satisfy basic needs and will on the whole, not generate a range of new specialist activities. Nevertheless, complex trading patterns might develop for the indirect transfer of a variety of resources which are not available to the local community.[245]

The introduction of foreign luxuries during the 8th century BC was associated with freedom of trade. The principle of freedom of trade is important for an understanding of the transitions which occurred in central Italy during the 8th and 7th centuries BC. This kind of trade readily develops when groups are involved which originate from elsewhere, such as in our case the Levantines and Greeks. Their position outside the community frees them from social obligations and the emerging cultural integration favours communication and the establishment of trade networks. Mediums of exchange appeared and the market principle was introduced.[246] Moreover, this trade stimulated internal changes in the modes of production which subsequently became directed to participate in the Mediterranean commercial arrangements.[247] The 7th century BC export of transport *amphorae*, *bucchero* and other commodities from central Italy to regions in primarily the western Mediterranean, records the effective transition of the internal mode of production. It is materialised by an increasing standardisation of the local artefacts. This will be exemplified in chapter II and III for the production of ceramics and metal commodities. The metallurgical output, for example, increased sharply during the 8th to 6th centuries BC.[248] The processes involved can be summarised as the transition of a subsistence oriented trade to an exchange oriented trade which developed from an initially limited import of luxury items assisted by freedom of trade, social-economic competition and a general economic growth.

I have argued that at the end of the 7th and the beginning of the 6th centuries BC, the freedom of trade became regulated in order to protect the internal social-economic conditions. The urbanisation process which progressed during the second half of the 7th and 6th centuries BC advanced the development of an internal market which is exemplified by the progressive standardisation of manufacture. Though quantification was introduced, exchange was probably still embedded within its social context. It is likely that reciprocity and redistribution were the principal exchange mechanisms.[249]

[245] Rowlands 1973, 591 and Bietti Sestieri forthcoming.

[246] Nijboer 1994. See chapter IV.

[247] Rowlands 1973, 593.

[248] This is examined in chapter III.

[249] The advance of market exchange in central Italy requires further research. The principle of quantification is difficult to assess and the few examples that are presented in chapter IV, are more or less coincidental. Future settlement excavations of the ancient, primary centres in central Italy might establish the structure and lay-out of early markets. It could have been an open space next to the sanctuary where people could gather,

During the 5th century BC external imports in central Italy appear to have faded somewhat. The towns with their separate territories became more-or-less self sufficient while they may have maintained the exchange mechanisms that had been previously established. It did not become necessary to progress to step 6 in the sequence of commoditisation and the system of coinage was not introduced until the 4th and 3rd centuries BC.

This general account of the economic development of central Italy requires adjustsments when applied to individual sites with primary industrial evidence. The examination of these sites will present a modified development for each individual settlement but which in essence will accommodate the outline presented above. Nevertheless, two topics remain to be singled out. These are:
a. the relation between gift exchange and other exchange mechanisms, and
b. the role of the sanctuaries.

Gift exchange of prestigious goods between members of the 'upper-class' has been given a prominent position by various scholars as the exchange mechanism during the Orientalising Period in both Etruria and *Latium Vetus*.[250] In my opinion gift exchange occurred but can never account for all forms of exchange during this period since it does not incorporate the means by which these gift were initially obtained nor does it clarify the production mechanisms. The connection between gift exchange and other means of transfer is intricate and miscellaneous. Gift exchange is based on relatively unreliable ties of negotiation. It can in time evolve into more stable forms of social relations based on periodic ritual, collective symbols and ideology.[251] These returning rituals propagate more constant, formal arrangements. With the increase in communication and trade during the 7th century BC, the principles of quantitative exchange were introduced and as a result promoted market mechanisms. It remains unclear to what extent quantitative exchange was applied and, therefore, to what extent markets functioned in central Italy. The indefinite character of the market conditions are illustrated in chapter IV but can be partly explained by the late arrival of coinage and the fragmented picture of the quantification or metrological systems in use.[252]

The importance of periodic rituals is demonstrated by the upsurge of sanctuaries during the 7th and 6th centuries BC. These sanctuaries also reflect a communal identity. It is noteworthy that the Levantine and Greek influence can be distinguished in specific rituals. The amalgam of indigenous and foreign ideology testifies to the freedom of communication and trade.[253] Moreover, this freedom is indicated by the ethnic diversity of the elite and the free movement of persons and groups between communities in central Italy.[254] The open disposition resulted in acculturation and the maturing of a cultural *koinè*, a shared cultural idiom throughout central Italy. The evolution of the sanctuaries encouraged the deposition of rich votive hoards which is one of the methods of storing economic surplus.[255] Thus, certain religious authorities were able to create reserves of wealth in favour of their institutions. These reserves will have stimulated new conditions for exchange in which the religious institutions played a major role. The transfer of wealth to the sanctuaries during the 7th and 6th centuries BC made some of these sanctuaries into political and productive centres. The elite who institutionalised these centres could thus regulate the early markets that developed around these sanctuaries.

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eat and exchange goods: *cf.* Edlund-Berry 1989.

[250] *cf.* Bartoloni 1989, 201-2; Anzidei *et alii* 1985, 220 and Rathje 1988.

[251] Sahlins 1972, 136-7, 221.

[252] Quantification and the fragmentation of metrological systems is discussed in chapter IV.

[253] The Levantine and Greek influence on rituals is discussed by for example, Cornell and Burkert: Cornell 1995, 158-62; Burkert 1992, 46-53, 74, 111-2.

[254] *cf.* Ampolo 1976-1977; Cornell 1995, 158.

[255] Peroni 1979, 16. See however, also: Bartoloni 1989-1990.

The formation of sanctuaries is one of the features of centralisation. In central Italy, urban centres became furnished with temples while rural sanctuaries could be erected along territorial borders or at seats of certain *gentes*.[256] As such, the sanctuaries originally came to represent the religious, political as well as the social bond between centre and periphery. Nevertheless, the individual development of a sanctuary varied widely during the period 800 to 400 BC.[257] Once it was established, the settlement around it did not necessarily develop into an urban centre since this depended on the subsequent progress of the urbanisation process.

1.8 *Social and cultural development*

The social and cultural changes during the period 800 to 400 BC have been mentioned at times in the previous sections. The main aspects of these changes which correlate to economic transitions are:

1. the development from a ranked to a stratified society. Status strata in a ranked society are established on cultural criteria of esteem, stature and privilege while class strata in a stratified society are based on economic relations;[258]
2. competition during the stratification process of the 8th and 7th centuries BC. This competition materialised both in the possession of *keimeilia* which are the highly prized imported goods as well as in the imitation of these commodities;[259]
3. the assignment of class to those who were involved in industrial activities. I claim that it is not relevant for the Orientalising Period to assign artisans to a social niche which is actually being established;[260]
4. the general cultural transformation which involved features such as the introduction of writing, symposia and new technologies. The funerary ideology changed as well;[261]
5. the formation of early states through the progress of social stratification, the urbanisation process and of increasing control over territories.[262]

Another feature of the social and cultural development which should be specified before I examine pottery production in chapter II, concerns the differential evolution of the Latin and Etruscan civilisation. Both have their characteristic language and are located in neighbouring but dissimilar regions, that is Etruria and *Latium Vetus*. These regions constitute in this thesis central Italy along the Tyrrhenean coast and their differential evolution appears to be based on the inequality of territorial resources. The agricultural as well as the mineral assets of Etruria were superior to those of *Latium Vetus*.[263] Other disparities concern the socio-political evolution, mortuary ritual, religuous organisation and the differential trade networks.[264]

The Etruscans developed a political system of adjacent city states whose origins probably emerge during the early

[256] *cf.* Bouma and van 't Lindenhout 1996-1997; Kleibrink 1997.

[257] *cf.* Bartoloni 1989-1990; Edlund 1987.

[258] Wason 1994, 37-8.

[259] *cf.* section 1.1.

[260] See section 1.1.

[261] *cf.* Bartoloni 1989, 187.

[262] See section 1.6.

[263] See sections 1.5 and 3.5.

[264] In section 1.6, I have mentioned the difference in settlement nucleation for both regions. *cf.* Bietti Sestieri 1992 b.

Iron Age.[265] The polities were comparable social and cultural units in scale and in organisational complexity. The institutional features of Etruscan society did mature almost simultaneously at various centres in the region though the developments in southern Etruria seem to have been primary.[266] The congruous developments from the Early Iron Age established peer polities especially in Etruria. The interaction between peer polities incorporates all reciprocity between neighbouring autonomous, socio-political units which are usually located within a single geographical region.[267] As an interactive process it is recorded for advanced chiefdoms and early states. The concept of peer polity interaction has been frequently applied to the early state module of Etruria of the 6th century BC but for perceptible reasons less to the developments in *Latium Vetus*.[268]

In ancient *Latium* the evolution into city states was more diffuse because in general the polities developed on a more restricted scale. This makes it difficult to outline stable territories with primary and secondary centres.[269] Rome is the exception and emerges as the highest-order centre of *Latium Vetus* during the 7th and 6th centuries BC. The emergence of a highest-order centre in ancient *Latium* implies that the polities did not develop into balanced socio-political units. When compared with Etruria, the polities in *Latium Vetus* seem to be directed primarily by their religious institutions which is demonstrated by the numerous Archaic sanctuaries which have been identified.[270] The institutional rivalry between the various centres in *Latium Vetus* is expressed in the vast succession of temples during a period that the necropoleis no longer functioned as an arena for personal competition.[271] At *Satricum* for example three religious structures could be identified during the 6th century BC, each rebuilt on a more monumental scale.[272]

The differential evolution of both regions is also expressed by the development of external trade and the quantity of foreign commodities. In volume the imports of Levantine and Greek goods in *Latium Vetus* is limited when compared to Etruria. Beijer has studied the Greek and local pottery in ancient *Latium* dated to the 8th and 7th centuries BC and concludes that '*hardly any new evidence has turned up to sustain a firm place for Latium in the network of international contacts during the Late Iron Age*'.[273] The area along the Tiber presents for ancient *Latium* the most abundant evidence for foreign commodities. The large quantity of regional imports during the 7th century BC which mainly consists of Etrusco-Corinthian wares and *bucchero*, is in contrast with the limited number of artefacts from overseas. The exchange is, therefore, primarily the result of contacts with Etruria. It appears that in ancient *Latium*, the communication with other communities in central Italy, especially with Etruria, are from the 8th century BC essential for both the local economy and for the flow of innovations rather than contacts with Levantines

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[265] *cf.* Bietti Sestieri forthcoming.

[266] *cf.* Bietti Sestieri 1992 b, 21-75, 244-53.

[267] Renfrew 1986 a, 1.

[268] *cf.* Renfrew and Cherry 1986.

[269] *cf.* Bartoloni 1987; Bouma and van 't Lindenhout 1996-1997.

[270] For a chronological survey of Latial cult places see Bouma: Bouma 1996, Part III, Appendix A, 153-65. Sanctuaries in Etruria are presented by: Edlund 1987; *Santuari d'Etruria* 1985.

[271] See Bouma on for example, Lanuvium, the *Juno Sospita* sanctuary; Rome, Capitoline, Jupiter sanctuary; Rome, *Forum Boarium*, S. Omobone; Veii, Portonaccio sanctuary and the sanctuary at Velletri: Bouma 1996, part III, 43-4, 75-7, 84-6, 108-11, 112-4. Damgaard Andersen comments that for the decennia around 500 BC '*the most common type of building seems to have been temples, now much larger than before, and building temples can almost be considered an industry*': Damgaard Andersen 1993, 85. I refer to Colonna and Ross Holloway on the transition in burial customs: Colonna 1977; Ross Holloway 1994, 168-70.

[272] *cf.* Colonna 1984; Bouma 1996, 81-101; Maaskant-Kleibrink 1992, 108-46.

[273] Beijer 1995.

and Greeks.[274]

I have suggested in the section on the economic development that during the decades around 600 BC, the external trade became regulated with different means in Etruria and *Latium Vetus*. This implies political intervention and a significant stage in the formation of early states. In ancient *Latium* the mortuary ritual no longer materialised in lavish funeral gifts though it is likely that the elite found other ways of commemorating their ancestors. By the 6th century BC, grave furniture in Etruria remained important but became less affluent when compared to the previous century. This different distribution of the material wealth in both regions represents distinct social, cultural and political conditions. The Etruscan city states appear to be governed by an oligarchy which is revealed by the continuing furnishing of the family tombs and necropoleis.[275] The stratification process in Etruria seems to have matured into an advanced arrangement of distinct social classes. In *Latium Vetus* the social units seem to be slightly less well-defined and are predominantly incorporated in the *gens* which can be translated as clan. The *gens* consists of persons with a common name. Blood ties and common descent are not necessary for association. A *gens* has a hierarchical structure with a *paterfamilias*, the family connections and patron-client relationship. The institution of *gentes* is not particular to the social organisation of ancient *Latium*. Etruscans also had clans but the organisation into *gentes* seems to have had a special role in the social and cultural development of *Latium Vetus*.[276] Bietti Sestieri suggests on account of grave clusterings at the necropolis of Osteria dell'Osa, that the first indications of this development became manifest around 800 BC.[277] During the 7th and 6th century BC continuing stratification and competition resulted in the emergence of patricians which were members of clans that had obtained privileges. These patricians regulated the institutions of Rome and other major centres in ancient *Latium*.[278]

The last phenomenon I would like to discuss in this section, is early state formation. As a process, it involves various social and cultural aspects which can be related to specific economic conditions between stratified groups. An early state is defined by Claessen and Skalník as '*a centralised socio-political organisation for the regulation of social relations in a complex stratified society divided into at least two basic strata, or emergent social classes - viz. the rulers and the ruled -, whose relations are characterised by political dominance of the former and tributary obligations of the latter, legitimised by a common ideology of which reciprocity is the basic principle*'.[279] This description introduces features such as tribute, reciprocity and ideology which can be transferred to conditions in central Italy. For example, in many early states priests form a separate group that acquired political authority[280] while in central Italy the increasing significance of the religious institutions is attested for the 7th and 6th centuries BC. Another characteristic of early states is the limited role of conquests though they became more important with advancing state formation.[281] Some of the secondary sites discussed in this study, disappear during the late 6th and 5th centuries BC and this may indicate the growing relevance of conquests. Warfare usually has distinct economic

[274] Bietti Sestieri 1992 b, 217.

[275] Oligarchy denotes in this context a political organisation of a few individuals of a privileged class which govern autonomously.

[276] Bietti Sestieri 1992 b; Cornell 1995, 84-5, 143-4, 176-9, 245-51, 289-91 and Smith 1996. Torelli presents some data for the difference between the development of *gentes* in Etruria and ancient Latium: Torelli 1988 b, 242-7.

[277] Bietti Sestieri 1992 a; 1992 b.

[278] Cornell considers that an oligarchy was established at Rome during the late 4th century BC: Cornell 1995, 372-3, 377-9. On the other hand Torelli hardly differentiates between the upper class of Etruria and *Latium Vetus*. He mentions that oligarchies became established during the 5th century BC in both regions: Torelli 1988 a, 63-68.

[279] Claessen and Skalník 1978, 640.

[280] Claessen and Skalník 1978, 647.

[281] Claessen and Skalník 1978.

consequences since it manipulates resources and promotes intensification. However I will only briefly discuss combats and wars between the various polities in central Italy. They will be merely mentioned when it is possible to relate them to specific settlements or when they provide an argument for significant changes in the general Mediterranean trade network.

Early state formation is furthermore distinguished by the definition of property and the obligation to yield tribute. The cross-cultural analysis of Claessen and Skalník shows that this formation is not based on actual private ownership of resources but that it develops from communal means.[282] Increasing centralisation or state formation would advance private possession of the means of production but the majority of early states is characterised by poorly defined private ownership. Tribute was due to the upper social stratum but seldom arose from actual possession of resources. Thus, it is possible to encounter within the early state, settlements where the residents were free to organise their activities though they had to pay tribute or render occasionally services.[283] It is probable that in central Italy resources originally belonged to the *gentes* or clans and were only gradually converted into actual family property. For example, the appropriation of land at Rome by wealthy citizens seems to be a process that matured during the 5th century BC.[284] Legal private ownership of land is shown by the Twelve Tables and increasing differentiation in family property must have assisted debt-bondage and the marginalisation of the poorer members of society who eventually may have become unfree dependents instead of *clientes*.[285] This account indicates that the transition from communal to private property developed during the period 800 to 400 BC. The definition of ownership of means of production is a prolonged process which signifies that it was not concluded in the 5th century BC. For sure it was not concluded during the Orientalising Period. The wealthy tombs of the late 8th and 7th centuries BC record increasing social distinction and differentiation in access to resources but they do not substantiate unbounded appropriation and legal family landholdings. The transformation from communal to private ownership of resources is characterised by an intermediate stage of reciprocity and tribute which reflects the *clientela* system of central Italy and curbed the social tensions between those who could not participate in status building activities and those who could.

[282] Claessen and Skalník 1978.

[283] See for example, the arrangements at the settlement at Lago dell'Accesa: section 3.6.6.

[284] *cf*. Smith 1996, 192.

[285] Smith 1996, 189-210 and Cornell 1995, 280-6.

Chapter II *POTTERY*

'... the earth produces so much clay that the pottery-workshops will never have to be without; besides the artefacts made on a potters-wheel, jars invented for our wine, drainage-pipes, tiles and bricks are made of earthenware and accordingly King Numa established as the seventh guild, the guild of the potters'.

Pliny, *NH* 5, 159[1].

2.1 *Introduction*

In this chapter I discuss for central Italy the development of modes of production for the ceramic industry such as household production, household industry and workshop industry. These terms require definition for which I will use the descriptions by Peacock.[2]

Household production supplies a family with its essential ceramics, such as vessels for the preparation of food and storage jars. The family is self-sufficient in its ceramic needs. The pottery is usually made annually during a limited number of months with simple technology employing neither turntable nor wheel. The pottery is fired in an open fire and the vessels produced, are not intended for trade. It is interesting to note that household production is ethnographically seldom recorded and leaves scarcely any archaeological traces.[3]

Household industry is rather similar to household production with the exception that the families were no longer self-sufficient. Specific ceramic products are obtained from specialist potters. Household industry implies a tendency towards commerce. The distribution of the pottery is limited and usually restricted to the region of origin. The production techniques of the vessels remain elementary and besides open firings, a simple updraught kiln was occasionally used. An advance on this rudimentary mode of production is the use of a turntable. The women, who maintained this industry, were sometimes assisted by men but did not employ a potters' wheel. The production is an anually subsidiary activity during several months but always subject to the more important agricultural demands.

Household industry is predomonantly associated with low status of the producers who had to produce for others in order to provide for the basic needs of their family. The nucleation of household industries usually occurs in marginal agricultural regions.[4] Furthermore, household industries are difficult to detect in an archaeological context since they rarely produce sound archaeological evidence. The archaeological allocation of a household industry to a specific site relies on details such as distinctive stylistic traits, potters' marks and specified fabric descriptions and these details are rarely available. Household industry for pottery may not have been an important mode of production in central Italy between 800 and 500 BC because it is associated with agriculture and marginalisation. Peacock reports that nucleation of household industries is related to marginal agricultural regions and these regions gradually became settled during this period.[5] It is debatable whether in these circumstances people did occupy marginal agricultural land and thus were forced to augment their subsistence with pottery production. As will be

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[1] English translation by H. Rackmann, William Heinemann Ltd., London 1952.

[2] Peacock 1982, 6-51. Peacocks' Chapter 2 is entitled *Towards a model for Roman pottery studies*. He also examines in this chapter the manufactury and the estate production. Judging from the archaeological data so far available, these modes of production are not relevant for the period that is discussed.

[3] Peacock 1982, 13-4.

[4] Peacock 1982, 17-25.

[5] see section 1.5.

substantiated, the economic development in central Italy originally favoured craft specialisation in urban centres leading to the workshop mode of production rather than the production of specific wares in an agricultural marginal region. During the 5th and later centuries this probably altered. Population pressure and associated marginalisation of the agricultural base of households likely developed from the 5th century BC.[6] The marginalisation can be observed in the changing settlement patterns during this period and would eventually have affected the social position of potters.[7] Increasing social and economic pressure is also reflected by the disappearance in the decades around 500 BC, of various secondary settlements such as Acquarossa, Poggio Civitate and Laurentina-Acqua Acetosa.

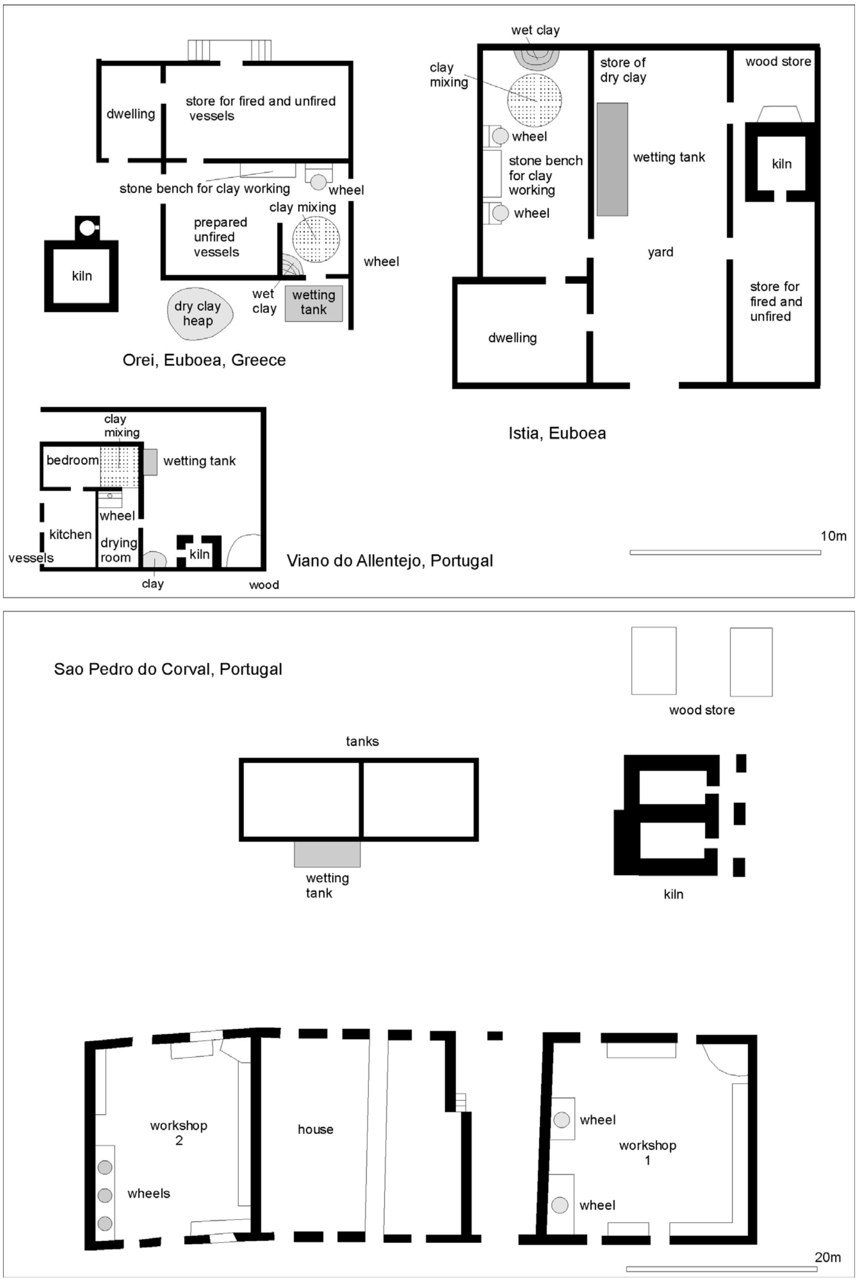

Fig. 8. Four ethnographic and four archaeological plans of pottery workshops. (ethnographic plans left; archeaeological plans next page)

[6] For a discussion on the principle of marginalisation of the pottery production see for example: Arnold 1989, 199.

[7] *cf.* Nijboer *et alii* 1995.

In contrast to the household modes of production, workshop industries are recorded by archaeology due to the lay out of buildings and industrial installations. Workshop industries are characterised by the use of the potters' wheel and a kiln since these devices secure the production of enough quality vessels to sustain the potter and his family. The wheel and kiln are fixed constructions situated within or near a workshop. The above description of workshops does not exclude the use of the turntable which is particularly suited for the production of large vessels such as the storage jars or *dolia*. Figure 8 presents some workshop plans which illustrate the principles involved. In this figure four workshop plans which have been recorded in ethnographic studies, are compared with four workshops which were excavated. Archaeological investigations can record facilities such as kilns, wetting tanks and various working and storage areas. Besides illustrating the installations required for a ceramic workshop, Figure 8 illuminates the relationship between ethnography and archaeology. In addition, this figure presents an indication of aspects examined in the section archaeological evidence of this chapter since it exemplifies the functional features of workshop layouts.

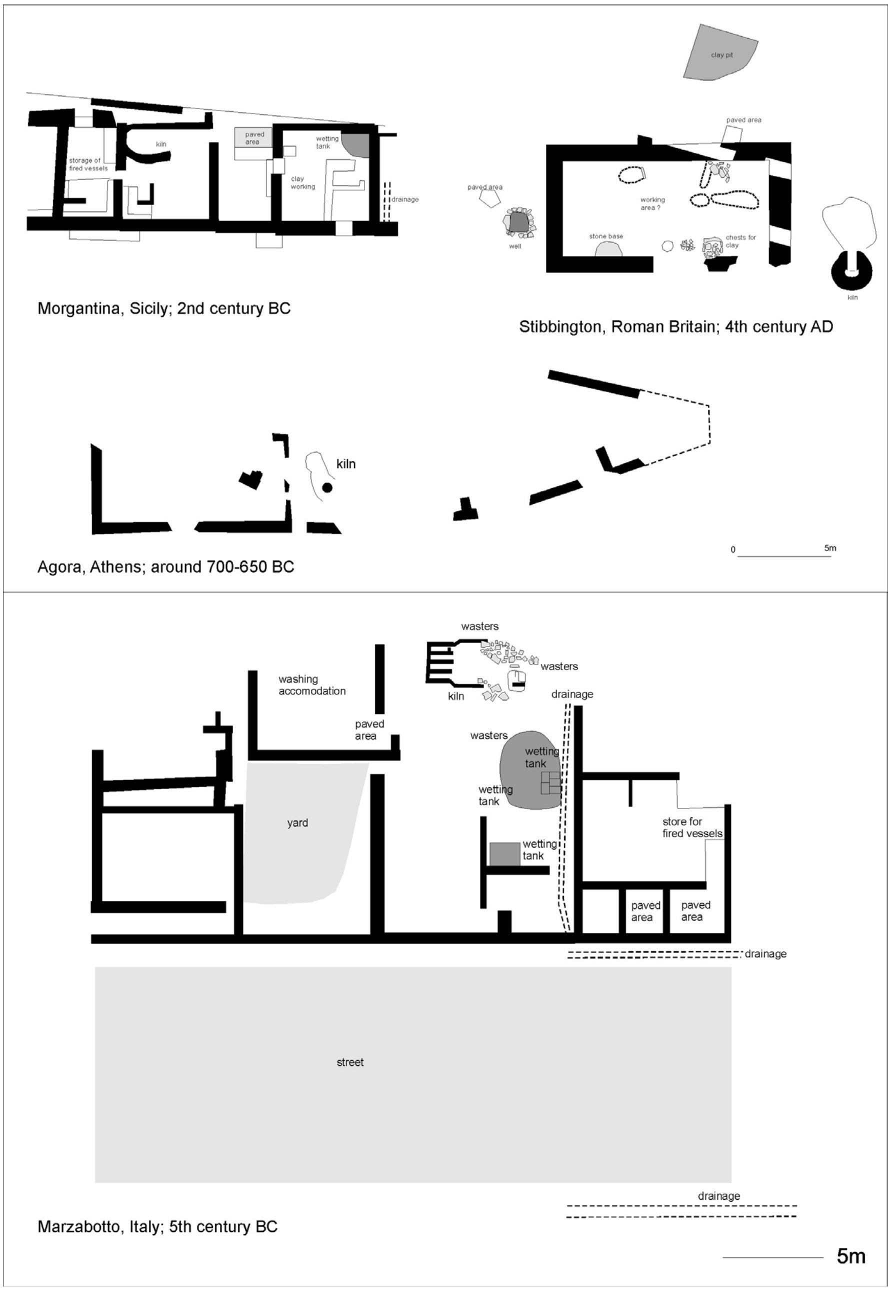

Fig. 8. Four ethnographic and four archaeological plans of pottery workshops. (archaaeological plans left; ethnographic plans previous page)

The activities performed in a workshop in antiquity are depicted in Figure 9. One can detect various activities such as the preparation of the clay, modelling, wheel throwing, painting and firing. One of the scenes in this figure clearly illustrates an open workshop area which may have existed in courtyards or stoa-like buildings.

Workshop industries signal markets which are essential for the disposal of the produced ceramics. Therefore they are associated with a different economy when compared with the household modes of production. '*The success of the workshop will depend upon a balance between clay, fuel and markets, but the precise weighting will vary from one workshop to another*'.[8]

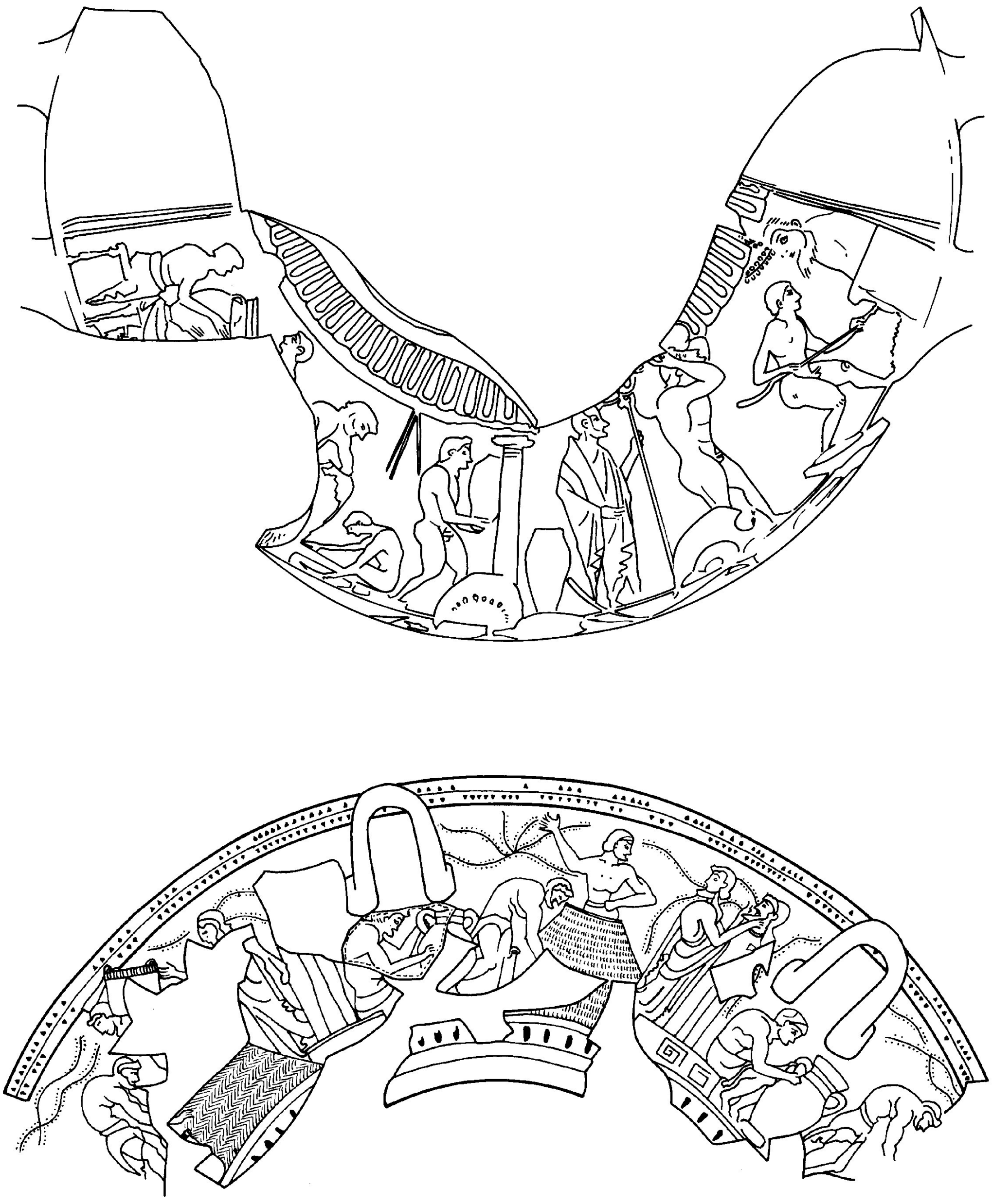

Fig. 9. Activities in pottery workshops as depicted on Greek vases.

[8] Peacock 1982, 25. The ratio in weight of fuel to clay can vary from 10:1 to 3:1 but this does not necessarily denote that potters had to settle near woodlands. There are examples of workshop industries that rely on prunings and wastage of farming.

Within the workshop mode of production, various arrangements are distinguished. One can for example, differentiate between the individual rural workshop and the nucleated industries which may be either urban or located in the countryside.

The individual workshop is a small pottery which mainly produces coarse ceramics intended for the local market. Fine-wares are seldom made in these modest workshops. The actual difference between the individual workshop and more complex household industries is limited.

Nucleated workshop industries can be subdivided in urban and rural nucleated workshops of which the urban variety is more common.

Urban nucleation develops with the increase of demand if adequate clays and fuel are present. Due to fire hazard and the nuisance of smoke, it is not uncommon to find the urban potteries on the fringe of urban centres or along the main entrance roads. Some of the archaeological examples examined in this chapter, display these location characteristics though reallocation outside the urban centre is so far not attested before the Archaic period. Urban workshops tend to be larger both in equipment and in workforce when compared to the potteries described above. On average a workshop employs six to eight men.[9] There is also a tendency to become full-time and work throughout the year. Nonetheless, full-time profession is not a requirement for workshop industries. Pottery production in workshops can be combined with farming. An important characteristic for urban industries is that they generally produce a wide variety of pottery types.

Rural, nucleated workshop industries are located near suitable resources and often generate more specialised wares. Moreover, a rural location eventually relies on middlemen for distribution.[10]

Other authors who have arrived at similar descriptions of these various modes of production from a *corpus* of ethnographic data, are van der Leeuw and Arnold.[11] The above descriptions represent models. It is not always possible to distinguish one mode of production from another since one method may evolve and variations within one model are manyfold. These variations within the modes of production have been recorded by ethnography but can equally apply to the archaeological record. This makes it difficult to construe the development of the various modes of production at a particular site unequivocally. For example, simple systems of household industry can occur simultaneously with technically and commercially more advanced ones. The disparity of modes of production is especially noteworthy for circumstances in central Italy where the *impasto* tradition continues while simultaneously fine wares and workshop conditions are recorded. This seemingly equivocacy of the pottery production in central Italy is one of the subjects examined in this chapter.

The modes of production for ceramics have been presented above as a hierarchical design from simple to more complex arrangements. I have introduced characteristics for each production method but simultaneously I would like to emphasise that a simple division does not correspond with reality nor with the available evidence. For example, it would seem from the descriptions that one of the main characteristics of a workshop is the potters' wheel. However the distinction between the products made on a heavy turntable which required men for manoeuvring, and the products modelled on a fast wheel, are arbitrary.[12] Another complication involves the primary

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[9] Scheibler makes a distinction between workshop-types and the number of craftsmen involved: Scheibler 1984. A family workshop would employ 2 to 5 people while the master workshop could provide work for 5 to 10 people, mainly assistents and according to the economic development also slaves. Nucleation of workshops could lead to a concentration of 30 to 40 people working in pottery production and combining communal tasks. Large industrial complexes would employ up to 100 potters. Scheibler considers the Attic pottery workshops of the 6th century BC to be master workshops, with a master who was seconded by some assistents while producing fine table wares.

[10] Peacock 1982, 25-43.

[11] van der Leeuw 1976; Arnold 1985.

[12] Peacock 1982, 23.

evidence on the early production of fine wares in central Italy.

Pottery made on a fast wheel is commonly classified as fine table ware. For central Italy, I have not been able to locate reports on actual remains of early workshops producing such fine table wares. Reports on remains of workshops are more common for Southern Italy.[13] For example, at Gela on Sicily a kiln and the associated pottery was published by Adamesteanu.[14] This workshop is dated to the late 7th and early 6th centuries BC. The massive kiln was situated on the edge of the Archaic town.[15] Adamestaeanu ascribes several vessel types to this workshop such as *oinochoai*, plates, *amphorae* and *stamnoi*. The ceramics were decorated with Geometric and Corinthian motives as well as paintings of griffins, birds, dogs, a sphynx with a male bearded head, and a warrior with helmet and shield. The products of this workshop were mainly distributed in Gela but also to the nearby *Siculoi* settlement of Butera. Although for central Italy, no primary evidence for workshops producing fine table wares, is known, attributions of such workshops to specific centres are manifold. These attributions are based on secondary evidence such as stylistic, chronological and quantitative examination. The distribution pattern has been occasionally studied for specific groups of decorated pottery (Fig. 6). My research is based on primary information but one reason for including occasionally the stylistic attributions is that they indicate the simultaneous existence of several workshops in the major towns of central Italy, thus implying urban nucleation. Moreover, the fine ware production demonstrates the rapid transformation of the production modes during the late 8th and 7th centuries BC. The change is recorded by:

1. those ceramics which are local imitations of imported vessels, and
2. the *bucchero* production.

An illustration of the first group of ceramics is based on:

- imported Geometric pottery that activated the production of Italo-Geometric pottery which was produced from about 750 BC;[16]
- the Phoenician red slip ware that inspired the local *impasto rosso* tradition of the Orientalising Period;[17]
- the Corinthian pottery which was the archetype for the Etrusco-Corinthian wares produced locally from the middle of the 7th century onwards to approximately 540 BC;[18]
- Attic Black Figure vases that provided a model for the Etruscan Black Figure pottery which was produced from around 540 to 450 BC;[19]
- Attic Red Figure vases which were copied in Etruscan Red Figure wares that are dated from the middle of the 5th to the 3rd centuries BC.[20]

These examples can be read as a sequence of external influences and concerns the production techniques as well as the typology. Occasionally, Etruscan vessels were the prototype for Attic artefacts. A *kyathos* type from Vulci was most probably the prototype for the Attic *kyathos* which first appeared in the Nikosthenes workshop around 530-

[13] Cuomo di Caprio 1971/1972; 1992.

[14] Adamestaeanu 1953, 244; 1956.

[15] The kiln was of circular shape with a diameter of 3.2 m and a raised oven floor with ventilation holes of about 5 cm width.

[16] *cf.* Rizzo 1989; Beijer 1995; Bietti Sestieri 1992 b, 44-5.

[17] *cf.* Rathje 1990 esp. n.3; Niemeyer 1993, 340. Examples of Phoenician red slip wares are published in: Moscati 1988, 492-510; Gehrig and Niemeyer 1990, 129.

[18] *cf.* Szilágyi 1977; 1992; Cerchiai 1990.

[19] *cf.* Ginge 1987; Hemelrijk 1984.

[20] Pianu 1980.

520 BC.[21]

Each step in the above mentioned sequence has been attributed to immigrant craftsmen who applied their skills within the urban centres of central Italy. In some cases there are good reasons to suggest the presence of immigrants for example, when 'Meistersignaturen' are available[22] or when a specific style or decoration technique became, without precedent, established at a particular site. However the internal logic of the sequence presented above suggests another option. New decorative techniques could have been adopted by workshops already established and which used the imported pottery as prototypes to copy. The production at Vulci for example, of Black and subsequently Red Figure vases might well have been a local technological adaptation and does not require actual immigration. Another illustration from Vulci of a possible internal development can be perceived from a comment by Spivey: '*the lingering influences of the last phases of Etrusco-Corinthian, which seem based in Vulci and which may run down to 540 or so, are worth taking into account of the Micali painter's formation*'.[23] Thus on stylistic grounds it is suggested that the Micali painter who produced Etruscan Black Figure pottery, was influenced by the final Etrusco-Corinthian wares produced at Vulci. In my opinion a stylistic distinction between influence and actual training would be hard to ascertain as long as primary evidence is missing.

The second ware group that confirms the rapid development of the production of table wares in central Italy, is *bucchero*. The term *bucchero* is applied to the black or grey, lustrous ceramic vessels produced in various regions of central Italy from the 7th to the 4th centuries BC.

Bucchero is considered to be the '*céramique nationale de l'Age d'or des Etrusques*'.[24] Early *bucchero* production probably evolved from the manufacture of dark, fine *impasto* vessels and was first produced in southern Etruria. The *bucchero* paste was obtained through a finer levigation than the dark *impasto*. The characteristic black colour of *bucchero* evolves around the firing conditions in the kiln. The pottery was fired in a highly controlled reducing atmosphere.[25] Previously, it has been suggested that various components such as carbon[26] or manganese-dioxide[27] were added to the paste in order to obtain the intense black colour since it was established by archaeometric analyses that *bucchero* contained both carbon and magnetite.[28] These substances could, however, derive from the firing process itself.[29] Cuomo di Caprio has recently described some experiments which illuminate the firing process of *bucchero*. Unfired, conventionally made pottery was placed in a container filled with carbonaceous material or sawdust. The container was carefully sealed after which it was fired in a kiln. During firing, a highly reducing atmosphere is obtained in the container and this results in an intense black colour of the fired vessel that is comparable to the *bucchero* ware. Firing pottery in these circumstances also accounts for the

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[21] *cf.* Rasmussen 1979, 113.

[22] *cf.* Martelli 1989; Colonna 1975. Martelli presents some Etruscan signatures and introduces the hypothesis that the *Pittore della Nascita di Menerva* can be identified as *kusnailise*.

[23] Spivey 1987, 77-8, fig. 19.

[24] Gran-Aymerich 1993, 19.

[25] Rasmussen 1979, 2.

[26] Francaviglia *et alii* 1975, 228.

[27] Del Vita 1927, 194.

[28] Leoni and Trabucchi 1962; Francaviglia *et alii* 1975.

[29] Cuomo di Caprio reports that mixing clay with carbon would reduce the plasticity of the clay. A reduction of plasticity makes the manufacture of *bucchero sottile* strenuous. Experiments indicate that clay mixed with carbon powder was hard to throw on a wheel: Cuomo di Caprio 1993, 219.

presence of carbon in the fabric.[30] This specific procedure of placing artefacts in a sealed container filled with carbon is also reported for the diffusion of carbon in iron and for the granulation technique.[31] It appears to me that this distinctive method of manufacture for various materials and artefacts is compelling since the close association between *bucchero* and metalwares in typology would be supported by a related production technique.

Both, the fine *impasto* and *bucchero* vessels imitate metalwares[32] as well as ivory artefacts.[33] For instance, metal *oinochoe*, jugs, *kyathoi* and goblets have served as prototypes for the *bucchero* production. Moreover, it is likely that the decorative techniques of *bucchero* such as ribbing, incision and relief decoration, originated from metal models. A peculiarity within the *bucchero* repertoire are those vessels which have received a lamination of silver or gold plate.[34] The similarities between on the one hand metal and ivory artefacts and on the other hand *bucchero* vessels implies a close relationship between potters and other craftsmen.

Fig.10. Settlements in Italy to which local manufacture of Bucchero is assigned.

[30] Cuomo di Caprio presents this firing experiment for *bucchero* as a hypothesis: Cuomo di Caprio 1993, 220-1.

[31] See section 3.2 and 3.4.

[32] *cf.* Rasmussen 1979; Rathje 1983, 12-4; Markoe 1992, 64; Minoja 1993.

[33] Gran-Aymerich 1993, 21.

[34] Ramage 1970, 39-41; Gran-Aymerich 1993, 30.

Bucchero probably originated at *Caere* around 700 BC[35] from where its production spread to other neighbouring centres such as Veii, Tarquinia and Vulci.[36] In the beginning the *bucchero* production is characterised as limited because the vessels were carefully made as individual artefacts. From southern Etruria, its manufacture spread to various sites to the north and south (Fig. 10). This diffusion is related to a standardisation of the artefacts because they became produced in series. During the late 6th and 5th centuries BC, the *bucchero* is known in a limited range of forms and its distribution was confined to the local market.[37] Thus the production of *bucchero* gradually evolved from prestige ceramics for banquets to semi-luxury vessels and eventually to common table wares. This evolution is one of the essential features of manufacture in central Italy and is one of the themes of this study since it records the devaluation process of artefacts made in workshops.[38]

Figure 10 presents most of the sites to which local manufacture of *bucchero* has been assigned. If these attributions are acknowledged then many of the main Etruscan settlements had a workshop in which at least *bucchero* was produced.[39] These workshops could have produced both fine *impasto* vessels as well as *bucchero*. This combination of different wares in one workshop is attested for Vetulonia. At this site, a pottery workshop produced during the 7th century BC, dark *impasto* as well as *bucchero* vessels. Both ware groups are decorated with a selection of 15 stamps. So far *kantharoi*, *kyathoi*, bowls, lids and an *aryballos* have been attributed to this workshop.[40] The production in one workshop of several wares, including *bucchero*, is also suggested by the wasters from a kiln excavated at S. Pietro a Sieve (loc. I Monti). This kiln is situated just outside a *necropolis* of substantial size which indicates a considerable settlement near the production site. De Marinis reports that the wasters from the kiln included *bucchero*, *bucchero sottile*, various fabrics of *impasto* and depurated wares. The ceramics from this site are dated to the 7th and early 6th centuries BC.[41] Furthermore, the production site at S.Pietro a Sieve demonstrates that the manufacture of *bucchero* is not restricted to the sites recorded in Figure 10.

2.2 *General geological perspective*

Geology and pottery production can be associated through the raw materials, clay, temper and occasionally slip and paint. In theory it should be possible to correlate earthenware to distinctive geological outcrops.[42] However a one to one relation is often not feasible because the raw materials are processed by the potter and particular mineral assemblages may be characteristic for vast geological regions.

Ethnographic data have shown that clay- and temper sources are preferably located within 1 km reach of a pottery making community. Communities hardly ever go beyond 7 km in order to obtain their basic resources for

[35] Bartoloni 1989, 211.

[36] For example Gualterio has documented the *bucchero* production at Tarquinia: Gualterio 1993.

[37] Gran-Aymerich 1993, 22-3.

[38] *cf*. sections 3.3 and 3.4.

[39] Mannoni examined by thin-section analyses, *bucchero* from Pontegagnano, *Caere*, Tarquinia, Pisa as well as some 'imported' *bucchero* from other archaeological sites: Mannoni 1993, 223-7. Mainly on account of the small number of samples and sites this research was not conclusive for the identification of production places and the distribution pattern of *bucchero*.

[40] Gregori 1991.

[41] de Marinis, 1991. The site was recently excavated and to my knowledge details are not published. Near the kiln several foundations of modest structures are reported as well as evidence for metalworking. The combination of various crafts on one location is not uncommon for the 7th century BC as will be documented in this study, especially in chapters II and III.

[42] I would like to thank drs. A. Arnoldus-Huyzendveld for her remarks on the geological aspects discussed in this thesis.

pottery production.[43] Slip and paint resources are obtained from greater distances.[44] This implies that the immediate geological surroundings of a pottery making community requires detailed examination first when the provenance of pottery is inspected. Therefore most of the geological provenance studies for pottery in central Italy concentrate on the adjacent environment of a given settlement. One of the methods used to correlate geological minerals with pottery is thin-sectioning. Thin-sections have been made from pottery found at various archaeological sites in central Italy. Whenever possible the minerals determined in these sections, were related to the minerals recorded in geological studies. The minerals in the pottery ideally correspond with the geological minerals near the site being examined. This approach is based on the paradigm that the basic resources for pottery production, clays and temper, are mined not far from the workshop.

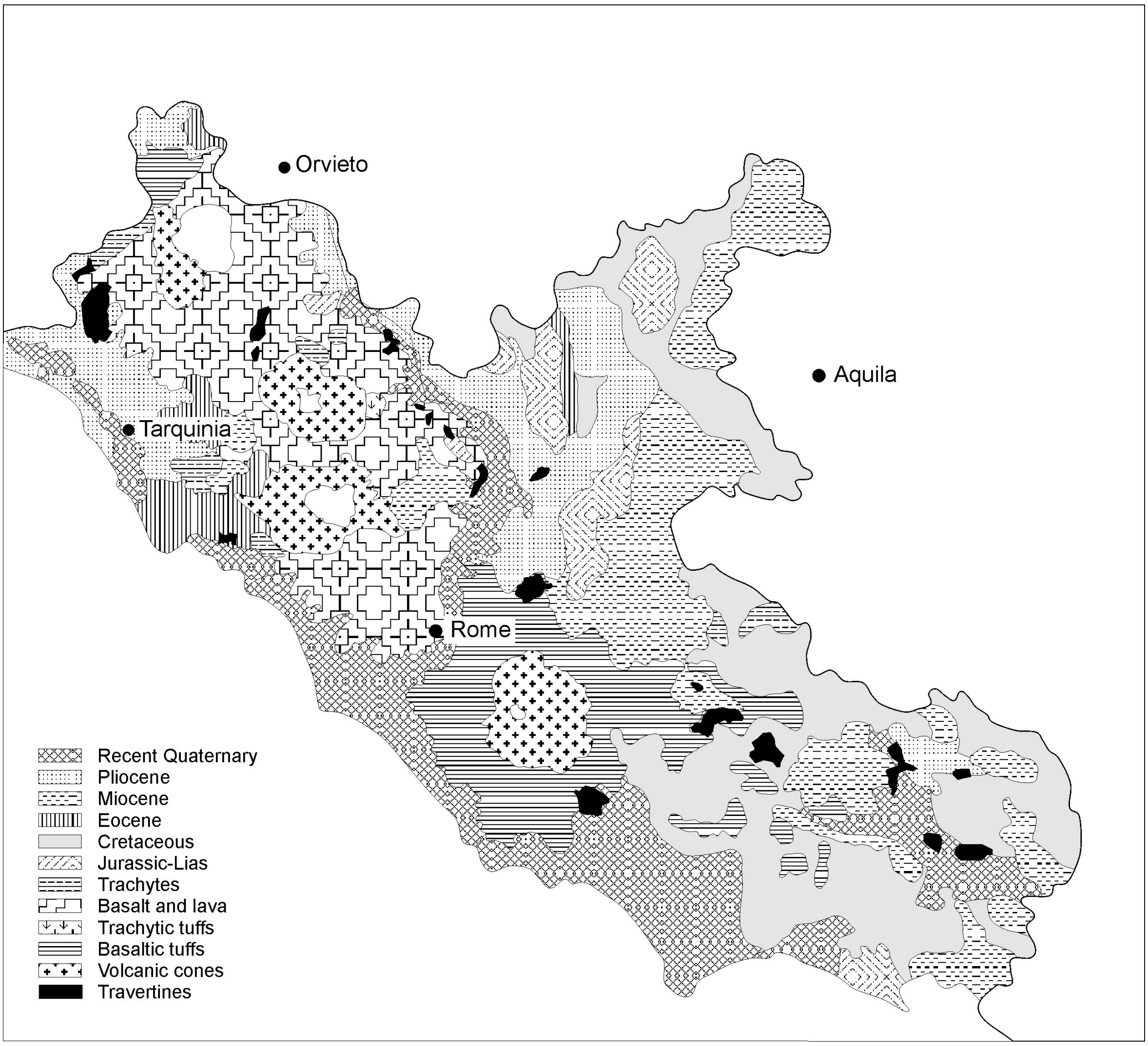

Fig. 11. General geological map of the present province of Lazio.

[43] Arnold 1985, 35-57.

[44] Preferably within a 10 km range but distances of 200 km or more are occasionally reported: Arnold, 1985, 52-3.

The present province of *Lazio* which includes *Latium Vetus* and a major part of Etruria is characterised by extensive layers of volcanic origin from the Quaternary period (Fig. 11).[45] The volcanic layers cover the pre-existing soils. The various volcanic regions which were active are located in the *Monti della Tolfa* (the area between Allumiere and Cerveteri), the *Monti Volsini* (the area around the *Lago di Bolsena*), the *Monti Cimini* (the area around Viterbo), the *Monti Sabatini* (the area around the *Lago di Bracciano*), the *Colli Albani* (*Vulcano Laziale*) and the area around Frosinone (*Vulcani della Ciociaria o Ernici*). Each of these six regions have some specific *tufa* outcrops as well as some characteristic *peperinos*. The deposits of the *Vulcano Laziale* are exemplified by abundant leucite minerals while the *Vulcano Sabatino* are distinguished by much fine-grained lava with large crystals of feldspar and nepheline.[46] In the Tolfa, Alumiere and Cerveteri region large agglomerates of trachyte occur and in the *Monti Cimini* and *Volsini* plagioclase trachytes and leucitic phonolites are frequent. Specific sedimentary rocks can be found on the right bank of the river Fiora, from the region of Grosseto to the region of Viterbo.[47] Limestones of various geological origin are found throughout *Lazio*.

Marls and calcareous clays are encountered at various locations.[48] In addition to pyroclastic material, the Quaternary deposits of central Italy consist of littoral, lagoonal, lacustrine and fluvial deposits (sand, loam, clays and travertines) as well as manganese and iron oxide deposits.[49]

It may appear from the general geological perpsective that it is possible to differentiate the pottery production of sites in central Italy on geological grounds. This can be viable for particular cases but many sites have at least some geological features in common. I would like to illustrate this with two examples.

In *Latium Vetus* at the end of the 7th century BC, vast proto-urban settlements emerged all along the contact area between volcanic outcrops and coastal sediments. Sites such as Castel di Decima, *Lavinium*, *Ardea* and *Satricum* occupied comparable geomorphological positions. The territories of these sites contain volcanic layers from the *Vulcano Laziale*, marine and fluviolacustrine deposits as well as aeolian deposists. Thus, the potters of quite a few sites in *Latium Vetus* had in theory access to various clay and temper sources of similar geological origin. The second example correlates the geological situation around *Caere* and Tarquinia.[50] Coastal deposits of pliocene clay and marls are present in both territories. Furthermore, they both contain palaeogene sedimentary rocks which have weathered by prolonged marine activity in later periods. The volcanic quarternary tuffs are specific for the immediate surroundings of *Caere* and provide some typical minerals. One of the sedimentary rocks is characteristic for Tarquinia.[51] Therefore it is in theory difficult to distinguish *impasto* pottery from *Caere* or Tarquinia on the basis of the minerals present in the *impasto*. Some of the geological features are, however, distinctive and these could determine the provenance of characteristic ceramic artefacts of both centres.[52]

[45] These layers cover a surface of about 8,000 km^2.

[46] The term used in geology is *trachytic phonolites*. These are fine-grained lava with large crystals of feldspar and nepheline originating from an extrusive igneous rock of intermediate character (containing 52 to 66% silica by weight), belonging to the alkaline basalt volcanic suite.

[47] These rocks formed in the Permian period and consist of argillaceous schists, micaceous-arenaceous schists, quarzite and quarzitic conglomerates.

[48] In the territories of Genazzano, Arcinazzo, Subiaco, Agosta, Marano Equo, Ciciliano, S.Vito Romano, Paliano, Anagni, Ferentino, Fiuggi, Vico del Lazio, Collepardo, Veroli, parts of the Valle Latina and other areas: Sabella 1954, 12.

[49] The geological information derives predominantly from: Sabella 1954, 9-13, 222.

[50] An area of 5 km around *Caere* and Tarquinia was examined based on the *Carta Geologica d'Italia al 500.000 (foglio 2)* and information by: Mannoni 1993.

[51] Mannoni 1993, 223. This characteristic calcareous rock contains particles of carbonate cement, microfauna and maybe also rounded quartz grains but it hardly contains mica.

[52] Fabric descriptions from specific sites like *Satricum*, *Caere*, Poggio Civitate and Acquarossa are discussed in combination with geomorphological features in section 2.6.

Resource specialisation involves the selective use of particular resources such as certain clays for the manufacture of certain wares.[53] In central Italy *bucchero* and pale Archaic wares suggest the use of specific clay deposits though cogent research is required. Francaviglia suggests that specific clayey tuffites were employed for the *bucchero* production from the late 7th to the late 6th centuries BC.[54] However clayey tuffites are found throughout central Italy which indicates that potters had easy access to such deposits. Archaeometric research of the *bucchero* from *Caere* which is reported by Burkhardt, has not been able to locate the clay source of vessels dated to the 7th and first half of the 6th centuries BC. Nevertheless, clayey tuffites cannot be excluded on account of the associated volcanic minerals, but Burkhardts' research did indicate that during the second half of the 6th century BC a different clay deposit was used for *bucchero* production.[55]

Pale Archaic wares were produced from the late 6th century BC and are known from many sites in south Etruria and *Latium Vetus*.[56] Though in previous centuries Italo-Geometric and Etrusco-Corinthian vessels were made as table-wares from pale firing clays, the upsurge in pale Archaic wares is associated with fabrics which contain coarse inclusions. Apart from architectural terracottas, pale Archaic wares are especially common for large vessels such as *teglie* and *pithoi*. Some jars, bowls and jugs are also classified as pale Archaic wares. Curri and Sorbelli suggest that these wares were manufactured from calcareous marls which would produce pale coloured terracottas with a porous texture.[57] The porous texture makes the artefact less heavy in comparison with the fired products of most other clay-types and thus clays which fire into porous fabrics are suitable for large artefacts such as the ancient tiles. A slight disadavantage is that calcareous marls can be more friable.[58] The hypothesis that specific deposits of calcareous marls were exploited for the manufacture of pale Archaic wares has not been tested with archaeometric techniques and samples of such wares from different sites. It remains, therefore, a suggestion. Moreover, marls and calcareous clays are common in central Italy and, therefore, potters were not restricted to one specific clay deposit. Other suggestions for the source of pale Archaic wares are alternative clay sources such as specific clayey tuffites that might produce a pale colour during firing or manufacturing techniques that could be manipulated. Nevertheless, during the late Archaic period, potters throughout central Italy consciously strove to obtain a pale colour for some of their products and thus will have employed specific resources and may also have adapted their manufacturing techniques.[59]

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[53] Rice 1991, 262.

[54] Francaviglia *et alii* 1975, 228-30. In this case the term 'weathering' includes chemical changes due to hydrothermal (post volcanic) processes.

[55] A plastic, marine clay with few inclusions of which the microfossils and foraminiferae are characteristic: Burkhardt 1992.

[56] Pale Archaic wares are also classified as *impasto chiaro*, *impasto chiaro sabbioso* or coarse creamware/coarse buff or pink ware: *cf.* Bouma 1996, 329.

[57] Curri and Sorbelli 1973.

[58] Curri and Sorbelli 1973, 261-3.

[59] I would like to thank Sarah J. Vaughan of the Wiener Laboratory of the American School of Classical Studies at Athens for drawing my attention to a related discussion on Cycladic white wares from Akrotiri on Thera. For the manufacture of the distinctive local white bodied wares, the potters from Akrotiri did use during the Early Cycladic period, two clay sources pointing to '*the existence of parallel (and possibly competing) material traditions*'. The potters employed either locally-available carbonate-rich volcanic clays or local non-calcareous volcanic clays. The carbonate-rich clays might derive from weathered tuffite incorporating old volcanic materials. By the Middle Cycladic period only the calcareous clays were delved and for specific wares manipulated by processing, higher firing temperatures and more controlled firing conditions. Clear white fabrics could be produced by means of a combination of exposure to elevated firing temperatures, that is over 1000°C, and the use of an oxigen-poor firing atmosphere. Oxidizing firing conditions produced only pale pinkish fabrics: Vaughan *et alii* 1995. Arnoldus-Huyzendveld points out that whitish clayey tuffites as fluvio-lacustrine deposits are fairly common in central Italy. Sometimes these deposits are calcareous. An advantage for early exploitation of these deposits is that they occur on the surface because they are formed during a final stage of volcanic phenomena and are, therefore, not covered by more recent layers: personal communication.

2.3 *Preparation of raw materials*

The raw materials for ceramic production can be manipulated in numerous ways.[60] Potters usually modified clays in their natural state in order to obtain particular characteristics. The preparation methods can depend on the function of the ceramic artefact to be produced or on the production technique involved. Thus, the fabric of a cooking-jar needs to have thermal shock resistence because the function of the jar requires repeated heating and cooling. This can be achieved by specific non-plastic inclusions such as feldspars, augite and hornblende.[61] On the other hand, a potters' wheel requires a very plastic clay and non-plastic inclusions of a small particle size because otherwise the inclusions would cut the potters' hands.[62]

The preparation methods for the raw materials primarily involve removing matter from the clay or adding material to it. I will restrict the discussion to the preparation techniques of levigation and tempering because these techniques are frequently recorded in the archaeological record.[63]

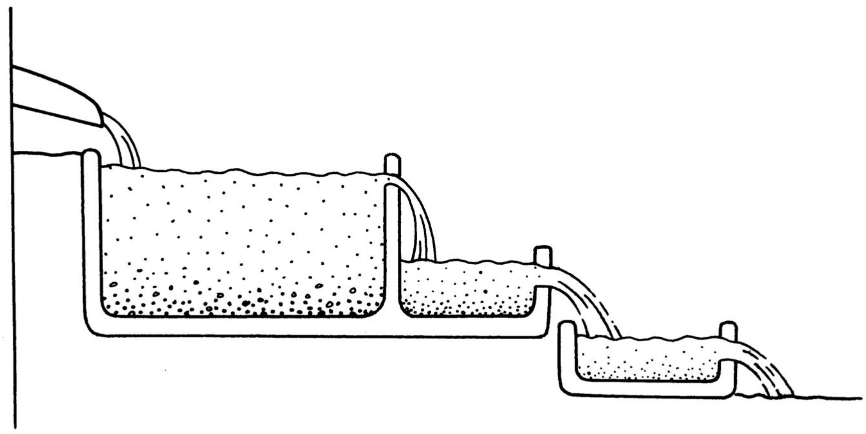

Fig. 12. The priniple of levigation in running water.

Levigation entails mixing the clay with enough water to dissolve the clay and to allow the coarser fraction to settle out of the suspension. The upper stratum will be purified clay which could be used for wheel-throwing. Levigation can be achieved in large levigation tanks though smaller containers occur more widely. In central Italy, tanks and containers have been frequently excavated near kiln complexes but are not always interpreted as such.[64] A distinction can be made between levigation in stagnant water, in running water or by employing sifting.[65] Levigation in stagnant water would require a basin or tank preferably linked to a water supply as was discovered at Laurentina-Acqua Acetosa, Lavinium and Marzabotto.[66] Levigation in running water would involve at least two basins which are correlated and positioned in a descendent order (Fig. 12). The clay is placed in the first basin and mixed with water. The running water will transport the clay particles to the next tank while the heavy and coarse particles will

[60] *cf.* Cuomo di Caprio 1985, 52-65; Rye 1981, 29-44.

[61] Rye 1976, 109-18.

[62] Arnold 1989, 29.

[63] Preparation techniques like mixing clays, aging or kneading are documented only in exceptional archaeological case-studies. Levigation and tempering are attested frequently. Levigation is recorded by settling tanks and conscious tempering by specific ware-groups.

[64] See for example section 2.6.4 on the tanks at *Caere*.

[65] Cuomo di Caprio 1985, 60-2.

[66] See sections 2.6.2; 2.6.3 and 2.6.7.

remain at the bottom of the first reservoir. The system of successive basins can involve three or more basins each rendering finer clay particles.[67] I suggest that levigation by running water was practised at the pottery workshop of *Caere*.[68] An early levigation system is reported at Anagni. This system is dated to the second half of the 7th century BC, based on the associated pottery. It consisted of a large oval pit filled with clayey soil and mixed with sand and fragments of *impasto* and faunal remains. To the north a series of smaller basins associated with canals were excavated. These basins were filled with levigated clay. It is deduced that the oval pit, smaller basins and the canals represent an early levigation system for clays.[69] Unfortunately, the Anagni levigation structure cannot be related to other workshop remains.

Plastic and very plastic clays such as those from the montmorillonite group[70] are not suitable for levigation since they crack during firing when purified. Experiments with clays from *Satricum* showed that the marine clays when levigated deform during firing while some clayey tuffites provide satisfactory results when purified.[71] The experiments demonstrate that certain clay deposits are less suitable for levigation and thus required tempering by non-plastics when employed for ceramic production. In addition, it is noteworthy that some of the levigated clayey tuffites from *Satricum* rendered after firing, properties that coincide with characteristics of *figulina* pottery such as the powdery surface.[72]

The other preparation technique presented in this section involves tempering. The quality of the clay can be adjusted by adding non-plastic material to the clay. Non-plastics may be naturally present but could also be added by the potter. For example, fabrics with a high percentage of non-plastics (25 to 35%) have been used in central Italy for moulding and it is probable that these fabrics are the result of intentional tempering. The size of the non-plastic material reduces shrinkage during drying as well as the drying time itself. This could be a reason for the substantial amount of non-plastics in the architectural terracottas and many heavy and large ceramic vessels like storage jars.

Certain non-plastics such as feldspars, augite and hornblende affect resistence to thermal shock of cooking-jars. Moreover, thermal shock resistence can be manipulated by increasing porosity. The desirable pore size would be between 0.5 and 1 cm. and is obtained by using organic tempering material such as straw and grasses. These materials burn out during firing and leave pores of suitable size. Deliberate tempering with organics in order to produce a specific fabric with appropriate thermal shock resistence and insulation characteristics was noticed in the lining of one of the kilns at *Satricum* but is not reported for the cooking jars.[73]

Tempering experiments by Schiffer and Skibo with untempered paste and pastes mixed with either fine sand or organics (horse-manure) in substantial quantities (approx. 30 to 40%), demonstrated that sand temper yielded the most rapid drying rate. Moreover, sand tempered fabrics heated more effectively. Untempered wares lost much of their strength and have the least resistence to thermal shock. The tempered wares '*did not undergo any significant strength reductions after thermal shock*'.[74] These experiments indicate that tempering had significant effects to such extent that one can assume that potters in antiquity were aware of them. For example, the drying time was reduced

[67] A system with successive basins was for example, recovered at Athens: Young 1951, 230-49.

[68] See section 2.6.4.

[69] Gatti 1993 b, 301.

[70] Shepard 1956, 376; Cuomo di Caprio 1985, 22.

[71] I would like to thank Elly Weistra and Leo van der Holst for the experiments.

[72] *Figulina* pottery is wheel thrown and made from a depurated paste. They fire characteristically into a white or pale colour: Bouma 1996, 395-402. It was probably locally produced at *Satricum* during the 5th and 4th centuries BC from a deposit of clayey tuffites.

[73] See section 2.6.1.

[74] Schiffer and Skibo 1987, 603-7.

by more than 40% when sand was added to the untempered paste. Furthermore, heating water was noticeable more effective in sand tempered vessels. It is, therefore, likely that the tempering of pastes with inorganic non-plastics in order to produce cooking jars was intentional in central Italy since the effects are considerable. The large amount of augite in the cooking jars of the Archaic period is particularly remarkable since augites are one of the minerals best suited to achieve thermal shock resistence.[75]

Mixing and kneading the clays with non-plastics or with other clays required provisions in workshops such as paved areas. These areas are common in workshop contexts and are reported frequently in section 2.6. Other provisions in the workshops for the mixing and kneading of the paste are probable since this production step has to be done intensively in order to remove pockets of air, disperse the non-plastic particles evenly and to make the clay smooth and homogenous.[76] After mixing and kneading the prepared paste, the clay vessels can be modelled.

2.4 *Forming and finishing methods*

After preparing the paste, ceramics can be formed by:
- modelling by hand,
- modelling by mould or
- modelling on a potters' wheel.

A combination of the various modelling techniques is possible as well.

Modelling by hand requires no particular tools. The ceramics are formed with the potters' hands and the motor patterns may evolve around pinching/pressing, coiling and slab building.[77]

The simplest way is to take a ball of soft clay and make a series of even pinches outward from the centre. With this method, one can make small vessels with simple form and a crude and irregular finish. Many of the miniature vessels in central Italy have been made in this way which can also produce slightly larger vessels. By pressing a ball of clay outwards and modelling the walls of the vessel accordingly one can produce simple mugs and bowls.

Coiling involves manipulating a series of clay coils in order to form the walls of a container. The base is usually a flat piece of clay on which the rolled out coils are gradually built up winding round and round. The coils can be joined by pinching and irregularities can be removed using pebbles or other tools, thus creating a smooth surface. Coiling can produce elaborate forms and the finishing techniques can be intricate. A combination of coiling and rotation can produce vessels which are sometimes hard to distinguish from wheel thrown pottery. The use of a rotating base on which the ceramic vessel is modelled can be considered a stage towards the potters' wheel since the motor patterns are related. Actually the difference between on the one hand vessels which are initially formed by coiling and then shaped on a wheel and on the other hand wheel thrown vessels, is not obvious. A recent study of 3rd millennium BC ceramics from Mesopotamia, Iran and India indicates that containers which were previously thought to have been wheel thrown were in fact made by coiling and subsequently wheel finished. Coil-built roughouts can, however, be identified by specific non-rectilinear grooves where coils are joined even if they are compressed by subsequent rotation.[78] In central Italy, the vessels with large dimensions such as storage jars and basins, are regarded as having been made by coiling and turning. A well known ethnographic example illustrates how potters on Crete made pithoi by a combination of coiling and turning on a turntable. These potters from

[75] Maaskant-Kleibrink 1987, 114; Arnold 1989, 24.

[76] Peacock 1982, 54; Rhodes 1979, 71.

[77] *cf.* Rye 1981.

[78] Courty and Roux 1995.

Thrapsanos travelled in groups to different parts of the island in order to make and market their storage jars.[79]

Slab building can be used for rectangular shapes. Flat sheets of clay are rolled out or sliced from a lump of clay with the appropriate plasticity. The slabs are joined together when they have been dried to a leather-hard consistency. Some of the hut-urns and temple models from central Italy may have been made with slabs of clay.[80] The mere placing of a slab of clay on top of a semi-cylindrical support is the basis of the production of cover-tiles or *imbrices*.[81]

Pulitani reproduced some Iron Age ceramics which are dated mainly to the 9th and early 8th centuries BC, in order to study the ceramic production at Osteria dell'Osa.[82] The vessels are characterised by hand forming and were frequently incised, impressed or decorated with plastic elements. They obtained a careful surface treatment and an undeveloped formal differentiation makes it probable that individual ceramic types were used for various functions. The ceramics that were specially made for the funerary ritual such as the hut-urns, had some noticeable defects which caused the disintegration of some parts of these *impasto* objects. Pulitani reproduced most of the vessels by coiling on a flat base. For larger vessels such as the hut-urn, relatively thick clay strips with a rectangular section were used. The surface treatment involved burnishing in order to supress coarse particles, to close the pores and to obtain a dense interior and exterior. Meticulously made vessels were burnished several times during the drying stage and eventually polished with a piece of leather for a lustrous surface. The 13 reproduced vessels were subsequently fired in an open fire for 24 hours employing 20 kg carbon which corresponds with about 130 kg wood. The fire was covered with straw and soil and a temperature of about 600 to 700°C was obtained. In order to prevent the extinction of the fire on account of insufficient oxygen, two vent-holes were made which caused a limited draught and the relatively clear red-brown colour of the ceramics. It was deduced from these experiments that the various production stages were probably incorporated within other household activities. The manufacture of the ceramics was time-consuming when compared to other production techniques such as moulding and wheel-throwing. One vessel was made in one hour while another took three hours depending on its size and surface treatment. The manufacture of the hut-urn, for example, took two and a half hours. Collection of the clay and the firing process may have been organised by the community. It is suggested that the pottery production at Osteria dell'Osa has aspects of household production though household industries cannot be excluded. Bietti Sestieri especially mentions the manufacture of large dolia '*which may have required the use of kilns, as is indicated by their colour, usually a homogenous red or light red*'.[83]

Master craftsmen who modelled by hand, produced the monumental terracotta statues which were employed for adornment of buildings such as the Archaic temples in central Italy. These life-sized terracottas were modelled and sculpted in clay. They are associated with artisans such as Vulca, Damophilos and Gorgasos who are mentioned by the ancient writers.[84] The statues were constructed from hollow segments. Details were sculpted with tools such as scalpels and scrapers. The large terracotta statues had to be hollow for drying and firing purposes and the separate segments of the statues were accurately attached to each other in order to fire them as one piece. During construction the clay statues were probably supported in order to prevent sagging and collapsing. A series of life-

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[79] Hampe and Winter 1962, 4-11; Peacock 1982, 27.

[80] Boëthius discusses some temple models: Boëthius 1978, 36-58. A recently discovered Archaic temple model in *Satricum* is presented in: Bouma 1996 part II, 113-4. For hut-urns see: Bartoloni *et alii* 1987.

[81] Wikander, Ö., 1993 a, 104-9.

[82] Bietti Sestieri, 1992 a, 439-46.

[83] Bietti Sestieri 1992 b, 87.

[84] See section 2.7.

sized ceramic human figures, a sphinx and some animal akroteria were positioned along the ridgepole of the Archaic courtyard building of Poggio Civitate. These sculptures are dated around 600 BC and belong to the oldest monumental terracotta statues of central Italy.[85]

The development of the coroplast tradition can be outlined by the imposing terracottas excavated on sites such as *Caere*, Veii, Rome, *Pyrgi* and *Satricum*.[86] Originally the artisans used clays which fired to dark colours while during the late 6th and early 5th centuries BC cream-coloured fabrics became dominant. Life-sized ceramic, funerary monuments such as the *sarcophagi degli esposi* from *Caere* which are now exhibited in the Villa Giulia and the Louvre have to be included in an examination of the monumental terracottas from central Italy.[87]

It is generally assumed that the craftsmen who made the monumental terracottas worked on commission and were itinerant. Lulof for example, proposes '*that the craftsmen who decorated the temple in Satricum, were also responsible for the terracotta decoration in Ardea, Rome and Falerii*'.[88] Nonetheless, Briguet suggests that a local coroplast school existed at *Caere* during the 6th and early 5th centuries BC on account of the numbers of terracottas excavated.[89] At Lavinium a coroplast workshop was established during the 5th century BC.[90]

The second modelling technique involves moulds and results in the production of ceramics in series. Manufacture is quick and the outcome is uniform. A mould is a negative model of an original, positive image which can be made from any hard and resistent material such as wood, stone, metal or even clay which was subsequently fired. It is important that the shape of the original can be reproduced in an open or two-piece mould because undercuts, that is sharp angles less than 90° necessitate the assemblage of a series of moulds which counteracts mass-production. The mould itself is made of materials such as terracotta or wood. The paste is pressed into the mould and dried to a leather-hard stage. It is possible that some of the original water content of the clay is absorbed by the mould though an excessive absorption would make the clay adhere to the surface of the mould and thus makes it difficult to remove the artefact. This depends on the absorption capacity of the mould which can be regulated by immersion in water. Moreover, it is possible to apply a suitable interlayer between mould and paste such as carbon dust. Shrinkage of the paste makes it easy to remove the artefact from the negative eventually.[91]

Early moulds in central Italy are related to architectural terracottas. Simple moulds, basically wooden frames, were used for the manufacture of roof-tiles or *tegulae*. These are attested in central Italy from the middle of the 7th century BC.[92] At Poggio Civitate, a mould of a *canopic* head was found dated to the late 7th century BC and which had been used for making a terracotta revetment system.[93] This mould is carefully made of a fine-grained clay which had been subsequently fired. Other terracotta moulds from the late 6th to the 5th centuries BC that were employed for the production of terracotta *antefixes* are known from Vulci and Falerii.[94]

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[85] Phillips 1993, 19-27.

[86] See for a discussion on the manufacture of these monumental statues: Lulof 1991, 115-37.

[87] *cf.* Briguet 1989. See also section 2.6.4.

[88] Lulof 1991, 167.

[89] Briguet 1989, 102, 214-8.

[90] See section 2.6.2.

[91] *cf.* Cuomo di Caprio 1985, 79-84.

[92] Wikander, Ö., 1993 a, 27-36, 105-8.

[93] Nielsen 1987, 116-7.

[94] *Santuari d'Etruria* 1985, 46-8. The moulds in this catalogue represent a selection of the moulds known in central Italy. Other moulds are mentioned in section 2.6.

Moulds may also have been used for the production of ceramic vessels. Circular or cylindrical containers can be made by employing a rotating wheel and a mould. The mould is placed on a wheel and lined with clay. Pressure is then applied by hand or with a template which is gradually brought towards the mould as it rotates. This action squeezes away any excess clay to produce a vessel of the required thickness. The method is suitable for producing flat forms.[95] A well known example of a combined use of mould and wheel is the production of *terra sigilata* whose moulds may have been made directly from metal prototypes.[96] In central Italy some of the ceramic bowls dated to the 7th century BC and imitating metal wares, may have been modelled by a combination of moulds and rotating wheel. These carinated bowls are characterised by a clear, rounded angle between the body and the shoulder and a long out-curved rim. The surface is burnished to a black lustre and the shape imitates bronze *paterae*.[97]

Another method of moulding involves pouring a homogenous mixture of clay or slip into an absorbent mould. A thick layer of clay builts up as the water is drawn into the mould. When the desired thickness has been reached, the excess slip is poured off and the clay allowed to dry. This process is most commonly used for casting complex hollow shapes such as figurines. Slip casting is, to my knowledge, not attested for central Italy during the period 800 to 400 BC.

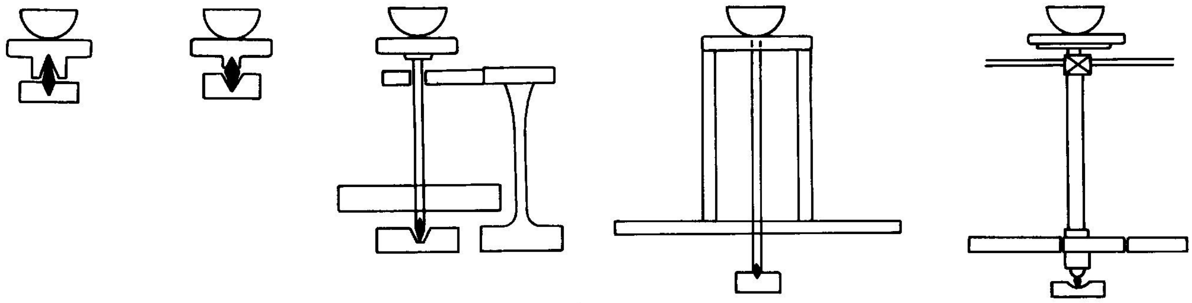

Fig. 13. Some designs of potters'wheels; a and b are simple pivoted wheels.

The third modelling technique involves wheel throwing which signals workshop conditions and emerging markets. In Etruria and *Latium Vetus*, the variation of pottery shapes with particular forms for specific functions such as fine ceramic drinking sets with *kotylai*, *skyphoi* and *oinochoai*, rapidly increased over the 8th and 7th centuries BC.[98] This development is associated with a certain degree of standardisation because the vessel shapes became more uniform than the types in the previous period. It reflects an intensification of production which can be partly attributed to the use of the potters' wheel. The fast wheel was an important innovation allowing for the more efficient production of pots. The mean time for the production of wheel-turned pottery is a fraction when compared with the time involved for the manufacture of ceramics modelled by hand. For example, a medium sized vessel can be produced on a wheel within 6 minutes.[99] Nevertheless, Arnold appropriately comments that this rate of production

[95] Hodges 1976, 26-8.

[96] Cuomo di Caprio 1985, 81-4; Friis Johansen 1960.

[97] Some of these bowls were coated with a black-firing slip. A *tazza cratere* with a diameter of 28 cm from *Satricum* was made on a wheel from a red-firing clay which had been subsequently coated with a heavy slip which coloured black during firing. Bietti Sestieri also hints at the employment of moulds for the production of vessels with an elaborate plastic decoration: Bietti Sestieri 1992 b, 94. See also: *Santuari d'Etruria* 1985, 54.

[98] Consult for instance, Maaskant-Kleibrink for an impression of the increase of pottery types and wares during this period: Maaskant-Kleibrink 1987, 108-11.

[99] This can be related to the hand modelling experiments by Pulitani which were mentioned above: Bietti Sestieri 1992 a, 439-46.

'*cannot be maintained because the potter must spent time digging and preparing clay, firing, selling the finished vessel and maintaining his workshop*'.[100]

The fast wheel consists of a heavy disc of wood, stone or clay, set upon a substructure fixed with a free-turning, vertical pivot (Fig. 13). Probably the simple pivoted, fast wheel was generally used in antiquity. It requires assistence as depicted in Figure 14. There is no evidence for the existence of more complicated designs of potters' wheels in central Italy during the period examined.[101]

Throwing clay involves first centring a ball of clay on a rotating wheel. Subsequently the walls of the vessel can be pulled up assisted by the centrifugal force, by directing pressure with both hands. Two parameters are important, the velocity and the duration of the rotation movement. For small vessels a relatively high velocity is required while for large vessels the duration of the rotation movement needs to be prolonged in order to allow the potter to pull up the walls. The various sections of an elaborate vase-form such as the foot and body, may be modelled separately, joining the parts later on. The basic vessel form is manipulated on the wheel while additions such as handles and outlets are attached later.[102]

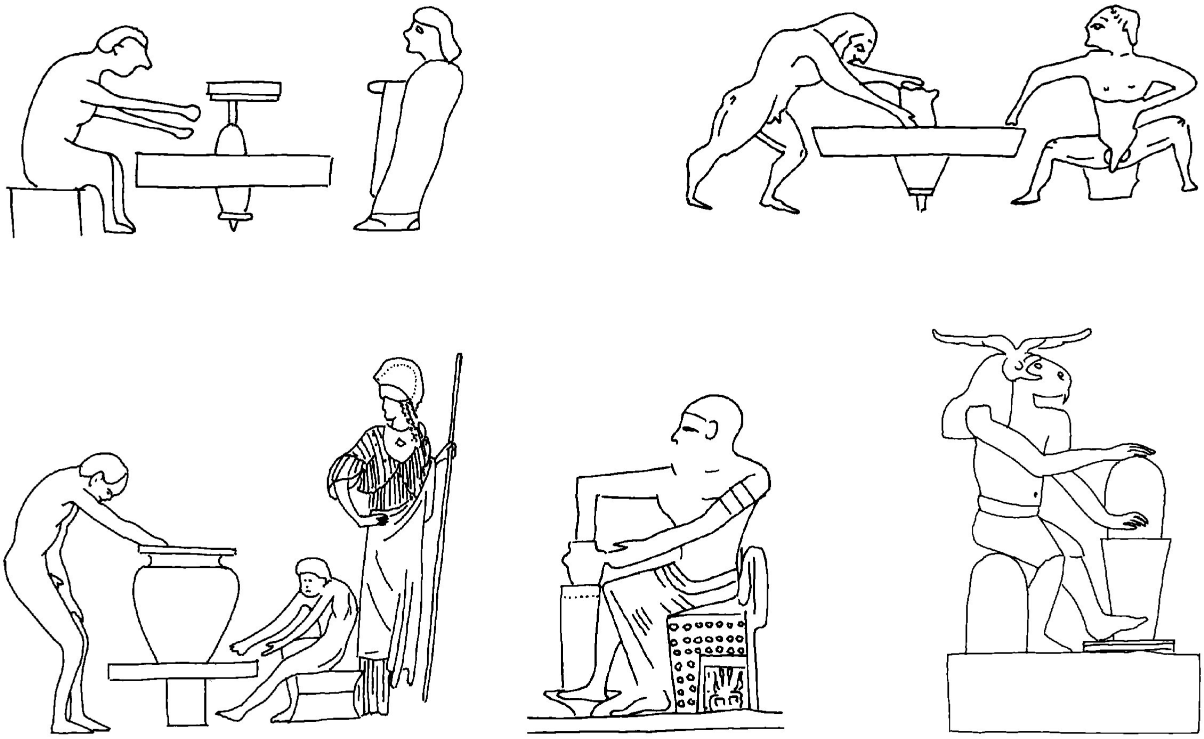

Fig. 14. Ancient illustrations of wheel-throwing.

Wheel throwing was introduced to central Italy during the 8th century BC. A ware group that was made in Italy by employing this new manufacturing technique is the Italo-Geometric pottery. Pottery classified as Italo-Geometric is made of refined clay on a potters' wheel and fired in a kiln with separated firing and combustion chamber. The production of Italo-Geometric pottery which is based on the Greek-Geometric pottery, can be detected from the third quarter of the 8th century BC. One of the more important production centres is located at Vulci while Bisenzio,

[100] Arnold 1989, 208. Arnold discusses the efficiency of various production techniques: Arnold 1989, 202-11.

[101] *cf*. Hodges 1970, 159; Moorey 1994, 147-8. Both authors discuss the introduction in Antiquity of a kick-wheel or true potters' wheel.

[102] For a more detailed account of the various options of a potter while using a wheel *cf*. Cuomo di Caprio 1985, 69-78.

Veii and Tarquinia are also mentioned as sites where workshops were established.[103] On stylistic grounds Rizzo suggests a local production of this type of pottery at *Caere*[104] and Bartoloni postulated that from the first half of the 8th century BC, Greek craftsmen produced fine ware pottery at Rome.[105] The precise location of some of the early pottery-workshops which imitated Greek-Geometric vessels requires more cautious statements. Nevertheless, it is acknowledged that imported Greek Geometric pottery as well as their local imitations are synchronic in southern Etruria from approximately 750 BC. For *Latium Vetus* another account is given. After examining the pottery of Greek type in this region, Beijer could still report for the first half of the 7th century BC that '*vases of depurated clay in the Greek tradition do not seem to be an essential part of the Latial material culture*'.[106]

In the archaeological literature, ceramics modelled on a potters' wheel, are equated with the workshop mode of production. In this context Peacock considers the potters' wheel as well as the kiln to be indicative because they improve both the quantity and quality of the ceramics produced.[107] The potters' wheel and the kiln are fixed installations and, therefore, the debate on itinerant versus sedentary craftsmen is hardly relevant for potters who modelled their vessels on a fast wheel. The establishment of workshops which made the livelihood of the potter essentially subject to the exchange of ceramics, requires economic incentives and emerging market conditions. Thus, the consequences of the introduction of the potters' wheel are comprehensive and not merely entail technological aspects but above all economic and social transformations. The evolution is usually not abrupt and, therefore, the introduction of the potters' wheel within a local framework requires above all time and reflects not *histoire événementielle* but slower rythms. I, therefore, consider that in Etruria the use of the potters' wheel remained exceptional before the second half of the 7th century BC until the expansion of the Etrusco-Corinthian wares and the *bucchero* production. In *Latium Vetus* the fast wheel did not become a regular feature before the late 6th, early 5th centuries BC and is associated with the advance of wheel-thrown vessels of depurated wares and clay, that is the *argilla figulina* tradition.[108]

While examining wheel-throwing, I would like to stress the continuing employment of the turntable or slow wheel as one of the modelling techniques for the production of the *impasto* pottery.[109] A distinction between

[103] Bartoloni mentions Tarquinia, Veii and Vulci as production places of Italo-Geometric pottery: Bartoloni 1989, 183-7. Bietti Sestieri includes Bisenzio: Bietti Sestieri 1992 b, 45. Beijer examined the early Greek and local pottery in *Latium Vetus*: Beijer 1995.

[104] Rizzo 1989.

[105] Bartoloni employs the term *argilla figulina*: Bartoloni 1981, 101; Bietti Sestieri 1992 b, 249. Beijer rejects a local production of wheel thrown, fine wares at Rome during this period: Beijer 1995, 57-8.

[106] Beijer 1995, 61.

[107] Peacock 1982, 25.

[108] Carafa in his study on pottery from Rome that is dated from the late 8th to early 5th centuries BC predominantly presents *impasto* ceramics: Carafa 1995. He also quantifies the various fabrics that were encountered during excavations on the northern slopes of the Palatine. The coarse wares are the main group (45 % of about 29.000 sherds). This ware group is known from the late 8th century BC but is most intensively encountered during the 6th century BC. The vessels which are produced include jars, bowls, basins and storage jars. Coarse wares are probably partly modelled on a turntable or slow wheel since the fabric still contains various coarse-grained inclusions such as augite, micas and crushed stones. The fabric is not particularly suited for modelling on a fast wheel and the surface features which indicate rotation are probably caused by modelling on a slow wheel. From his study it can be deduced that *figulina* and *bucchero* production at Rome is limited at least until the late 6th century BC when compared to the *impasto* output. This corresponds with other sites in *Latium Vetus*. Bouma while presenting the archaeological evidence from *Satricum*, considers that the production of depurated wares started in the late 6th century BC while *figulina* is attested in 5th and 4th century layers: Bouma 1996, 312-402. At Laurentina Acqua Acetosa *figulina* is known from contexts that date to the late 6th and early 5th centuries BC: Bedini in *Grande Roma*, 1990, 175-77.

[109] The terminology slow wheel and fast wheel require specification. The slow wheel is considered to be a turntable or a wheel that is rotated with low velocity while the fast wheel is a potters' wheel with a high velocity. The terms can be ambivalent because it is not always possible to distinguish between a high or low velocity while examining pottery surfaces. Both techniques can be represented as an inclined plane or gradient. Moreover, the rotation of a potters' wheel can be adjusted in order to obtain a low velocity which makes it a slow wheel. In the archaeological literature *impasto* pottery is associated with the wheel or *tornio*: *cf*. Bouma 1996, 312-3; Carafa 1995, 18. A distinction between a slow or fast

ceramics modelled on a slow wheel or on a fast wheel can be arbitrary.[110] It has been demonstrated by experiments and ethnographic examples that surface features which indicate the use of a potters' wheel are usually ambiguous and can also be attributed to other modelling techniques.[111] The use of a slow wheel or turntable in central Italy may still represent a household industry although the turntable can also occur in workshops usually in combination with other modelling techniques. The ware denominations *impasto* and *figulina* are crucial for a discussion on slow or fast wheel and, therefore, require a closer examination.[112]

Impasto is commonly used for fabrics with a fair amount of inclusions which are still visible with the naked eye, approximately granule- to medium-size; 4 to 1/4 mm. in diameter.[113] Pastes with a considerable percentage of inclusions of this size are usually not suitable for throwing on a potters' wheel. These non-plastic inclusions increase the rigidity of the paste and thus reduce the plasticity because they moderate the amount of water-absorbing surfaces. Good water-absorbing characteristics are essential for a potters' wheel as it ensures an optimal plasticity of the paste. Throwing clay involves the greatest structural reorganisation of the paste when compared with other modelling techniques and, therefore, necessitates an optimal plasticity and a high water content. Coarse *impasto* pastes have adverse characteristics for modelling on a wheel with high velocity. Moreover, pastes for wheel-throwing contain smaller inclusions than pastes used for hand-forming techniques because they otherwise would cut the potters' hand.[114] In the study by Courty and Roux, there is a significant distinction between on the one hand the coarse fraction of the pastes which were hand modelled with or without the use of a turntable and on the other hand the coarse fraction of pastes which were wheel-thrown. Both the amount of the coarse fraction as well as their size is less.[115]

Figulina is levigated clay with scarcely any visible inclusions on a macroscopic level. It may contain fine to silt size non-plastics and is usually coated with a wash or slip. In central Italy it usually fires to a pale to reddish yellow colour and can be characterised as a powdery fabric.[116] The *figulina* paste is adjusted for modelling on a fast wheel and thus reflects workshop conditions.

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wheel is usually not made. The hypothesis in this research is that the *impasto* pottery will be manufactured predominantly on a turntable or slow wheel while the *figulina* pottery is manufactured on a potters' wheel.

[110] Peacock 1982, 23.

[111] Courty and Roux 1995. Van der Leeuw discusses the various techniques which have been documented for the production of globular or nearly globular pots with a simple everted rim: van der Leeuw 1993. Quite a number of different modelling techniques and approaches were reported for the manufacture of this specific vessel shape.

[112] This discussion is hampered by the few fabric descriptions available for central Italy and the vague definition of various wares. The term *impasto* is used for numerous fabrics while also *figulina* is a collective name for depurated pastes of different geological origin. Momentarily, the Archaeological Institute of the University of Groningen is preparing a fabric and ware description for archaeological ceramics from southern *Lazio*.

[113] *cf.* Shepard 1956, 118; Cuomo di Caprio 1985, 28. The size and amount of the inclusions is usually not specified in the archaeological literature. Bouma reports terms commonly used besides *impasto* that is *simple pottery*, *ceramica comune* etc.: Bouma 1996, 312-3. He also presents some descriptions of *impasto*. See also Gierow on advanced impasto D which is turned on a wheel: Gierow 1966, 244.

[114] Arnold 1989, 29.

[115] Courty and Roux present five examples of pastes for hand modelling including those which were used for moulds and turntables. These pastes have on average 28% coarse inclusions with a mean size of 300 µm. In contrast are the pastes which were wheel thrown. These contain on average about 16% coarse inclusions with a size of about 110 µm.

[116] Bouma gives a short description of *figulina*: Bouma 1996, 395. Bedini uses occasionally the suffix *farinosa*, to describe the depurated clay: Bedini in *Grande Roma* 1990, 175-7. La Rocca describes lucidly the difference in fabric of early wheel thrown pottery from Rome and the later figulina: La Rocca 1977.

Except for the manufacture of *bucchero*, it appears that during the 8th and 7th centuries BC, the potters' wheel was predominantly employed for imitating Greek painted pottery.[117] I, therefore, conclude that in central Italy, the majority of the pottery was not modelled on a potters' wheel but was made with other manufacturing techniques. Further on this conclusion will be related to the upsurge of building activities in central Italy from the middle of the 7th century BC. These activities gave another impulse to the process of craft specialisation within the ceramic industry.

So far, I have discussed individual modelling techniques though some of the table wares from the Orientalising Period stand out on account of their intricate execution which reflects a combination of various modelling and decoration techniques. The effect of combining modelling techniques is a sharp increase in labour or in modern terms energy expenditure, because the manufacture of a vessel is separated into modelling phases.[118] This separation requires drying stages between the modelling phases before the vessel is completed. Time investment during the manufacture of this type of pottery in fine *impasto* or *bucchero* was much larger when compared with the same types of vessels in Italo-Geometric and Etrusco-Corinthian fabrics made on a potters' wheel. Moreover, the surface treatment of the early fine *impasto* and *bucchero* pottery was more time-consuming because they were burnished to lustre while the painted pottery imitating imported vessels was given scarcely any surface treatment at all. This marks two different socio-economic systems for the late 8th and early 7th centuries BC:

- one system in which production time is economically indirectly significant (the amount of time to make a vessel is not immediately translated into value) and
- one system in which increased efficiency became necessary.

Both systems merged in central Italy from about 650 BC when the ceramic artefacts became more and more standardised and eventually mass produced which reflects enhanced economic efficiency.

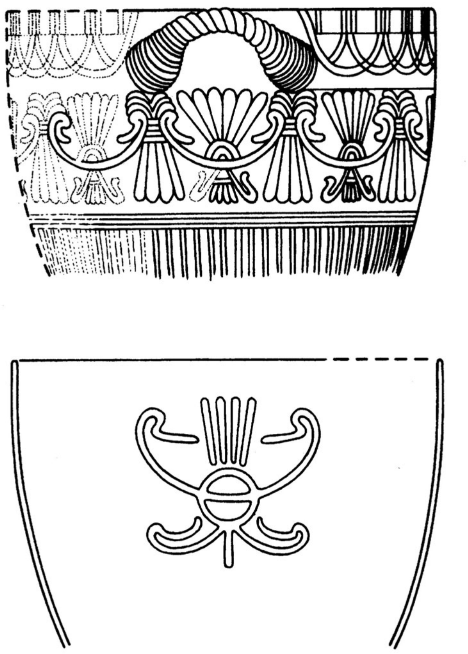

Fig 15. Fine impasto kotyle from Ficana

[117] Bietti Sestieri makes a similar remark for *Latium Vetus* during the 8th century BC: Bietti Sestieri 1992 b, 240. On account of the literature that is mentioned in the previous pages, I consider this remark still valid for the 7th century BC.

[118] For a critical assessment of the concept *energy expenditure* see: Voutsaki 1995, 9.

The manufacture of some of the most sophisticated *bucchero* vessels provides an illustration of a combination of modelling techniques and records the manufacturing time involved. The basic shapes are wheel-turned in one or more sections while the decoration techniques include moulding appliques and handmodelling decorative elements. These elements are predominantly borrowed from metal techniques such as stamped motives, ribbing, relief decoration and incision. Some of the ribbing is so deep that it may derive from actual moulding. Other intricate examples include *oinochoe* terminating in carefully modelled animals heads and *chalices* with *caryatids*.[119] Figure 15 illustrates a *kotyle* from Ficana while Figure 16 represents ceramic vessels from tomb 7 at Poggio Buco. Both figures illustrate ceramic vessels which were modelled and decorated while using various techniques. The producers of these elaborate vessels competed with the workshops that imitated the Greek painted pottery which was made more effectively on a potters' wheel. This may have been one of the motives for the adaptation of the local pottery producing system which resulted during the second half of the 7th century BC in a production of fine *impasto* and *bucchero* pottery in series. This process is accurately illustrated by the Figures 15 and 16. The *kotyle* from Ficana is a highly crafted, individually made artefact while the vessels from Poggio Buco are made in series. In fact, both figures illustrate the successful transformation of the local pottery producing system during the 7th century BC. This system had to compete with an emerging market system which involved Levantine and Greek communities and their respective manufacturing structures. A continuing standardisation of the local pottery production accounts for the long-term changes in *bucchero* manufacture which evolved from prestige ceramics into semi-luxury vessels. Eventually *bucchero* became one of the fabrics for common table wares.[120]

After modelling the ceramics, the artefacts require drying before they are fired. The physical water content of the clay has to evaporate, otherwise steam in the pores may damage the pottery during firing. Drying has to be thorough and gradual and usually lasts several days.[121] During drying, the water in the clay evaporates at the surface of the artefact through capillary action. The ceramic object shrinks due to the loss of water. Non-plastic inclusions preferably with a range of sizes counteract excessive shrinkage. Finishing methods for functional or decorative purposes are commonly applied during the drying phase. This may involve joining sections of the artefact to each other, such as separately thrown components of the vessel, moulded pieces and handles. Incising, carving, stamping and burnishing are also done at a stage when the body has still a suitable plasticity. Furthermore a wash, slip or engobe is applied when the artefact is semi-dry.

The only remains an archaeologist can expect to find as a reminder of this phase of the pottery production are drying facilities. These may be provisional but can also form part of a building. Facilities enhance the control over the production sequence and are, therefore, usually associated with workshops. One of the functions of the *southeast building* at Poggio Civitate which is a monumental, open, spacious structure with a triple row of columns and dated to the second half of the 7th century BC, was to accomodate space for drying ceramics.[122] Also at Marzabotto, workshops with drying facilities were reported for the 5th century BC.[123]

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[119] *cf.* Rasmussen 1979, 2-3, 96; Strøm 1981; Bonamici 1972; 1974, 30-1, 45-6. Poggio Buco tomb 7 contains many vessels esp. no. 57 and 58, which illustrate a combination of modelling techniques: Bartoloni 1972, 75-107. Some of these vessels are illustrated in figure 16.

[120] Gran Aymerich 1993, 22-3.

[121] Arnold 1989, 62-71.

[122] See section 2.6.6.

[123] See section 2.6.7.

2.5 *Firing*

The last step in ceramic production is the firing. During firing to about 700°C clay minerals decompose, a process which is irreversible because these minerals will no longer re-form when exposed to water. Sintering occurs from 400°C and is the major source of cohesive strength in ceramic bodies while vitrification develops at more elevated temperatures depending on the chemical composition of the clay.[124] The temperature obtained in the kiln affects the physical properties of the ceramic artefact. Therefore control over these temperatures became essential with increasing specialisation. This control over the firing conditions and temperature is the principle governing the development from open fire to more complicated kiln structures.

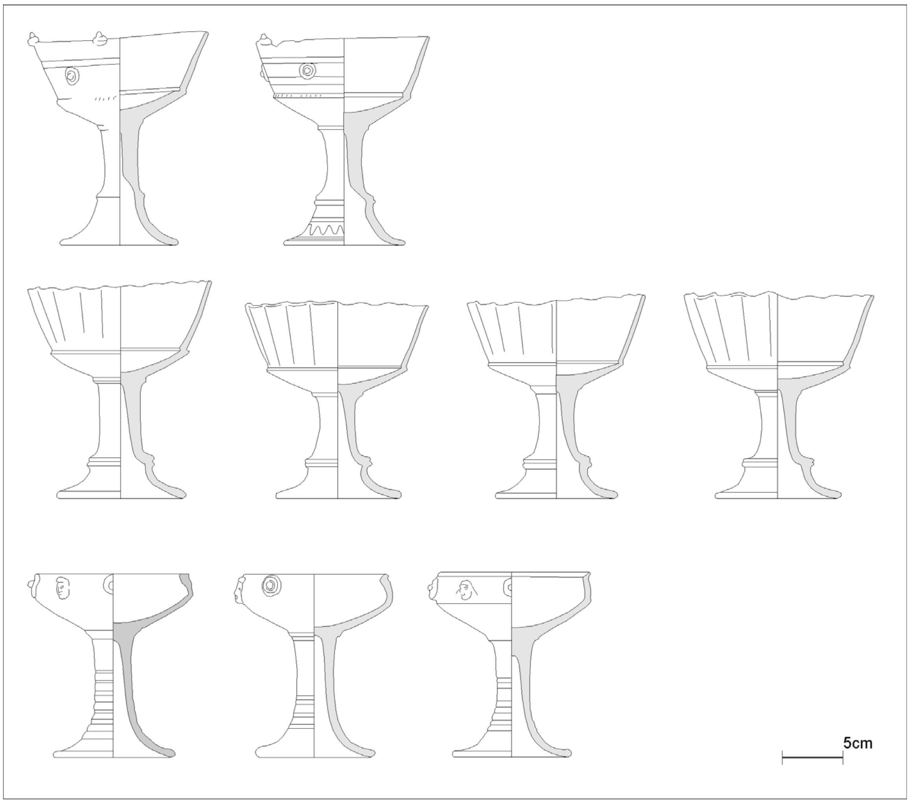

Fig. 16. Some ceramic vessels from tomb VII at Poggio Buco.

[124] For a detailed description of the processes occurring during firing see: *cf*. Shepard 1956; Rye 1981; Rice 1987.

The employment of a pottery kiln instead of an open- or pit fire is an indication for a complexer organisation of the pottery production. Thus it is relevant to establish when kilns were first built in central Italy.

In an open fire the ceramics are in direct contact with the ignited fuel. This results in dark discolorations on the pottery where the ceramics are in contact with ash or fuel.[125] Moreover, in an open fire, the rate of the temperature rise is difficult to regulate.

In a pottery kiln, the fuel is separated from the ceramics by a raised oven floor and this enhances the control over firing conditions and temperature. It also results in a more homogenous colour of the ceramics. In antiquity, the kilns in pottery workshops are usually updraught kilns with a grate which segregates the firing chamber from the source of heat below (Fig. 17). The firing chamber contains the ceramics while the combustion chamber holds the fuel. The heat will go from the combustion chamber to the firing chamber and smoke and gases from the combustion will be emitted through a vent or blow-hole on top of the firing chamber. The draught will go upwards, hence its name. For Italy, Cuomo di Caprio has examined numerous kiln-remains and derived a typology of which a shortened version is presented in Figure 17. This figure illustrates the two main categories:

type I: with a round or oval shape and
type II: with a square or rectangular plan.[126]

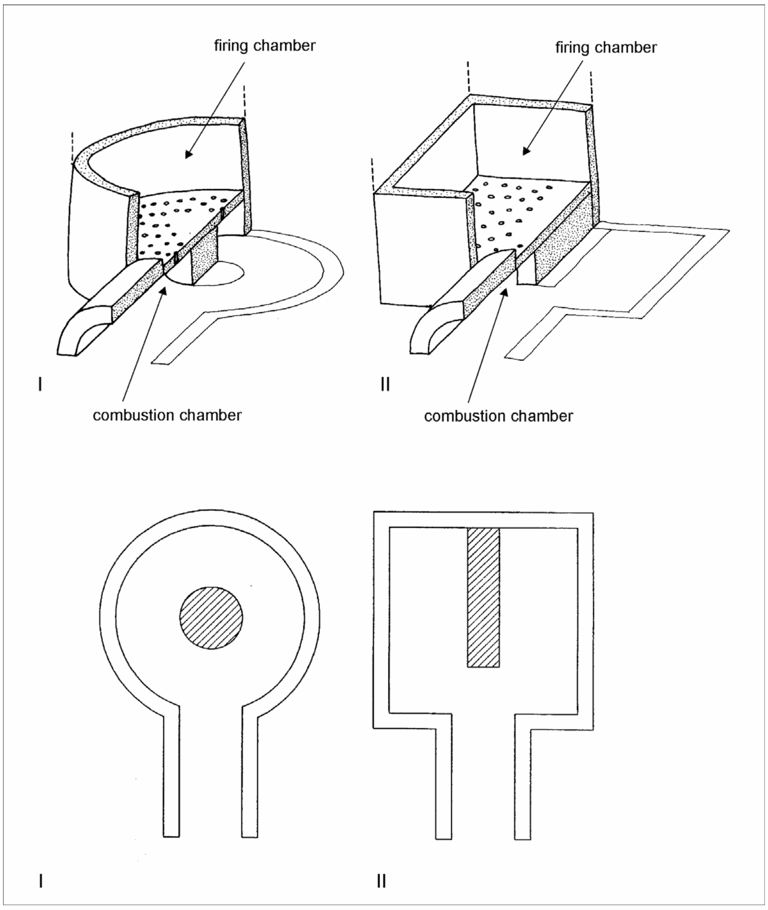

Fig. 17. Two common types of pottery kilns in central Italy; three-dimensional reconstruction and plan.

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[125] Rye 1981, 97-121. For experiments see for example: Lüdtke and Dammers 1990.

[126] For reviews of kilns in Italy and the typology see: Cuomo di Caprio 1971/1972; 1979; 1982; 1992. Cuomo di Caprio presents a typology which is based on variations in substructures. For this research a presentation of both main categories is sufficient. For the complete typology, I refer to: Cuomo di Caprio 1985, 135-48. Other kiln types can be found in Peacock and in Renfrew and Bahn: Peacock 1982, 32-3, 68; Renfrew and Bahn 1991, 292.

The substructures of pottery kilns can vary to such extent that I prefer not to differentiate between the various methods of building the combustion chambers. Usually, the substantial, raised oven floor has to rest on a central pedestal or another support such as wall, cross wall or arch. Pottery kilns are normally covered on the inside with a specially prepared lining that insulates and withstands high temperatures. The substructures of the kiln are commonly constructed in the ground and can, therefore, be expected to leave archaeological traces. The upper structures and the cover of the kiln are rarely ever found.

Within a traditional kiln, the atmosphere alternates between oxidising to reducing and vice versa during the firing cycle. The conditions can be influenced by the stoker when he delays or increases the amount of new fuel which has to be added to the combustion chamber.[127] This can be combined with a regulation of the air access in order to acquire incomplete combustion and thus reducing conditions in the kiln. The temperatures which are obtained either in an open fire or in a kiln can vary significantly depending on several factors such as the position of the vessel within the kiln or wind-force. Maximum temperatures recorded for an open fire range from 680°C to 920°C and for an updraught kiln from 715°C to 1,075°C.[128] This range of temperatures indicates the temperature at which ceramics in central Italy were fired. Francaviglia *et alii* suggest on account of the calcite content that *bucchero* from Veii, *Pyrgi* and some other sites was fired at temperatures lower than 750°C.[129] Elevated temperatures of around 1,010-1,020°C have been reported by McDonnell and Kars for the late Archaic terracotta statues from *Satricum*.[130]

Fuel is essential for the manufacture of ceramics and deforestation on account of industrial activities is often used as an argument for change in the pottery craft.[131] Peacock stresses, however, that pottery workshops *develop a symbiotic relationship with their environment.*[132] This implies that fuel requirements are related to the resources which are locally available and these range from straw, dung, prunings, wood to other combustibles. The ratio of pottery to fuel by weight, is about 1:2 to 1:3.[133] Higher ratios can occur depending on the kiln type, firing cycle and rate of oxidation. The firing cycle from the moment the fire is started until the removal of the ceramics from the kiln, depend on the firing method. An open firing does not have to last longer than one hour while the firing cycle can continue for several days in an updraught kiln.[134]

Arnold has commented on the investment in capital and labour in building a kiln. He considers that any investment could counteract further specialisation on account of the poverty of potters.[135] The capital investment would have

[127] Cuomo di Caprio 1993, 217.

[128] Rye 1981, 98-104. Rye documented the lowest temperature in the open-fire/kiln while the maximum temperature was reached. It can be deduced that the temperature difference in a fire at one moment can be more than 200°C.

[129] Francaviglia *et alii* 1975, 228-30. Calcite disappears from calcareous clays at extensive heating around 750°C. Calcite was completely absent in the major part of the *bucchero* samples except those from Pyrgi (*c*. 16%), Veii (*c*. 8%), Marsiliana (1-2%), Poggio Buco (1-2%) and one sample from Marzabotto (1-2%).

[130] McDonnell and Kars 1990, 17-8; Lulof 1993, 278.

[131] *cf*. Wertime 1983.

[132] Peacock 1982, 103.

[133] Arnold 1989, 215; Peacock 1982, 25. Peacock reports a ratio of 1:10. Also the ratio that was reported in the experiments by Pulitani, is much higher than 1:2 or 1:3: Bietti Sestieri 1992 a, 439-46.

[134] Time spans are published by: Rye 1981, table 3, 102-3.

[135] Arnold 1989 219-24. The occasionally rigorous systemic approach of Arnold towards pottery production which is based on contempory ethnographic research, can only be applied to archaeological data with constraint. In Antiquity for example, it is dubious whether the construction of kilns involved a capital investment.

been limited in antiquity since most of the resources for building a kiln were locally available. The labour investment for constructing a kiln is illustrated by experimental research. Rostoker and Gebhard demonstrate that a relatively small group of about seven men, could make in about two years, all the terracotta rooftiles for the temple of Poseidon at Isthmia in Greece, which is dated to the first half of the 7th century BC. Within two years approximately 1,900 rooftiles were produced, including the eaves and ridge tiles. The modern potters who executed the experiment, constructed a kiln of 1.5 by 1.5 m. and 2 m. height, according to the specifications of ancient Greek pottery kilns that had been excavated. The weight of the kiln was about 4 tons which mainly consisted of sun-dried clay bricks and the raised oven floor. It was built by three men in about three weeks using local materials.[136] This indicates that the labour investment for building a kiln was considerable but confined when compared with the total assignment which amounted to roughly two years.[137] Nevertheless, the knowledge for contructing a massive kiln such as the one in the experiment as well as the labour investment, reflects workshop conditions whether it was a permanent or semi-permament workshop.[138] For a semi-permanent workshop that went from commission to commission, it implies that the investment for constructing a substantial kiln is related to the commission at hand. In central Italy these commissions are probably associated with large building complexes such as temples and monumental courtyard houses. In this context it is relevant to mention that Enei reports tiles of different manufacture in small rural buildings around *Caere*.[139] This may indicate that tiles for smaller rural sites were not made on commission.

I have referred to the debate on itinerant *versus* sedentary craftsmen in Chapter I, but it is appropriate to examine this fundamental issue again in relation to the production of ceramics and the associated kiln structures. The debate is essential since it is closely related to a reconstruction of the urbanisation process in central Italy. As mentioned before, craftsmen who employed a potters' wheel are likely to have been sedentary. Another group of ceramics in demand from about 650 BC, are ceramic building materials. Due to the size of these ceramics as well as the quantity involved, it is unlikely that bulk transport over large distances occurred.[140] In addition, the manufacture of terracotta building materials is seldom a household activity. Although the production technology is simple, the firing requires kilns of sufficient size to contain these ceramics. The dimensions as well as the weight of the tiles dictates the proximity of a market in order to reduce transportation costs. Nevertheless, since the equipment for the production of tiles is simple, the workmen are more mobile than potters. Teams of workers are known to have travelled to suitable markets and rural building sites.[141] Thus, primary evidence from a rural context are necessary in order to

[136] Rostoker and Gebhard 1981.

[137] Many kilns in Antiquity were not as elaborate as the kiln that was reconstructed by Rostoker and Gebhard and accordingly the investment for construction would be even less. However, most of the 6th century BC kilns that are documented in central Italy and which are presented in section 2.6, correspond with the kiln of the Isthmia experiment.

[138] The labour investment for constructing a kiln denotes semi-permanent conditions. The dimensions of these kilns is partly related to the size of the tiles in central Italy during the period that is examined. The firing of these large tiles would require substantial kiln structures as will be demonstrated in section 2.6. Moreover, a kiln is merely one of the edifices they had to construct, in order to meet workshop arrangements for the manufacture of considerable amounts of architectural terracottas. Therefore, I consider that a group of artisans who worked on commission, would stay at least several months at a building site, sometimes even more than a year. This indicates that they were semi-permanent.

[139] Enei 1993, 35. The small buildings are dated to the 7th and 6th centuries BC.

[140] The measurements of *tegulae* are about 63 by 46 cm and of *imbrices* 60 by 10 cm though these measurements may vary considerably. Wikander has published a detailed list with the measurements of *tegulae* at various sites in central Italy: Wikander, Ö., 1993 b. The exceptional size of the ancient tiles makes it difficult to apply the ethnographic data on the production of building materials as analogy, especially when the output is considered: *cf*. Peacock 1982.

[141] Hampe and Winter have reviewed modern *pithos* makers on Crete who travel from village to village in order to produce and market their vessels: Hampe and Winter 1962, 4-11. Another example is reported by Renfrew who implies travelling craftsmen on account of the use of identical incised cylinders on a hearth at Lerna and on *pithoi* at Tyrins and Zagouries: Renfrew 1972, 344.

analyse semi-permanent conditions. I was, however, unable to locate for central Italy during the period 800 to 400 BC, workshop remains that clearly relate to semi-permanent conditions basically on account of a scarcity of evidence from the countryside. All the workshops examined in the next section relate to settlement centres.

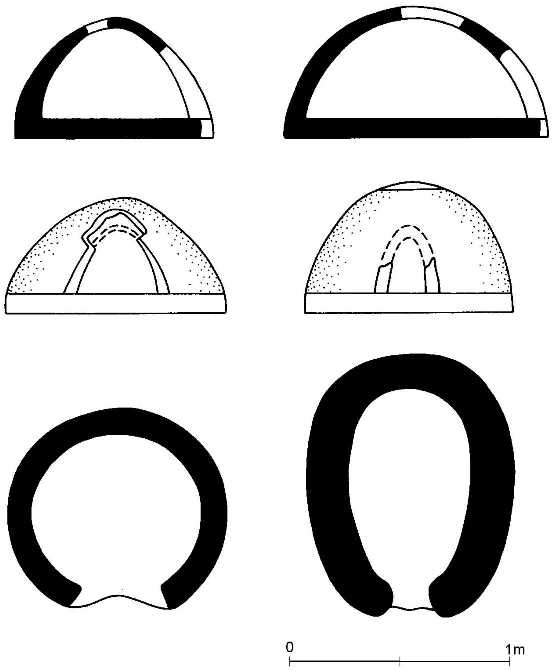

Fig. 18. Two early ovens from Sorgenti della Nova.

Primary evidence on pottery manufacture found in the countryside may either signify a semi-permanent workshop or a rural workshop. Edlund reports for Etruria and the Greek colonies, a limited number of workshops associated with rural sanctuaries or other building complexes. However she interprets the evidence as small industrial centres and not as semi-permanent workshops.[142] The example of a rural workshop in Etruria is the Etruscan-Roman villa at Blera.[143] This villa is associated with the production of tiles and architectural terracottas and the excavators suggest that the local manufacture started during the late Archaic period. The production continued for more than five centuries though most of the evidence is dated between the 4th and 2nd centuries BC. The findings at Blera do not represent a semi-permanent workshop but emerging estate production.[144] The evidence implies a preoccupation with pottery manufacture by a prominent Etruscan-Roman family who owned the land as well as the villa.[145] It, therefore, seems that the extant workshop remains from a rural context do not date from before the late Archaic period and that they do not represent semi-permanent conditions.

The debate on itinerant *versus* sedentary craftsmen will be discussed elsewhere, primarily because the itinerant artisan is dominant in the archaeological literature. At this stage I would like to continue with the development of the firing technology.

The pyrotechnological development in central Italy is not merely reflected by kiln structures for the production of ceramics but the advance of firing technology is also indicated by cooking facilities or metallurgical activities. Early

[142] Edlund 1983.

[143] Berggren and Andrén 1969; Edlund 1983.

[144] See Peacock on estate production: Peacock 1982, 46-50, 129-35.

[145] Berggren and Andrén 1969.

evidence of an attempt to control firing conditions during cooking, are the *forni* excavated at Sorgenti della Nova (Fig. 18). This site is occupied during the period late Bronze to early Iron Age while most finds are dated to the 11th and 10th centuries BC. Two ovens were found, one of which has a diameter of slightly more than 100 cm. and a height of 60 cm. As is illustrated in Figure 18, they are both dome shaped and have an outlet for smoke near the highest point. The excavators report that the ovens were probably used for preparing food in direct or indirect contact with fuel. The opening in the front could have been used for putting in fuel as well as food. It is likely that these and similar ovens in central Italy, are related to the preparation of food. They demonstrate a conscious effort at controlling firing conditions and temperature because ovens have the advantage of insulating the firing process.[146]

A deliberate attempt to control firing conditions before 800 BC, is implied by Bietti Sestieri for the manufacture of large ceramic storage jars during the Latial period II (900 to 770 BC). Although she mentions that in this period most of the smaller vessels were fired in an open fire, it is suggested that the large storage jars may have been fired in a kiln because they normally have a homogeneous red or light red colour.[147] Furthermore, regulation of the firing conditions is demonstrated by some pottery dated to the second quarter of the 8th century BC. In some tombs in central Italy, it is reported that sets of identical *impasto* bowls fired in different conditions, accompanied the deceased. Some of the bowls have been fired in oxidising conditions resulting in a reddish colour while others were fired in reducing conditions which turned them into a dark colour.[148] These cases illustrate an advance in the control of firing conditions before the arrival of the Levantines or Greeks on the mainland of Italy. This may signal the existence of household industries for specific wares during the late 9th and early 8th centuries BC. Unfortunately, this hypothesis is not supported by factual evidence of simple updraught kilns. Two early kiln structures dated to the 8th century BC are known from Rome and Lavinium but these are interpreted by the excavators as structures for open fires because the raised oven floor was not found.[149] These provisions for firing from Rome and Lavinium are, however, permanent structures and '*they represent an intermediate stage between open firings and true kilns*'.[150] Therefore they indicate conditions of household industries.

Updraught kilns of type I are described in the next section in contexts dated from the 7th century BC but as is indicated above, they can be expected to have existed in central Italy during the 8th century BC. A similar account can be given for kilns of type II. They are reported in 6th century BC settlements but due to the early tiles dated to the second half of the 7th century BC, kilns of type II probably were constructed in central Italy from the Orientalising Period.[151]

[146] Negroni Catacchio, 1982, 12-3, 49-50, 99. Negroni Catacchio presents ovens and early pottery kilns: Negroni Catacchio 1995, 275-83. The pottery production at Sorgenti della Nova is marked by the employment of a range of clays. Geochemical analyses denote that quite a few clay deposits were utilised. Moreover, it is reported that the potters were not very specialized: Negroni Catacchio 1982, 53. Bonghi Jovino and Treré mention an oven structure from a layer that is dated to the 10th to 8th centuries BC at Tarquinia. They consider this structure to be similar to the ovens from Sorgenti della Nova: Bonghi Jovino and Treré 1987, 61. An interesting oven is reported from the important, archaic *villa dell'Auditorium*: Terrenato *et alii* forthcoming. This oven had about the same dimensions as the other ovens reported by Negroni Catacchio: Negroni Catacchio 1995, 275-83. Its construction is however different since it was built from pieces of tuff assembled with clay. The excavators of the *villa dell'Auditorium* imply that the oven might have been used either to prepare food or to fire pottery. On account of the similarities with oven structures that are reported by Negroni Catacchio, and the function of the room next to the oven, I consider it to be related with the preparation of food. The firing of pottery would have required a structure with internal technical features and these are not reported by the excavators of the *villa dell'Auditorium*. See also Guidi *et alii* on the ovens from Cures Sabini: Guidi *et alii* 1996.

[147] Bietti Sestieri 1992 b, 87.

[148] Guidi 1984, 72; Bietti Sestieri and De Santis 1987, 43.

[149] Carafa for the structure in Rome and Fenelli for the remains at Lavinium; Carafa 1995, 255; Fenelli 1984, 341-4. However, the form and plastering of the structure at Lavinium is indicative for an updraught kiln: see section 2.6.2.

[150] Rye 1981, 98.

[151] Although tiles can be fired in round kilns, it is generally assumed that the rectangular shape of a kiln does accommodate the tiles better while stacking. Especially for the large sized tiles in Antiquity, the square or rectangular kiln has to be considered as the most appropriate type. See for words of caution: Cuomo di Caprio 1979, 91.

2.6 *Archaeological evidence*

The discussion of the archaeological evidence is primarily based on sites where actual production units are discovered. The information presented in this section, is related to settlements where kilns and other workshop remains were excavated. I have selected those sites where the evidence is relatively intact which means with a context presenting features that allow for a reconstruction of the character of the pottery production.[152]

Of all the workshop structures, kilns are most likely to have been preserved though almost never intact. Related evidence such as the raised oven floor, the firing chamber, the covering, fuel or wasters may not have been preserved. The presence of a kiln at a site does not necessarily indicate the existence of a workshop. It could also imply household industries or semi-permanent workshops. As is indicated above, a workshop producing mainly bricks, tiles or storage jars could travel from site to site. In order to interpret a kiln at a site, supplemantery findings are incorporated such as additional industrial remains, information that indicates the range of locally manufactured vessels and the features of the settlement itself. Occasionally, I reinterpret the data that were published on the industrial structures.

2.6.1 *Satricum*

During the 7th and 6th centuries BC the proto-historical site of *Satricum* functioned within a system of large, late Iron Age and Archaic centres, of which Ardea, Lavinium and Ficana can be mentioned. The ancient settlement at *Satricum* was located at the present-day Borgo Le Ferriere near the Pontine plain, on the easternmost border of *Latium Vetus*. It is situated approximately 60 km south-east of Rome. The settlement originated on a number of tuff plateaux in the lower basin of the river Astura. The Astura, the most important river in *Latium* south of the Tiber, connects *Satricum* with the sea.

The oldest kiln at *Satricum*, capital A in Figure 19, was built in the 7th century BC on the outskirts of the acropolis in square C27.[153] Of this kiln, only part of the combustion chamber was preserved. It is circular with an attached *praefurnium* (Fig. 20).[154] It belongs to the first category in the classification of Cuomo di Caprio.[155] The kiln was made by digging a pit into virgin soil in which the support of the raised oven floor was placed. This support was made of local tuff blocks of which many large, burned fragments were found inside the combustion chamber. It is possible that the raised oven floor was also made of tuff slabs. No furnace lining was found while the construction appears elementary. Due to the firing of the virgin soil, the dimensions of the combustion chamber and *praefurnium* could be measured as 140 cm wide and 165 cm long while the height was preserved for about 30 cm.

Between the tuff and *grumi* of the kiln, pottery was found that had been exposed to a firing temperature which was too high for the fabric. The excavated pottery included bowls, jars and cooking stands, many of which were decorated with plastic cord decoration (Fig. 21).[156] The fabric of the pottery inside the kiln was consistent in colour, clay matrix and tempering material. This uniformity encouraged an investigation into the provenance of the clay and

[152] This section is, therefore, not a compilation of all the sites in central Italy where kilns are reported.

[153] The kiln and its contents are dated to the late 7th century BC. This was confirmed by the pottery that was associated with wasters which were recovered from a trench that was excavated nearby the kiln, on the slope of the acropolis. About 400 fragments of wasters were recorded most of which were fairly thin, between 3 and 8 mm. The thickness indicates the production of fine table wares. The wasters were shapeless and their forms could not be identified though an Etrusco-Corinthian bowl was found among the associated pottery.

[154] The *praefurnium* is the flue leading from the stokepit to the combustion chamber.

[155] Cuomo di Caprio 1971/1972.

[156] Parallels of similar pottery was excavated elsewhere, for example, at Lavinium: Castagnoli *et alii* 1975, 14-9.

the tempering material. One of the local clays derives from the marine terraces. These terraces arose from changes in the sea level during the Early Holocene to Wurmian Age.[157] The marine terrace at Le Ferriere contains quartz, sub-rounded fragments of flint and to some extent local volcanic minerals. These minerals are mixed with the clay in varying quantities. Samples of a marine clay deposit were fired and thin-sectioned. These were subsequently compared with sections made from the pottery samples from the kiln. The thin-sections from the clay deposit and the pottery from kiln A are similar especially when one considers the possible processing techniques of the clays in antiquity. For example, a thin-section of the fired clay deposit contains about 30 % quartz, 1-2% plagioclase, 2-3% chert and some biotite while a thin-section of an *impasto* bowl found inside the kiln, contained the above plus grog and volcanic rock fragments indicating that the paste for the ceramics was mixed with other non-plastic inclusions. The processing of the clay with crushed volcanic rock fragment accounts for the presence in the fabric of the bowl of augite, volcanic glass fragments and some garnet.[158]

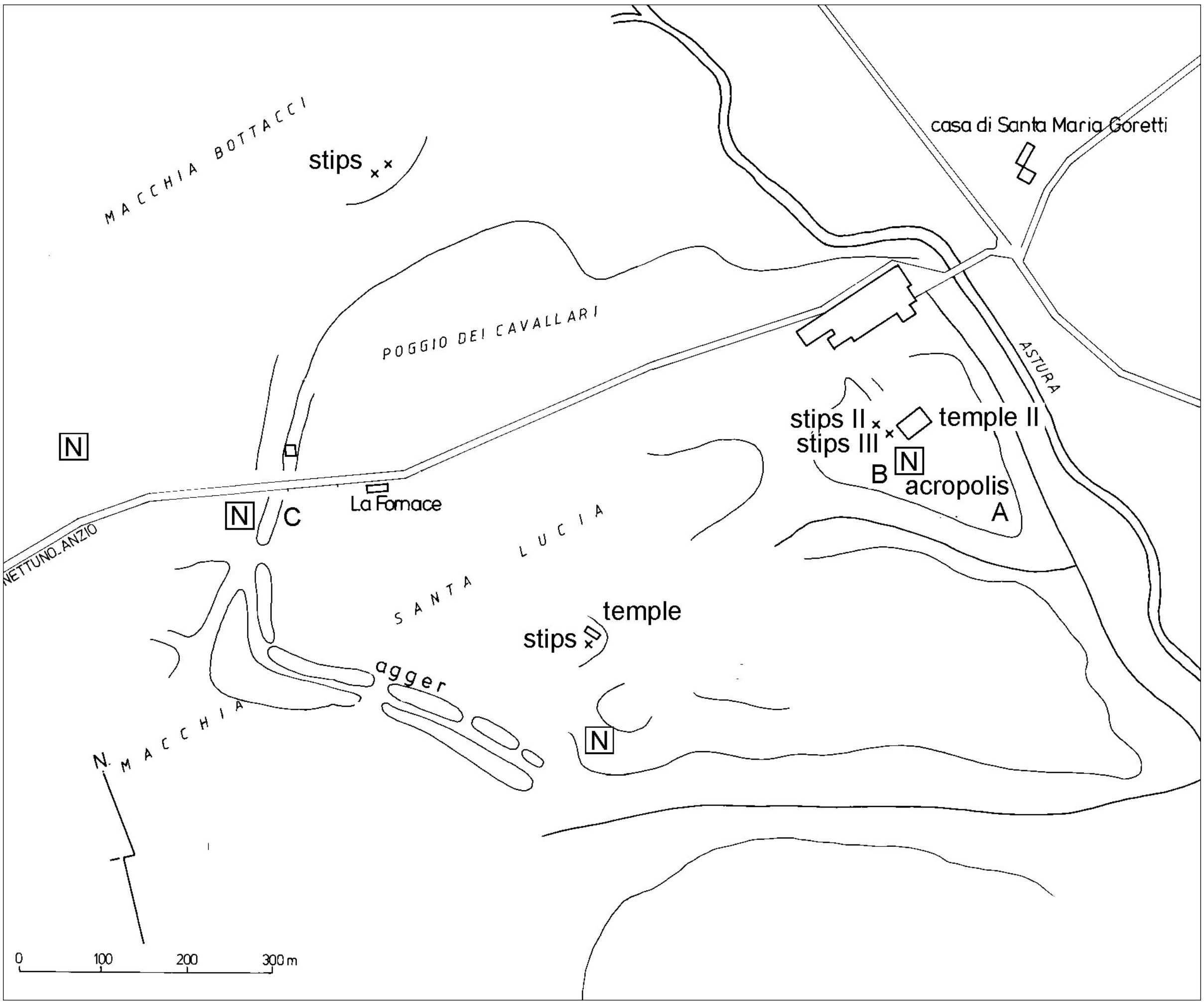

Fig. 19. Map of Satricum; A, B and C indicate the location of the pottery kilns.

[157] Sevink *et alii* 1984, 104.

[158] Making statements about the provenance of pottery by relating local clays with excavated pottery is precarious since similar clays occur elsewhere in *Latium Vetus*. Nevertheless, in view of the presence at *Satricum* of kilns, wasters, suitable clays and identical mineral compositions of both clay deposits/tempering materials and pottery, it must be concluded that local resources were employed for the native pottery production.

After establishing from the kiln remains, the character of the pottery produced at *Satricum* during the late 7th century BC, similar pottery found at the settlement can be investigated. Among this there were many *impasto* sherds from the huts excavated in the last century. Our excavation has yielded for example, sherds of a *holmos* from a destruction layer of a 7th century BC timber building.[159] The fabric of this *holmos* resembles the fabric of the pottery found in the kiln. The quartz and tempering material of the *holmos* is smaller in size but this could be due to the processing of the paste. The similarities in colour, clay matrix and minerals between the pottery from the kiln and the *holmos* make it likely that the stand was produced at the site. Thus, it is probable that in addition to the coarse wares found in the kiln, more advanced products such as the *holmos*, were produced locally.

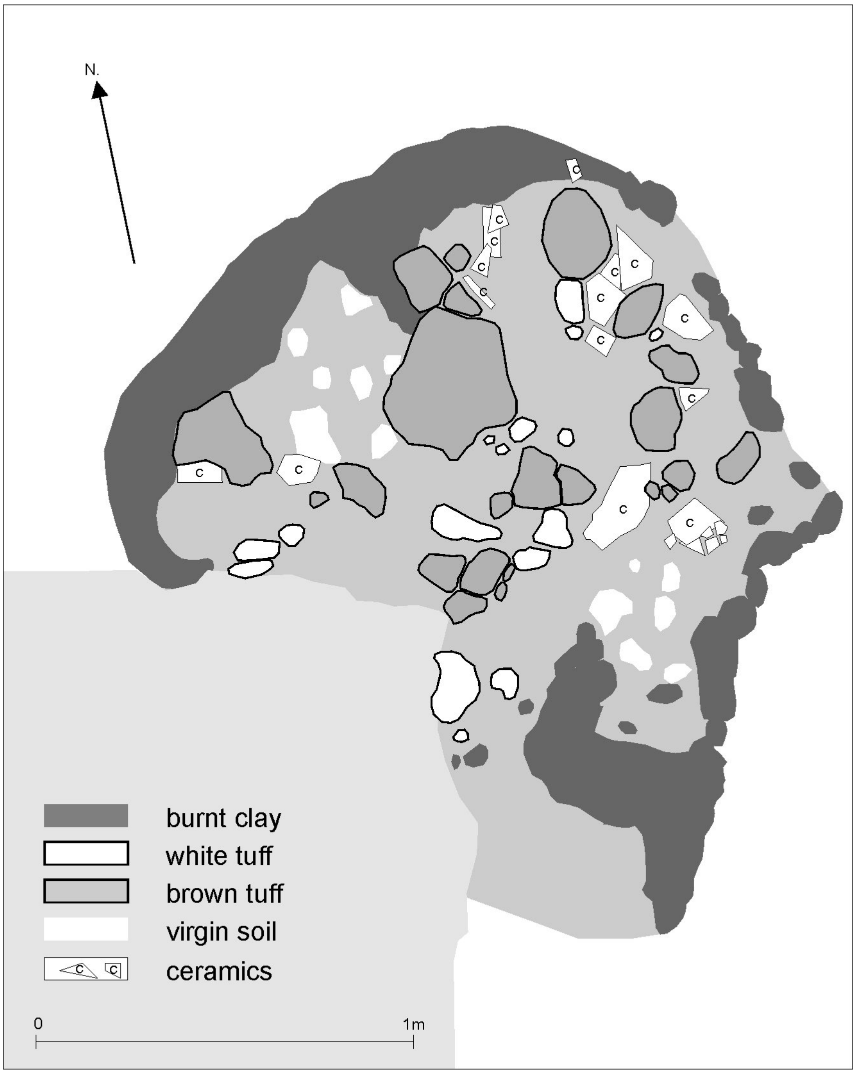

Fig. 20. Plan of kiln A.

There is no evidence for the use of a fast potters' wheel at the site at this stage. The fabrics which can be associated with local production are *impasto* fabrics which are difficult to model on a fast wheel. On account of the primitive kiln construction and the character of the pottery produced, the mode of production at *Satricum* should be interpreted as a household industry. This does not exclude a continuing household production of some of the wares for preparing food. However other ceramics at the site reflect the progressive features of this industry. Beijer has demonstrated that the local pottery was partly made with advanced modelling techniques. The thin walled

[159] Beijer 1991 a.

amphorae, for example, are made of a fine-grained *impasto* on a wheel from the early 7th century BC. The wasters found nearby the kiln were mostly fairly thin and might actually testify the manufacture of fine *impasto* table wares. Vessel types associated with this industry are carefully made *kantharoi, anforiskoi* and bowls. The pottery was decorated and burnished to lustre. It was manufactured both for the local market as well as for exchange with other sites in *Latium Vetus.*[160] Thus, the local ceramic products of the 7th century BC demonstrate an increase in specialisation but infrequently an increase in efficiency which would indicate appropriate workshop conditions.

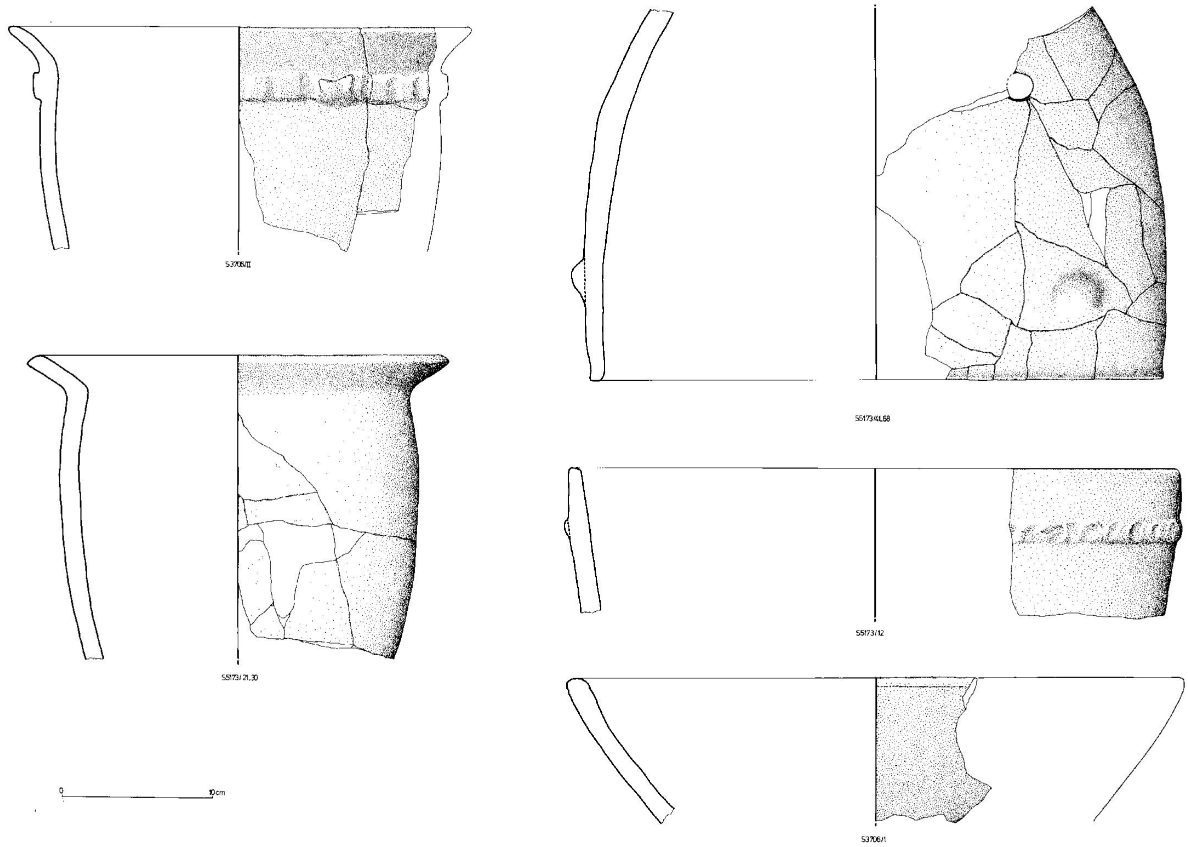

Fig. 21. Satricum, pottery that was found in kiln A.

One topic of the early specialised pottery production at *Satricum* remains to be discussed and that is the attribution by Gran-Aymerich of a *bucchero* workshop to the site (Fig. 10). Local *bucchero* manufacture is supported by the existence of potters who produced fine *impasto* table wares. These wares can be partly correlated to similar *bucchero* vessels at the site, especially the *bucchero amphorae*. Fifteen of these *amphorae*, dated to second half of the 7th century BC, were found in votive deposit I. These *amphorae* were also produced in fine, dark *impasto* and the *impasto amphorae* are well represented in the tombs. These *amphorae* are dated earlier but some are contemporaneous with the *bucchero amphorae* which suggests a transition around 640-630 BC. At *Satricum*, the settlement, necropolis and the cult place were partially excavated which makes it possible to analyse the distribution of the three main wares, that is *impasto*, depurated and *bucchero* wares in these different contexts.[161] The

[160] Beijer 1991 b. Beijer considers that the fine-grained *impasto* is modelled on a *tornio veloce*: Beijer 1991 b, 84. In my opinion this remains a suggestion which requires further analysis. The labour-intensive decoration and surface treatment of these vessels are conflicting with the use of a potters' wheel and workshop conditions.

[161] Bouma *et alii* 1995, Fig. 3, 189.

distribution illustrates that *bucchero* fragments remain an exceptional find in the habitation context (3 %) while it occurs regularly in the tombs and cultplace, respectively 15 % and 34 %. The hypothetical local *bucchero* production would have continued for about a century and amounts to hundreds of vessels but not thousands. If *bucchero* was produced at *Satricum* than it must have been in combination with the production of other wares as suggested by the wasters from the kiln excavated at S. Pietro a Sieve.[162] The production of *bucchero* at the site was a subsidiary activity, not full-time. This pattern is likely to have continued in later periods. During the 5th and 4th century BC, *amphoriskoi* were made of what has been labelled alternatively greyish *bucchero, impasto buccheroide, bucchero malcotta* or imitation *bucchero*.[163] The later *amphoriskoi* are no longer associated with the *impasto* tradition but with the depurated wares.[164] It is, therefore, likely that they were produced locally during the 5th century BC in combination with levigated wares.

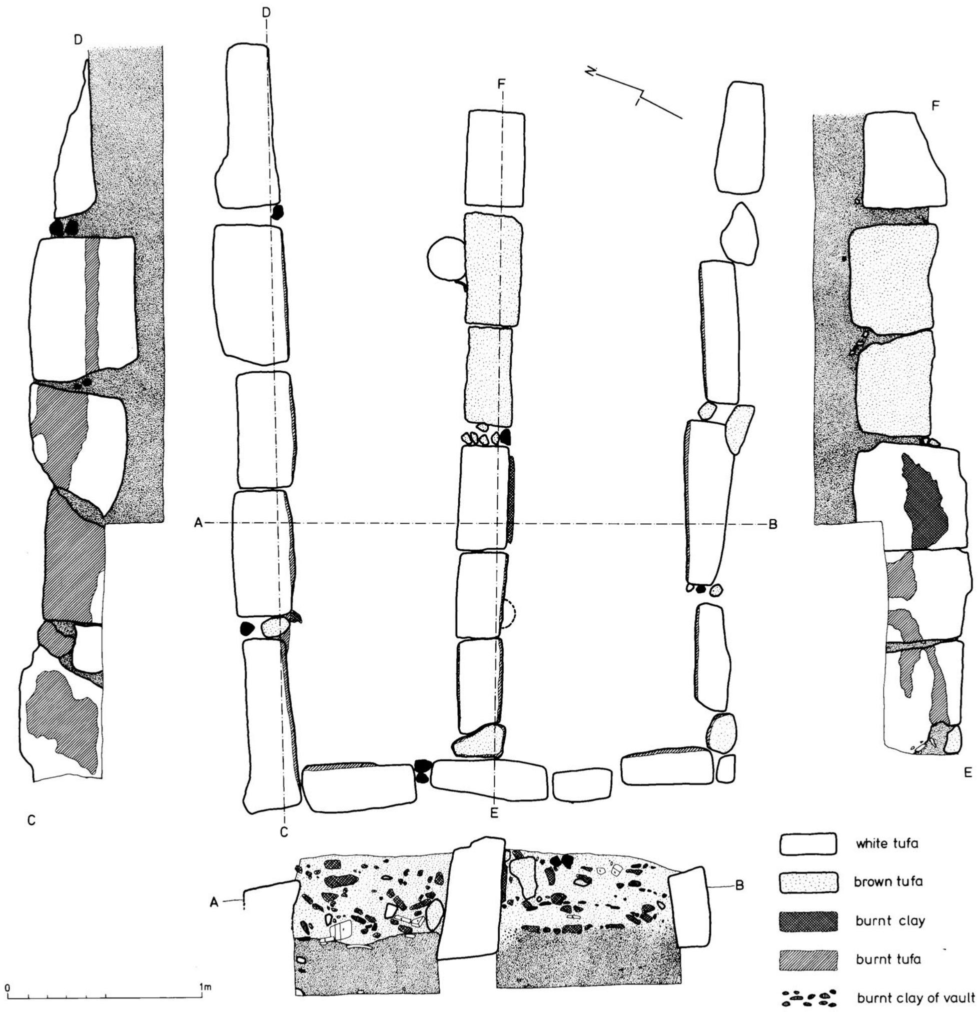

Fig. 22. Satricum, plan and section of kiln B.

[162] See section 2.1.

[163] Bouma 1996, 380-2. Without specification the description *buccheroïde* is insignificant: *cf.* Gran-Aymerich 1993, 27-8.

[164] Refiring experiments in oxidising conditions with *bucchero* from *Satricum* demonstrated that the late 7th, early 6th centuries BC *bucchero* fired into a red fabric containing much quartz. This fabric resembles in physical properties the clay from the marine terraces. '*Bucchero*' from the 5th century BC obtained a pale colour after refiring and a consistency similar to the *figulina* pottery from *Satricum*.

The second kiln at *Satricum* was of a more advanced type, capital B in Figure 19. It has a rectangular shape and dates to the late 6th century BC. The kiln was found along the edge on the south side of the acropolis and is about 3.7 m long, 2.7 m wide and its height was preserved up to 55 cm (Figs. 22 and 23). The combustion chamber with *praefurnium* was preserved. It is classified as kiln type II.[165] Similar kilns of the same date are found in Laurentina-Acqua Acetosa[166] and in Southern Italy[167]. However, none of the kilns of type II are dated before the 6th century BC. The combustion chamber was filled with debris from the kiln structure, pottery and wasters. The blocks of tuff which formed the substructure of the kiln were dug into a layer which contained 7th century BC wares. The remains of the structural features of the kiln were identified as fragments from arches and brick-like material all of which are tempered with organic matter such as grasses. I excavated more than 100 kg of the brick-like material. The bricks were probably used for building the arches and the upper structure of the kiln.

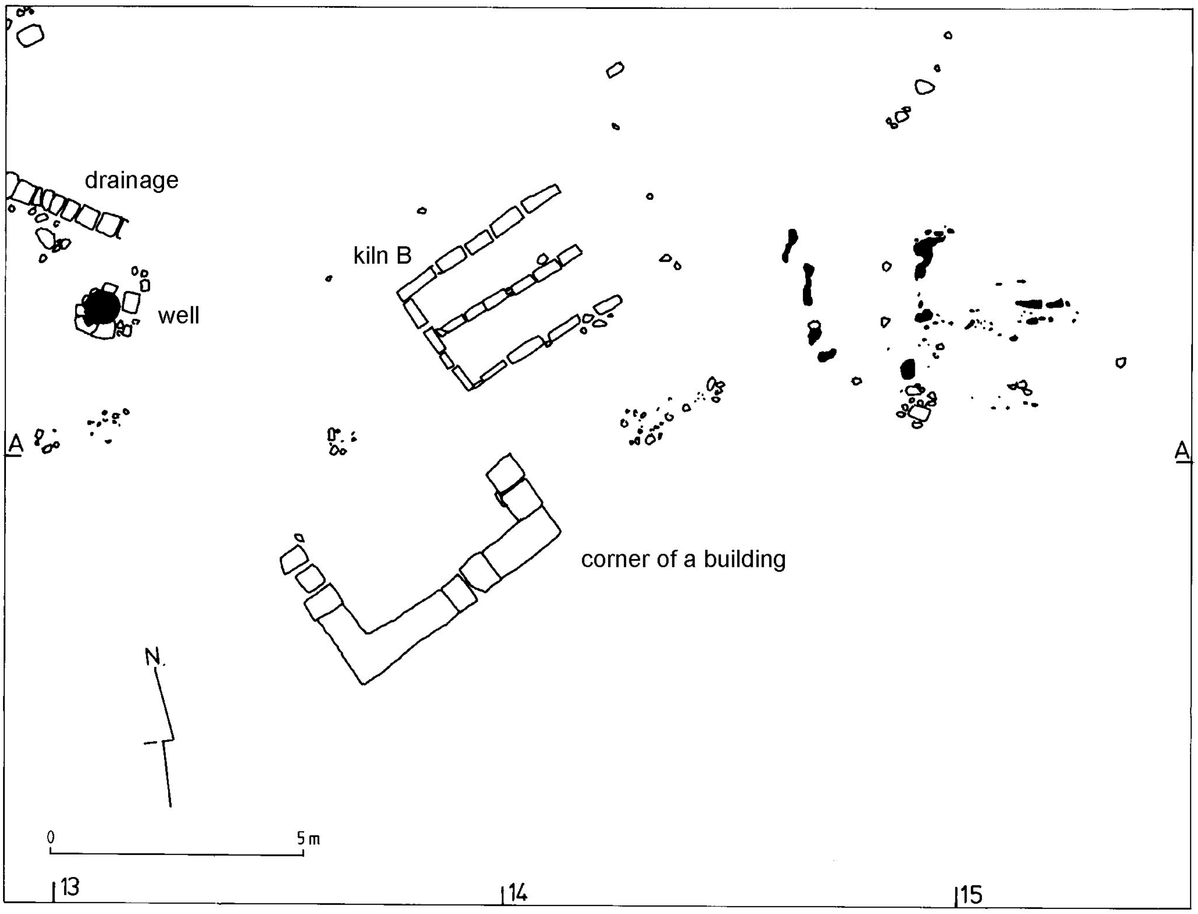

Fig. 23. Satricum, settlement features which can be related to kiln B.

The pottery inside the kiln consisted of wasters of storage jars, plain jars, bowls and *tegulae* (Figs. 24 and 25). The fabrics of the wasters include pale and red firing ceramics. Among the pale Archaic tiles there are several

[165] In the typology of Cuomo di Caprio, the second kiln at Satricum is a kiln type IIc for it has two parallel main corridors and probably arches supporting the raised oven floor: Cuomo di Caprio 1979, 75-80.

[166] Bedini 1981, 254-7; 1990 a, 173. See section 2.6.3.

[167] Cuomo di Caprio 1979, 83-6.

examples decorated with a black oblique stripe (Fig. 25).[168] It was evident from the wasters that both pale and red firing pastes were used in the ceramic industry at *Satricum* during the late 6th century BC. The fabric and mineral-content of the pale Archaic tiles and pottery was similar to the fabric and mineral-content of the temple decoration dated around 500 BC. It is, however, noteworthy that the decorated pale Archaic tiles found in the substructure of the kiln, are not reported for the late Archaic temple.[169] This demonstrates that tiles were produced in this kiln which except for the fabric, cannot be directly related to the construction of the temple.

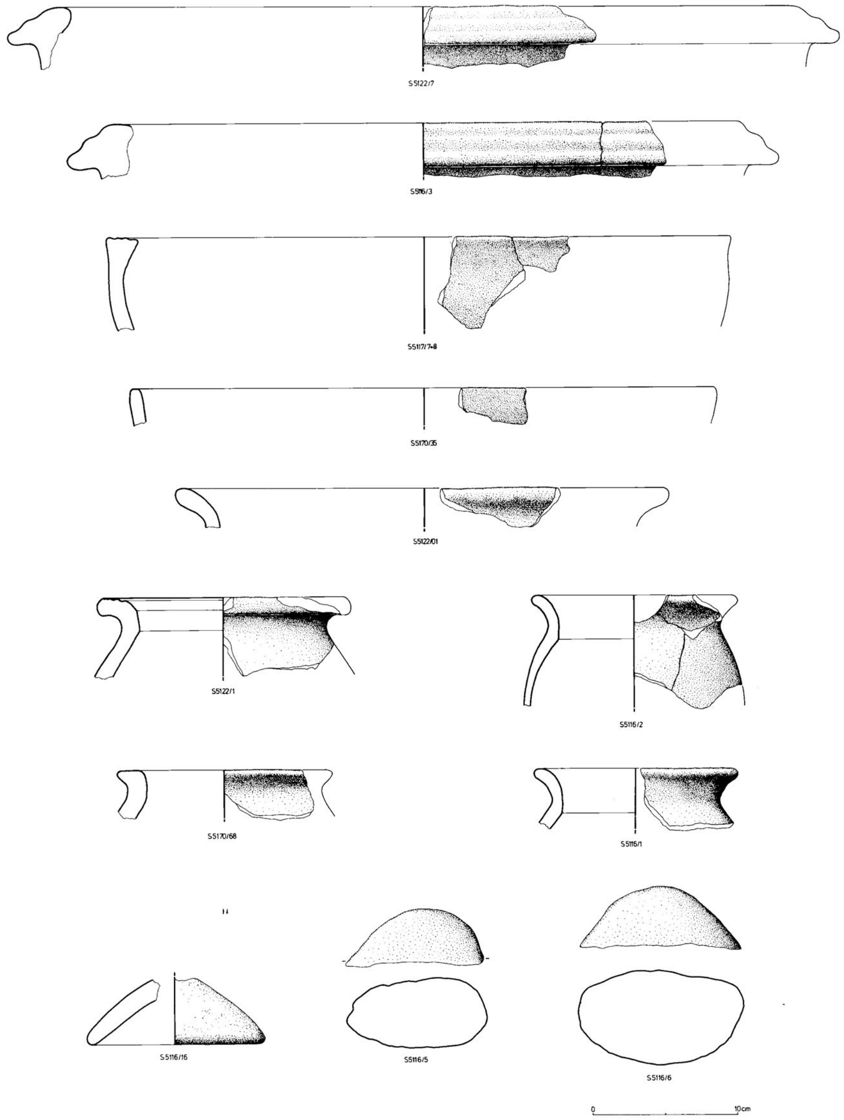

Fig. 24. Satricum, pottery that was found in kiln B.

[168] A parallel though with red lines was found on the *Forum Boarium* in Rome: Gjerstad 1960, fig. 272. The substructure of the second kiln at *Satricum* contained both well-fired *tegulae* and wasters on which the black decoration flows over the surface of the rooftile (Fig. 25).

[169] For a review of 6th century architectural terracottas from the temple see: Knoop 1987.

The paste for moulding the pale Archaic tiles was probably made from a primary clay, a clayey tuffite, which occurs at several places in and around *Satricum*.[170] The associated minerals of the tuffs and clayey tuffites are quartz, biotite, augite, olivine, rock fragments, leucite, volcanic glass and occasionally chert and garnet. These minerals were found to be the same as identified in the thin-sections of the temple decoration.[171] Several clayey tuffites in and around the site were augered. None of these produced a pale colour when fired though a buff fabric was obtained. The missing pale firing clay may be due to deficient prospecting of the clayey deposits around *Satricum* or the pale colour may result from specific processing techniques used in antiquity. Evidence from the clay survey demonstrates that potters who worked at *Satricum*, could and obviously did utilise the various clays and tempers which were locally available. The main sources are the marine terraces and the clayey tuffites. It is concluded that the bulk of the architectural teracottas and pottery excavated at the site, was produced from local clays and temper. The differences noted, for example in the various decoration schemes of the temple, are likely to be due to different processing techniques of the clays, altered firing conditions or to the use of different clay deposits in the area, as the minerals found in the terracottas occur locally. Some scholars ascribe the provenance of the various fabrics of the temple decoration to areas either north of Rome, Campania or the Alban Hills.[172] This view is not supported because local resources are not considered by these authors. It seems highly unlikely that in the 6th century BC the materials used for the terracotta decorations of the temples, were imported from other regions while the tuff blocks used for the construction of the same temples were quarried nearby.[173] Nor does the amount of clay necessary for the building activities at *Satricum* support a distant provenance. Sixteen to seventeen tons of clay were needed for covering the first temple with the required 1,400 tiles.[174] This figure does not include the imbrices nor the architectural decoration of the temple. The architectural terracottas, that is the rooftiles from the *oikoi* and courtyard buildings are not incorporated in this figure. Within 50 years the second temple was constructed at *Satricum* and because of its magnitude would have required substantially more architectural terracottas than temple I. The erection of temple II is correlated with a reconstruction of the acropolis necessitating further output from a workshop.[175] Moreover, the debris in the second kiln from *Satricum* demonstrated that the local workshop did not just produce architectural terracottas but also vessels such as basins, jars and storage jars that were partially made from the same paste as the architectural terracottas. This contradicts the assumption by Torelli who considers that by the late Archaic period, the manufacture of ceramic building materials became distinct from the production of ceramics.[176]

The correlation between the ceramics found in kiln B with pottery from the settlement is weak because there are few sealed deposits that can be dated to the late Archaic period.[177] Therefore a concluding remark about the mode of

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[170] For a geological map of the area around the site see: Maaskant-Kleibrink 1987, 17-22. The deposits of reworked pleistocene tuffs which are indicated on her map VIII on page 18, might have been employed by the potter or coroplast. I refer also to the formations *tq* on the *Carta Geologica del Servizio Geologico d'Italia, 1:100.000, foglio 158, Latina*. These reworked tuffs could unfortunately not be sampled. Arnoldus-Huyzendveld recalls some deposits of whitish clayey tuffites along the Astura: personal communication. These deposits might have been suitable for the production of pale archaic and *figulina* wares. See also section 2.2.

[171] Kars *et alii* 1987, 60; McDonnell and Kars 1990.

[172] Kars *et alii* 1987, 62-3; Knoop 1987, 227-31.

[173] Arnoldus-Huyzendveld 1981; Maaskant-Kleibrink 1987, 19.

[174] Rendelli 1990, 139.

[175] Maaskant-Kleibrink 1992, 108-46.

[176] Torelli 1983.

[177] Sealed archaeological deposits are tombs, votive deposits and layers within a stratigraphy. There are no tombs from the archaic period as there are hardly any tombs from this period anywhere in *Latium Vetus*. The *impasto* pottery from the oldest votive deposit which is dated from the 8th to the 6th centuries BC has been hardly published while deposit II dates from the beginning of the 5th to the late 3rd centuries BC. The late Archaic settlement neither retained much pottery because the foundation walls of the 6th century BC buildings were covered with a thin

production during the 6th century BC must remain general. The amount of building activity at *Satricum* during the second half of the 6th century BC would have enhanced craft specialisation by increasing the demand for architectural terracottas. Tiles for covering various small buildings, the *oikoi* and *sacellum*, were made at the site from around 600 BC. The fabric of the red tiles is similar to the fabric of the coarser *impasto* vessels at the site and are, therefore, correlated to the local pottery industry.[178] Starting from the advanced household industry formulated for the 7th century BC, this industry continued during much of the 6th century BC though the range of *impasto* pottery types was significantly smaller and there was less variation than in the previous period.[179] The ceramic vessels are of simple shape and hold significant amounts of non-plastics. They were modelled on a turntable or wheel though not on a fast wheel for the paste contained many non-plastics and was, therefore, unsuitable for an accelerated rotation. Increased efficiency of the pottery production prevented the manufacture of the labour intensive vessels which were recorded in the previous century. The limited repertoire of the *impasto* from the 6th century BC, mainly jars, storage jars, bowls and *teglie*, is transcribed to pale Archaic wares.[180] This characteristic indicates the affinity between the modes of production for both wares. On account of the confined range of the ceramic repertoire and the correlated standardisation of the vessels produced, it is likely that simple household production ceased. The increase in specialisation of the pottery craft at *Satricum* is associated with the manufacture of ceramic building materials and materialised in the construction of kiln B and its associated buildings.

The presence at the site of a semi-permanent workshop commissioned to decorate Temple I, is probable because so far, the fabric of the architectural terracotas ascribed to this temple, are not attested for other ceramic artefacts in the settlement.[181] This fabric appears to have been used merely for the construction of Temple I which implies the involvement of a semi-permanent workshop. The craftsmen associated with this workshop, would have functioned within a workshop context and remained at the site for a considerable time.[182] It is likely that during their stay at the settlement, there was some exchange of knowledge with the local potters in terms of kiln constructions, raw materials, firing conditions and modelling techniques. These local craftsmen could have applied this information to the manufacture of terracottas and rooftiles needed for the other buildings on the acropolis which were constructed during the second half of the 6th century BC.[183] It is remarkable that after the construction of temple I, the rooftiles at *Satricum* were frequently made of a pale *impasto*.[184] In addition, I consider that a non-resident artisan was involved in the construction of kiln B because the fabric of the furnace lining is specific and is not attested for other ceramics at the site. The paste of this lining was deliberately tempered with organics of about

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layer of earth, most of it disturbed. As yet one of the few deposits of the late 6th century BC is the combustion chamber of Kiln B which was dug into a 7th century BC context.

[178] A similar account is given by Wikander who points to the close relation between the production of plain tiles and pottery: Wikander, Ö., 1993 a, 137-9.

[179] For a report on the archaic pottery see: Maaskant-Kleibrink 1987, 114-7. At Rome the increase in coarse wares during the 6th century BC has been reported by Carafa. The range of coarse wares is limited and is restricted to jars, bowls, lids, basins and a few plates: Carafa 1995, 126-225.

[180] See for example, Carafa for a comparison between the 6th century BC pottery that was made in coarse wares and the *impasto chiaro sabbioso*: Carafa 1995. For *Satricum* I refer to: Maaskant-Kleibrink 1987, 114-9.

[181] I refer to Knoop for a fabric description of the terracottas of Temple I: Knoop 1987, 227-31.

[182] I refer to Rendelli for a calculation of the ceramics that were required for the construction of Temple I: Rendelli 1990, 139. The experiment at Isthmia, Greece, provides an illustration of the commission at hand: see section 2.5.

[183] Another option would be that some of the craftsmen that were associated with the semi-permanent workshop, remained at *Satricum* in order to construct the other buildings.

[184] Maaskant-Kleibrink 1987, 117-9.

0.5 to 1 cm length, in order to obtain a porosity which insures an appropriate thermal shock resistence and insulation characteristics.[185]

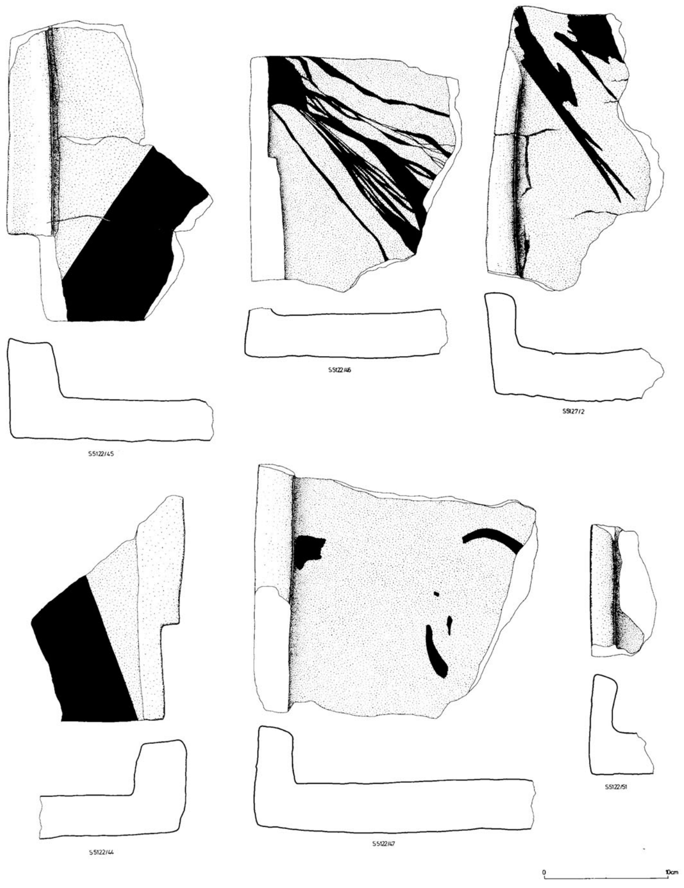

Fig. 25. Satricum, pale archaic decorated tiles that were retrieved from kiln B.

Temple II at *Satricum* was constructed around 500 BC probably also with the assistence of an itinerant workshop.[186] However the paste for the terracottas of this temple has been employed at the site for the manufacture of a range of other ceramic artefacts notably *dolia* and *teglie*. From the content of the combustion chamber of the second kiln it is deduced that in addition to the pale Archaic wares, red-firing ceramics were made.[187] It appears that a distinction between semi-permanent and resident conditions becomes extremely ambiguous in relation to kiln B. The workshop associated with this kiln, produced a wide variety of ceramics. The kiln itself reflects proper workshop conditions while the wasters of the pale Archaic tiles are related only by their fabric to the temple terracottas and not in decoration. Workshop conditions are further indicated by the permanent character of the surviving associated structures. The corner of a building is at exactly 90° to the kiln and a well and drainage system were excavated nearby (Fig. 23). The market for the products of this ceramic workshop was chiefly local and the

[185] See section 2.3.

[186] Lulof 1996, 204-8.

[187] Maaskant-Kleibrink notices that type II of the *tegulae* is frequently made of a light *impasto* but that red *impasto* tiles occur as well during the second half of the 6th century BC: Maaskant-Kleibrink 1987, 117. Wikander even suggests for Acquarossa, the existence of a roof with rows of white *imbrices* contrasting with red *tegulae*: Wikander, Ö., 1993 a, 154.

demand was primarily dictated by the building activities at *Satricum*.[188]

The third production site at the settlement was located about one kilometre to the west of the acropolis, near the *agger* and to the south of the road to Nettuno, capital C on Figure 19. The actual kiln was excavated during the last century and contained votive terracottas dated to the 4th century BC. These votives include a head, an *uterus* and a foot (Fig. 26).[189] A mould for forming a foot was discovered as well. Two areas with concentrations of kiln material were recently surveyed which indicates that there could have been at least two kilns at this location. The pottery and blocks of tuff found during the survey, suggest that this area was inhabited. The survey material included substantial fragments of a raised oven floor which shows that at least one of the kilns was massive and that the kiln had separate combustion and firing chambers. The survey also yielded wasters of tiles, imbrices and other pottery of the 5th and 4th centuries BC. Therefore this workshop was involved in the production of votive terracottas as well as domestic pottery and rooftiles. Thin-sections of the ceramics found in this area, contain a variety of minerals which occur locally. The clay matrix of ceramics from the pottery corresponds with the clay of the marine terraces, a deposit of which was identified adjacent to the kilns.[190] The workshop was situated next to a suitable clay deposit as well as along a major road. This location would have facilitated exchange especially with devotees who arrived at the site to participate in the religuous rituals.

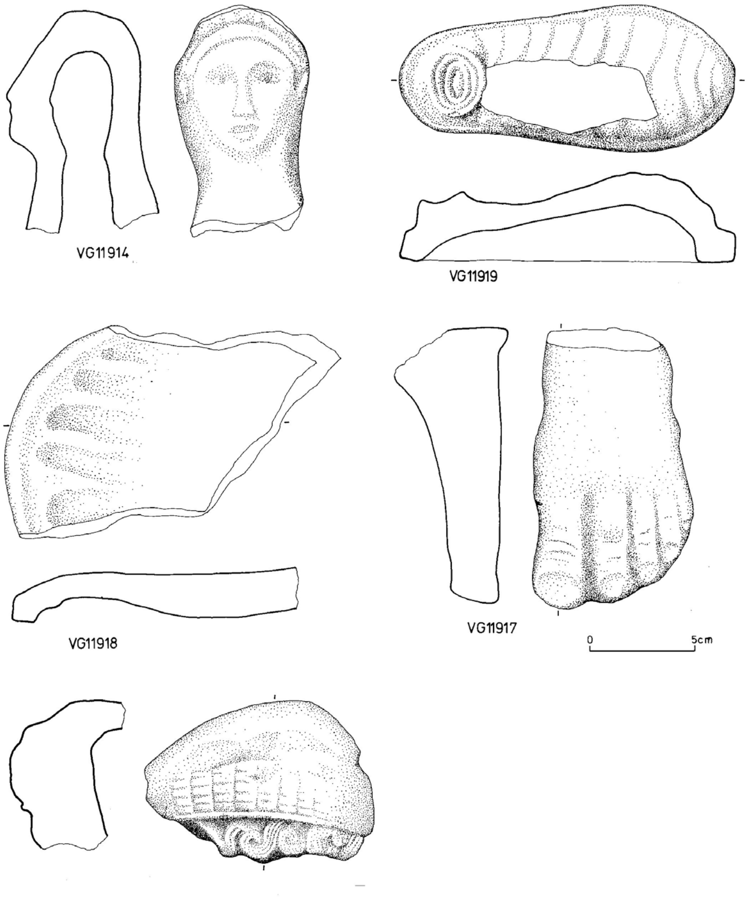

Fig. 26. Satricum, mould and votive terracottas that were found in and near kiln C.

[188] The various structures at the site as well as the restructuring of the buildings on the temple hill at *Satricum* around 500 BC is described by: Maaskant-Kleibrink 1992, 108-46.

[189] Della Seta 1918, 320; Castagnoli 1963, 515; Bouma 1996, 418.

[190] For a detailed report on this location and the survey see: Nijboer *et alii* 1995.

The artefacts found during the survey constitute so far the only published evidence for domestic houses and pottery production during the post-Archaic period.[191] No buildings on the plateaux are excavated which can be positively dated to this period while the existence of necropoleis on two of the plateaux does not make extensive habitation likely. Nevertheless, the pottery production can be correlated with the two small necropoleis dated to this period, the large votive deposit II on the temple hill and two other votive deposits at the site. The close relationship between the area surveyed and votive deposit II is substantiated by the similarities amongst the pottery in ordinary wares from both contexts. The resemblance is displayed both in morphology, that is vessels and types as well as in technology, which is shown by colour, texture and surface treatment.[192] On account of the contextual and stratigraphical evidence from deposit II and parallels from other sites in central Italy, most of the ordinary ware in the surveyed area can be dated to the late 5th and 4th centuries BC with a limited number of items dating to the full 5th century BC. From the contents of votive deposit II it was calculated that the demand for pottery by those who offered at the sanctuary, was significant. The workshop could have produced 300 to 400 ceramic artefacts a year over a period of almost two centuries, just to supply the pilgrims with the pottery needed for their ceramic offerings. The standardisation obtained and the fabrics of the jars offered which included depurated wares and *figulina* modelled on a potters' wheel, do not indicate household industry but workshop conditions.[193] The plain vessels predominate during this period and their execution does not imply a high degree of specialisation. The repertoire of the workshop was directed towards productivity and commodities with practical value. During the 6th and 5th centuries BC, production had been increased at the expense of labour intensive decoration techniques and surface treatments. The potters who lived here, made and exchanged pottery and votive offerings for pilgrims as well as ceramics required for the households at *Satricum* and for the funeral rites. Its location would have facilitated exchange which was probably conducted at the workshop. As such the potters were of importance for the continuity of activities at the site. It is not possible to decide whether they were full-time employed or combined the production of pottery with agriculture.[194] A part-time occupation appears likely because the traces of the settlement pattern are dispersed and scarce for the 5th and 4th centuries BC.[195] The limited size of the settlement does not reflect urban conditions and this makes it unlikely that there was more than one workshop. This workshop produced a range of fabrics and wares while employing various modelling techniques.

The evidence for the ceramic industry at *Satricum* has presented three production sites which indicates continuity but each reflects different circumstances.[196] The interpretation of these circumstances remains occasionally ambiguous because the site did not develop progressively into an urban centre. The pottery production of the 7th to the late 6th centuries BC is difficult to classify as either household industry or workshop activity. It has characteristics which can accomodate the definitions of both modes of production presented at the beginning of this chapter. The economic development of the settlement is truncated. During the 7th century BC goods from all over the Mediterranean changed hands at *Satricum* in what can be described as a centre of trade. This created an intensification of the pottery craft since fine *impasto* vessels and possibly even *bucchero* started to be produced locally. However at this stage the production was labour intensive and not related to the efficiency characteristic of

[191] In recent years the Department of Archaeology of the University of Amsterdam has excavated settlement traces on and around the acropolis of *Satricum* but these data have not yet been published.

[192] Nijboer *et alii* 1995, 10-4.

[193] Bouma provides a detailed description of wares and typology of the ceramics in votive deposit II: Bouma 1996, 305-419.

[194] Seasons which are less used for agricultural work are the most suitable for pottery production: *cf.* Arafat and Morgan 1989, 315, 328.

[195] I refer to Bouma and Kleibrink for a reconstruction of the site during the 5th and later centuries: Bouma 1996; Kleibrink 1997. See also section 1.7.

[196] An analysis of the local ceramic industry is based on the certainty that at least 90% of all the ceramics which were excavated, are locally produced from resources nearby: *cf.* Bouma *et alii* 1995, 189-92.

the workshop mode of production. During the 6th and 5th centuries BC, the economy of *Satricum* was reduced from interregional/regional to local importance. In this period, the pottery production received two important impulses which increased demand. Workshop conditions were established by the building activities and later the production of votive offerings. In addition, coroplast masters, possibly accompanied by some assistants, were requested for the construction of the 6th century temples. They were probably responsible for the execution and design of the temple. It does not seem plausible that the whole workforce needed for constructing the temples and other buildings at *Satricum* travelled from place to place. Most of the labour must have been executed by local workforce probably assisted and instructed by coroplast masters for decorating the temples. *Satricum* had lost much of its significance as a regional centre by the 5th century BC. The archaeological evidence so far available, suggest that its *raison d'être* in the following period revolved around the religious institutions. The activities around the sanctuaries generated the conditions for continuing workshop conditions. However the quality of the output became increasingly basic and this must have contributed to the marginalisation of the potters' craft at the site.

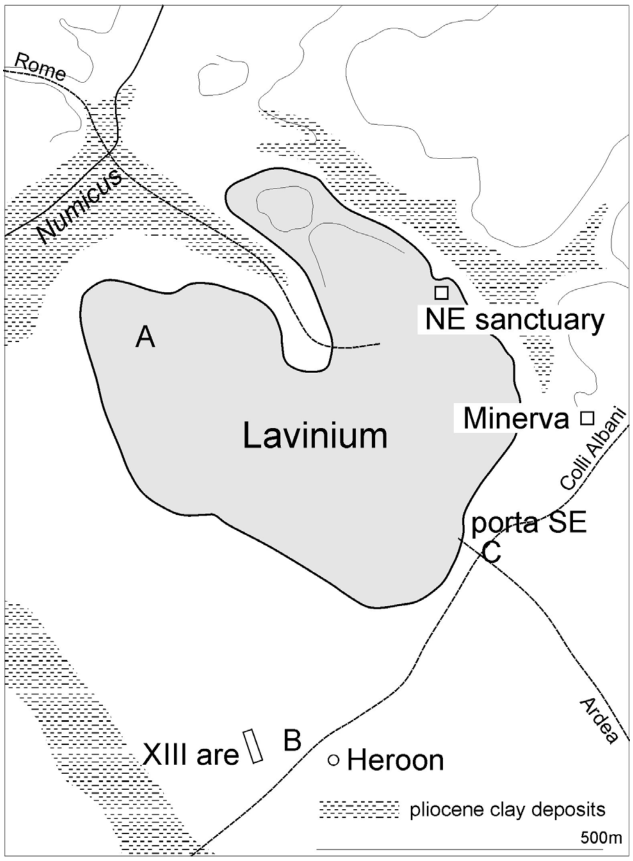

Fig. 27. Map of Lavinium; A, B and C indicate the position of the pottery kilns.

2.6.2 *Lavinium*

Lavinium is located about 30 km south of Rome on a vast plateau, 80 to 90 m above sea level and about 4 km from the Tyrrhenean coast. The town was separated from the coastal dunes by marshy lowland and had a good natural harbour at the mouth of the *Fossa di Pratica* known in antiquity as the *Numicus*.[197] In this study Lavinium is the second example of a settlement where a continuity in pottery production can be demonstrated by the kilns and

[197] Guaitoli 1990, 182; Sommella 1974, 291-2.

related structures.[198] All in all six kilns were excavated at the site. They date from the 8th to the 3rd centuries BC (Fig. 27). The four kilns discovered in the urban area and indicated by the capital A in Figure 27, are discussed first. These kilns and the associated structures are illustrated in Figure 28.[199] The excavators suggest that the oldest kiln of this complex is dated to the 8th century BC and does not yet have a separation of firing and combustion chamber. The pottery is fired in direct contact with the flames. It was dug into the soil and stratigraphically situated under the huts. The kiln was circular in shape and the furnace lining contained much organic material.[200] The pottery and bone material associated with this feature, cannot be related to firing of pottery because it occurs in or near the kiln due to the collapse of the layers which were originally on top of it.[201] The majority of the pottery was thus dated to the 7th while some sherds could be dated to the 8th century BC. The presence of local earthenware with clear colours suggests that during the 8th and 7th centuries BC more advanced kilns were built at Lavinium. According to Fenelli, most of the kilns at Lavinium accumulated material from later periods and thus are difficult to date precisely. The kiln which is dated to the 4th century BC in Figure 28, is associated with some wasters, furnace lining and a considerable quantity of pottery which can be dated to the 5th and 4th centuries BC. This material is homogenous in fabric and is characterised as coarse *impasto* modelled on a turntable or wheel. It included household vessels such as lids, plates and jars.[202] The two kilns dated to the 3rd century BC might to some extent have been employed for firing votive objects.[203] Except for coarse *impasto* wares, it is hard to relate the pottery kilns from this section of the town to a range of ceramic artefacts which were actually fired here. Wasters and related ceramics have not been reported.

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198 The separate kilns and structures are reported in various articles: Fenelli 1984, 341-4; *Enea* 1981, 170; Giuliani and Somella 1977, 370.

199 Figure 28 is based on Fenellis' 1984 article. She presented this section of the ancient town in an illustration which included numerous dams of the excavation grid. For clarity, our draughtsman Huib Waterbolk and I made a reconstruction drawing without indications of the excavation grid. We present walls as a singular feature which were previously bisected by dams in Fenellis' illustration. This reconstruction is presented in Figure 28.

200 Fig. 27 is based on Fig. 15 in the 1984 article by Fenelli. She presents the contours of the 8th century kiln as a keyhole type, that is kiln type I in the typology by Cuomo di Caprio: see section 2.5. Moreover, this kiln was plastered with furnace lining. A rudimentary kiln as suggested by the excavator is less likely to have the shape of kiln type I nor to have been plastered. Since details on the context of this kiln and its excavation have not been published it remains ambivalent whether this kiln is as primitive as suggested by the author.

201 Prof. dr. M. Guaitoli and dr. M. Fenelli were so kind to allow me to look at the material which is associated with the kilns and other structures, in March 1995.

202 Fenelli 1984, 342. About 12 boxes were inspected which were labelled *Settore S101 III, Svuotamente della fornace allargamento dell'elemente circolare sotto le tegole*. The majority of the boxes contained jars, lids and plates. It was characterized as *impasto grezzo tornito*. The jars had an outcurving rim and a strongly profiled, overhanging and undercut lip.

203 Fenelli 1984, 343.

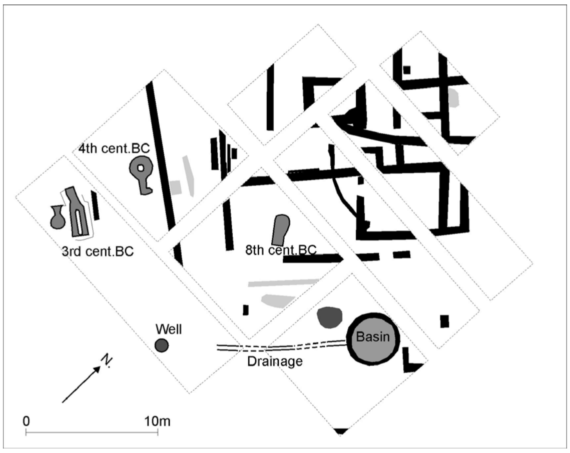

Fig. 28. Lavinium, pottery kilns and associated structures within the urban area.

The reconstruction drawing in Figure 28 makes it possible to associate these kilns with actual workshops remains. The well, water supply and basin have the same orientation as the walls and, therefore, may have been built simultaneously. Moreover, all kilns in Figure 28 have a similar alignment and are related to the direction of the building. The ground plan of the workshop structures in the urban section can be compared with the layout of the workshop remains near the XIII altars, just outside the town (Fig. 29). These are dated to the Archaic period and, in my opinion, the structural remains of the workshop inside the town should be dated accordingly.[204]

The well, water supply and basin in Figure 28 were excavated in the vicinity of kilns and are constructed for preparing clays. The basin which had a diameter of about 4m and which was approximately 1m deep was supplied by water through the well and drainage system. The material associated with the basin included some buff-coloured powdery, unfired clay which contained many coarse inclusions. I, therefore, agree with Fenelli that the basin was used for the levigation of clay which caused the coarse inclusions to settle first. The cistern was no longer in use by the mid 3rd century BC.[205]

[204] Fenelli presents the archaeological features as individual contexts without making structural correlations. Therefore she is much less specific about continuation of industrial activities in this section of the town and does not mention the possible existence of an Archaic workshop: Fenelli 1984.

[205] Fenelli 1984, 343.

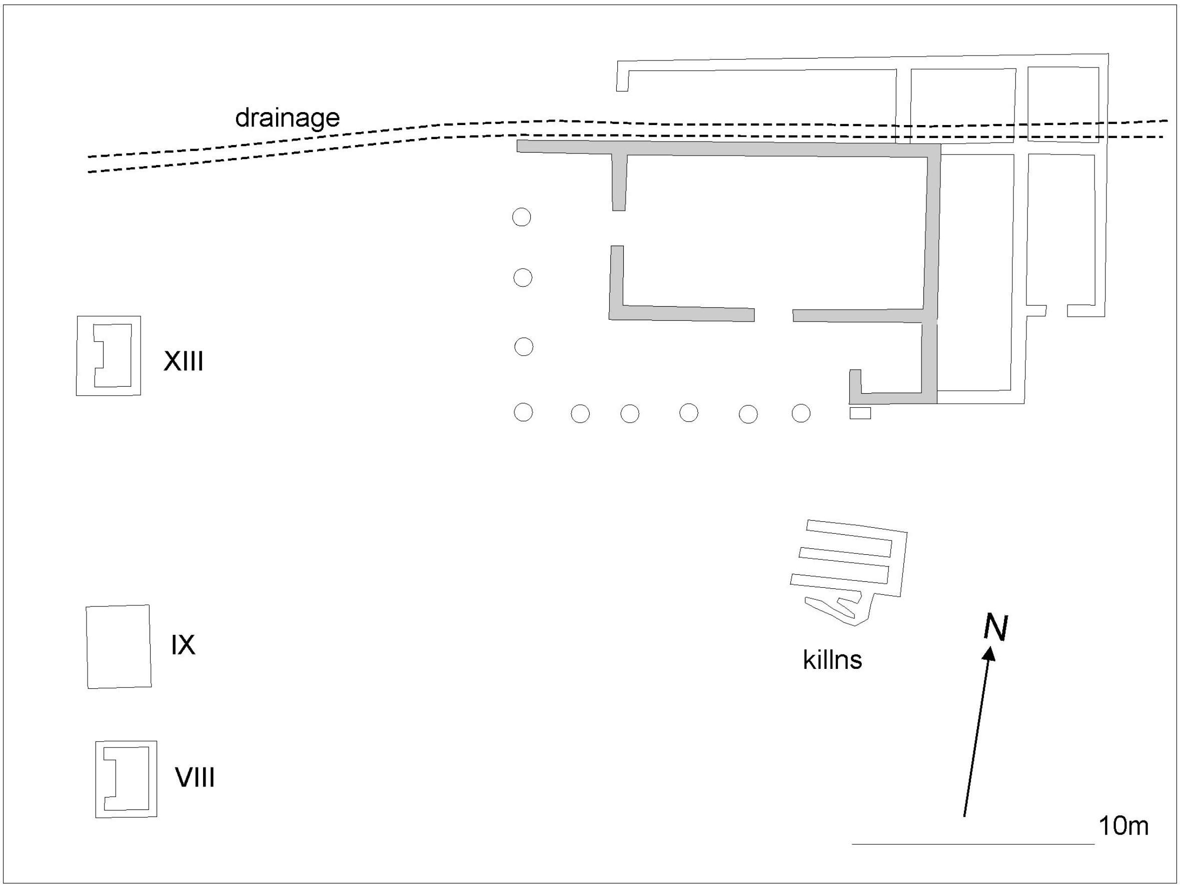

Fig. 29. Lavinium, pottery kilns and buildings near the XIII altars.

The kiln indicated by the letter B in Figure 27, is bisected by the city wall. It is reported that it contained pottery dated to the first half of the 6th century BC.[206] This kiln was probably in use during the late 7th, early 6th centuries BC because it was dismantled during the erection of the fortifications. Further details of this kiln are not reported.

The last kiln complex of Lavinium to be presented here, is a double kiln which was excavated next to the XIII altars and an associated building (Fig. 29). Two construction phases were identified. The first phase dated around the middle of the 6th century BC, consists of a central room of 16 by 8 m and is indicated in dark grey in Figure 29. This building was probably used as living quarters but also as a store for votive objects and domestic pottery since a large quantity of *bucchero* and *impasto* vessels was found. More than 200 loom weights were excavated which might have had a more practical function other than as votive offerings. During the second phase, several chambers were added to the building. The complex was destroyed by fire around the middle of the 5th century BC.[207] The extension of the Archaic building has been related to the pottery workshop which is attested by the kilns. The elongated rooms and the various independent entrances suggests they functioned as storerooms.[208] The portico structure reflects the open areas which are a common feature of workshops in antiquity.[209] The large quantity of

[206] Giuliani and Sommella 1977, 370. Fig. 9 in their article presents a plan of the remains of the kiln, the fortification wall and the SE gate.

[207] Sommella 1974, 278.

[208] Giuliani and Sommella 1977, 362.

household vessels which have been discovered near the building, indicates a secular purpose. This may be associated with the kilns and the workshop activities. However the identification of the building cannot be determined unequivocally because the nearby altars imply a religious connotation.[210]

The demand for ceramics at Lavinium was affected by the increase in the number of households through settlement nucleation during the 8th century BC and by the formation of an urban centre during the 6th century BC. In the late 7th and early 6th centuries BC the huts were replaced by buildings with stone foundations and tiles.[211] Originally the tiles were made of a red firing fabric but during the second half of the 6th century BC they became slightly larger, moulded from a pale firing paste and decorated with red or brown stripes similar to the tiles fired in kiln B at *Satricum*. Besides being used for covering roof-constructions, tiles were used for pavements during the Archaic period.[212] The buildings that have so far been excavated in the urban layout of Lavinium, are secular. They are either associated with production activities and located in the northern section of the urban area or with public functions and established in the central area. Unfortunately they are preserved fragmentarily which makes it almost impossible to hypothesise on the early building phases. During the 6th century BC Lavinium prospered to judge by the construction works.[213] The urban area was furnished with tuff fortifications, gates, public buildings while several facilities such as wells, reservoirs and drainage systems, controlled the waterworks of the town. This was the period in which the many sanctuaries of Lavinium thrived. The urban centre became gradually less inhabited from the late 4th to the 3rd centuries BC. The decline of the urban centre during the 3rd century BC is marked by a contraction of the occupied area, the desertion of the workshop locations and the neglect of the extraurban sanctuaries.[214]

The demand for pottery increased both by the religious offerings and by the construction activities which required substantial amounts of ceramic building materials. Lavinium was known to the Romans as *civitas religiosa* on account of its many religious institutions. According to tradition some of their most venerated cults such as Vesta and the Penates, originated in Lavinium. It was also home to the Aeneas legend. Two sanctuaries are connected to this legend: the Heroon with the XIII altars and the sanctuary near the mouth of the *Numicus* where Aeneas came ashore.[215] At Lavinium, cult activities are reported from about 650 BC at the north-east sanctuary and a few decades later at the Minerva sanctuary. At the first sanctuary, 30,000 miniature vessels were deposited which date from the second half of the 7th to the beginning of the 6th centuries BC.[216] Deposition of offerings at the sanctuary of the XIII altars starts around 570-560 BC. The bulk of the ceramics offered at the sanctuaries, was domestic. Vessels such as jars, lids, storage jars and *teglie* were excavated in large quantities. The pale coloured vessels produced from

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[209] *cf.* Zimmer 1990, 180-1; section 2.6.6. See also Fig. 9 in this study which presents some workshops in Antiquity, one of which has a portico.

[210] Damgaard Andersen 1993, 77.

[211] Guaitoli 1990, 185.

[212] Fenelli 1984, 337.

[213] Sommella 1974, 284; Fenelli and Guaitoli 1990.

[214] Fenelli 1984, 344. The urban decline was a slow process which can be related to the wars between Rome and the Latin League, a loss of political power and a change of commercial routes which became redirected by the development of the ports of Pozzuoli and Ostia as well as by the construction of the Via Appia.

[215] For a recent review of the various cult activities that are reported at Lavinium, I refer to: Bouma 1996 Volume III, 46-53, Appendix A, 158. The sanctuary at the mouth of the *Numicus* dates back to the first half of the 5th century BC. It continues until the 3rd century BC and is identified as the sanctuary of *Sol Indiges*. The actual shrine may have been at the centre of a large quadrangular precinct with sides of 110 m each.

[216] Guaitoli 1990, 184. Fenelli mentions 17,000 miniature vessels: Fenelli 1984, 331.

levigated clay, were introduced during the late 6th, early 5th centuries BC. As in *Satricum* the introduction of depurated clays in significant quantities can be associated with the local employment of the potters' wheel. During the 5th century BC a local coroplast workshop was established which made terracotta sculpture from nearly life size and above. The excavated kilns cannot be directly related to this workshop that was primarily active during the 4th century BC. It produced the terracotta votive statues that were dedicated at the XIII altars and at the sanctuary of Minerva. The votive deposit near the sanctuary of Minerva for example, contained over one hundred of these statues.

It is probable that terracottas, tiles, cooking jars, lids and other kitchen and table wares were produced *en masse* in Lavinium during the period late 7th to 4th centuries BC. Three fabrics can be distinguished:
- coarse *impasto* or *impasto grezzo* as jars, bowls, lids, *teglie*, storage jars and cups,
- pale *impasto* or *impasto chiaro* as *teglie*, jugs and bowls and
- depurated clay as jugs, bowls, plates and craters.

It seems likely that the workshops which made artefacts of pale *impasto* made both tiles and some vessels such as *teglie* and eventually even votive objects.[217] The *Silva Laurentina* could have provided the wood for firing while one of the clay sources for the potters was probably the pliocene deposits of clay around the urban area (Fig. 27). This deposit is remarkable pure and plastic and belongs to the better clays of *Latium*.[218]

The inspection of the ceramics associated with the kilns, did not result in a more precise determination of the wares produced at Lavinium. Furnace lining and some wasters were identified but these did not assist a more detailed reconstruction of the local ceramic industry. A definite publication of the Lavinium excavations could establish which wares and vessels are present at the site in substantial quantities. Among these are definitely the coarse wares and some depurated fabrics. For example, workshop conditions are implied for the 5th century BC by the volume and standardisation in fabric and in vessel types of the coarse *impasto* made on a turntable or slow wheel. The demand for these ceramics was affected by the increase in the number of households from the 8th to the 5th centuries BC, the need for rooftiles and architectural terracottas as well as by the numerous offerings at the sanctuaries from the 7th to the 3rd centuries BC.

For the the reasons mentioned above, both the kiln remains and the increase in demand for ceramics imply the existence of more than one workshops in or near the urban centre at a given time. During the late 6th, early 5th centuries BC there was probably a workshop at the XIII altars as well as one in the NE section of the urban area. As mentioned for *Satricum*, these workshops were mainly involved in the production of functional *impasto* wares. *Figulina* indicates the use of a fast wheel and started to be produced from the late 6th century BC. The establishment of a local coroplast workshop during the 5th century BC demonstrates a higher degree of specialisation during this period than could be established for *Satricum*.

2.6.3 *Laurentina-Acqua Acetosa*

This site is located on the outskirts of present Rome on the Via Laurentina near Tor de Cenci. It is well known for its cemetery which dates back to the early 8th century BC, has its *floruit* during the 7th century and lasts into the 5th century BC which is demonstrated by a number of tombs from the late 6th and 5th centuries BC. So far, 175 tombs were recovered while others remain to be excavated. The few tombs from the late 6th century BC are noteworthy considering the absence of tombs from this century at other settlements in *Latium Vetus*.[219] There is also some habitation evidence from the site (Fig. 30). Laurentina-Acqua Acetosa is important for this study because it presents

[217] Fenelli 1984, 342.

[218] Fenelli 1984, 343. Arnoldus-Huyzendveld notes that this deposit is calcareous and that a similar formation occurs along the coast at Nettuno: personal communication.

[219] For a general description of the tombs, I refer to: Holloway 1994, 120-2. Detailed reports are given by: Bedini 1983; 1990 b.

early evidence for the nucleation of workshops.

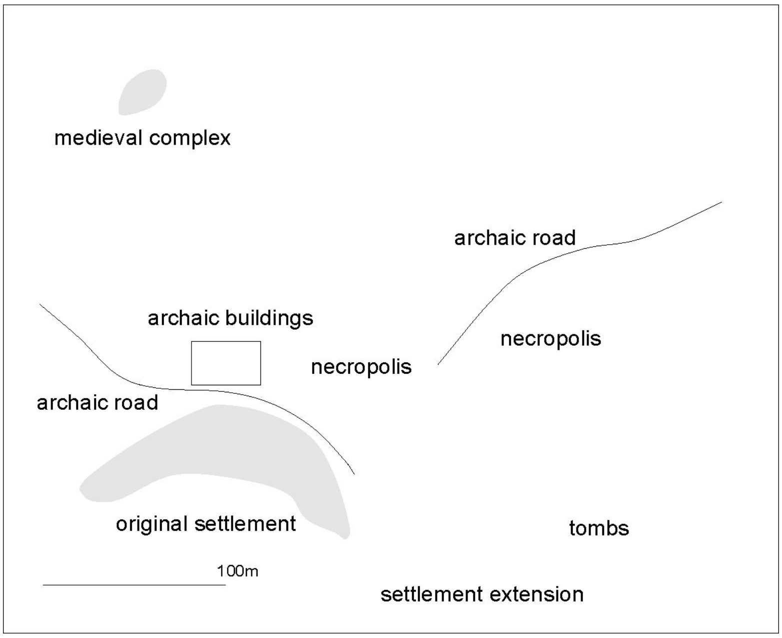

Fig. 30. Laurentina-Acqua Acetosa, location of settlement areas, necropolis and roads.

Three rectangular kilns were discovered by Dr. Bedini during excavations in 1978 and 1980-81 in an Archaic extension of the original settlement. The location of the kilns within the building complexes is illustrated in Figure 31. Bedini published some preliminary reports on the Archaic buildings with a short description of the kilns.[220] The buildings are dated from the second half of the 6th to the first half of the 5th centuries BC on the basis of the associated pottery. The context of the Archaic buildings is significant since it reveals an early urban plan which has not been testified before for *Latium Vetus* except by Carandinis' recent excavations around the Palatine, Rome.[221] Several buildings in this Archaic quarter were erected along roads, in line and occasionally separated by passages. This indicates the distribution of building plots to households. The houses were situated on the border of a plateau opposite the protohistoric habitation area and were excavated just outside the original settlement. The area was previously used as a burial ground from the early 8th to the early 6th centuries BC which means that the buildings as well as the kilns cannot be dated before the early 6th century BC. The kilns were identified as pottery kilns on the basis of design, furnace lining and remains of the raised oven floor.[222] The measurements of the substructure of the three kilns have been described as fairly similar, each being 250 to 260 cm long and about 170 cm wide. The depth of the firing chamber of kiln 1 is at least 80 cm.[223] Bedini notes the structural difference between kiln 1 and the kilns 2 and 3 though actual details await final publication. A detailed report on the kilns will be hampered by the fragmentary preservation of the remains.[224] Thus it remains uncertain whether the kilns are contemporaneous or if kiln 1 is slightly earlier in date than kilns 2 and 3.[225] However there are indications that three separate buildings

[220] Bedini 1979; 1981; 1990 a.

[221] *Grande Roma* 1990, 97-9.

[222] Bedini 1981, 254.

[223] Bedini 1981, 257.

[224] Bedini 1990 a, 173.

[225] Bedini 1981, 254, 257; 1990 a, 173.

were in use as pottery workshops during the late 6th and early 5th centuries BC. The arguments for this reconstruction are:

1. the combustion chambers of kiln 2 and 3 are related to the layout of the buildings V,2 and V,3 since they follow the orientation of walls, roads and passages. The kilns are integrated into the architecture of the buildings. The substructure of kiln 1 in building V,1 has a slightly different orientation and thus may have been made before the construction of the building V,1;

2. the walls of the rooms in which the kilns are situated are substantial and made of tuff. This is a construction method which is exceptional since it does not incorporate the usual wooden frame for the wattle and daub walls.[226] A tuff wall makes a building more fire-resistant. The wall could even have belonged to the upper structure of the kiln;

3. in addition, the buildings have water supply, reservoirs and basins which can be associated with the preparation of the clay. Figure 8 presents some workshop plans which reveal that kilns can be located within buildings and that all workshops accommodate a wetting tank, and

4. room 2 of building V,1, north of the kiln is furnished with yellow or grey tuff slabs which is exceptional when compared with other Archaic buildings.[227] The function of this room and the slabs may be related to preparing or modelling clay.

An impression of the ceramics made by these workshops, is presented in the majority of the entries in the catalogue of *Grande Roma*[228] and by the published ceramics that were found in both tombs dated to the late 6th and 5th centuries BC.[229] The ceramics are characterised by the excavators as homogenous and consisted mainly of burnished and reddish *impasto*, *impasto chiaro* and ordinary *bucchero*. The vessels include jars, cooking jars, storage jars, large bowls, plates and cooking stands. The typology of the *impasto chiaro* is more diverse while the depurated wares mainly consist of plates and small jugs.[230] Bedini kindly showed me the artefacts excavated in or near the kilns. The pottery from these kilns resembles the ceramics related to the late 6th century BC kiln at *Satricum*. The kiln from building V,1 was lined with a red fired paste and the associated pottery mainly consists of reddish tiles and storage jars. The ceramics correlated with the kiln in building V,2 comprise jars and storage jars and red and pale tiles and *imbrices*. Furthermore, it is accompanied by *figulina* material. The artefacts related to the kiln in building V,3 include pale coloured furnace lining and fragments of the raised oven floor. The furnace lining contained many cavities from organic material and as such resembles the late 6th century BC furnace lining from *Satricum*. The associated ceramics include reddish tiles, jars, a cooking stand, *teglie* as well as pale coloured jars. The fabric of the reddish *impasto* associated with the three kilns, appears homogeneous in colour, hardness and mineral content. It contains the usual volcanic mineral suite of *Latium Vetus* such as biotite, augite, leucite and tuff particles. The crude inscription on a tile which was written in the clay before firing implies that the potters could read and write.[231]

[226] van 't Lindenhout, pers.comm.; Maaskant-Kleibrink 1992, 128-9.

[227] Bedini 1981, *tav*. LII.

[228] *Grande Roma* 1990, 174-7.

[229] Bedini 1983.

[230] Bedini 1981, 256.

[231] Bedini 1990 a, 177.

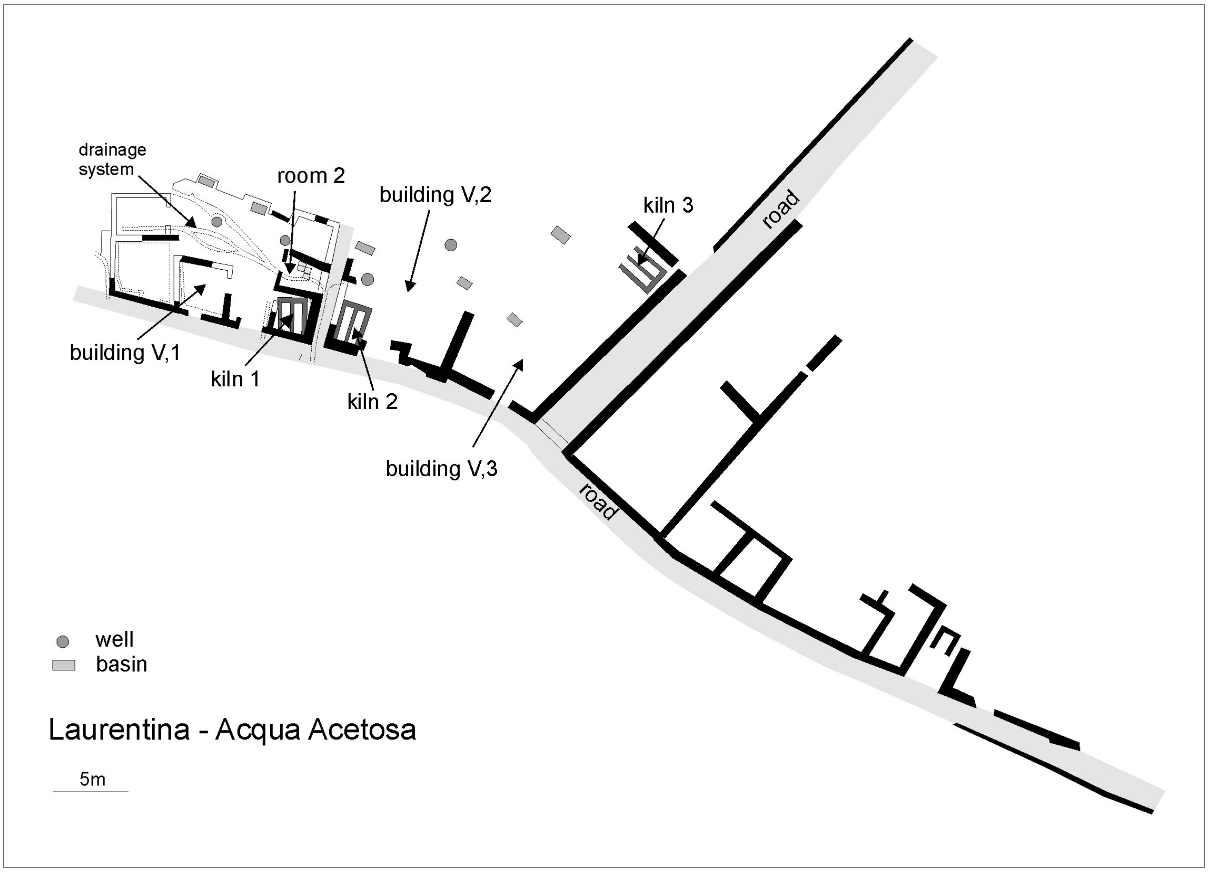

Fig. 31. Laurentina-Acqua Acetosa, Archaic industrial quarter with nucleation of pottery workshops.

The evidence from Laurentina-Acqua Acetosa records nucleated workshops, that is workshops which existed simultaneously. They were involved in the production of tiles and common household wares.[232] These workshops clearly represent urban and not rural nucleation because of the civic layout and their position just outside the original settlement, near a major access road to the town. Urban nucleation is characterised by a wide variety of pottery types such as kitchen and table wares, storage jars and other vessels which corresponds with the ceramic evidence from Laurentina-Acqua Acetosa. Usually urban nucleated workshops provide both the town as well as the hinterland with pottery. Potters tend to become full-time employed and on the whole they co-operate.[233] The front of the workshops measures between 8.6 and 14.5 m while their depth cannot be reconstructed due to the poor preservation of the buildings. The potters probably lived in substantial buildings which reflects conditions at *Caere* and Marzabotto, two sites which will be examined below. Neither the architecture of the workshops nor their literacy suggests a subordinate social status of the potters though they are likely to have been incorporated in the social organisation of *gentes*.[234]

The importance of the original protohistoric settlement is reflected in the affluence of the 7th century tombs.[235] During the Archaic period, the demand for ceramics increased due to the growth in the number of households and

[232] Even if the suggestion by Bedini is accepted that these kilns slightly predate the Archaic buildings and that they are the remains of a previous industrial quarter, they would still denote nucleated workshops: Bedini 1990 a, 173.

[233] Peacock 1982, 39-43.

[234] On the institution of the *gens* I refer to Bietti Sestieri and Smith: Bietti Sestieri 1992 b; Smith 1996, 185-202.

[235] Bedini 1990 b.

the building activities. In addition to the urban area with the workshops, other Archaic buildings are reported which are predominantly located to the south-east of the original proto-historic settlement (Fig. 30). The 5th century BC at Laurentina-Acqua Acetosa is marked by a sharp reduction of the archaeological information and desertion of the Archaic buildings around 460-450 BC. Some of the sections of the previous habitation area became burial grounds.[236] This decline of the site is reflected by other settlements in *Latium Vetus* such as Ficana[237] and *Satricum* and can be related to a general shift in *Latium Vetus* towards warfare and political instability from the late 6th century BC onwards.[238]

2.6.4 *Caere*

Caere is one of the major Etruscan towns and is located at a short distance from the Tyrrhenean coast about 40 km north-west of Rome. It was the only Etruscan town with a *thesauros* in the sanctuary of Apollo at Delphi. Moreover, it had three ports, *Pyrgi*, *Alsium* and *Punicum*. Trade with foreigners was directed from the early 6th century BC at these ports.[239] Like many other sites in central Italy, *Caere* is best known for its necropoleis. A complex social stratification is not only recorded by the *tombe principesche* but also by the opulent contents of tombs of intermediate level.[240] The urban centre extended over a plateau of approximately 150 hectares. Two habitation nuclei can be distinguished during the late 9th and early 8th centuries BC on the SW and NE side of this plateau. *Caere* emerged as a significant Etruscan centre from the late 8th, early 7th centuries BC. Gradually the plateau became completely settled. Based on the distribution of wells and other archaeological evidence dated from the 7th to the 4th centuries BC, it is deduced that the whole plateau became inhabited during this period. These centuries correspond with the maximum expansion of the town.[241] was calculated that at its peak, about 25,000 people could have lived at *Caere*. This figure seems high but is an average of the number of inhabitants given for the primary Etruscan towns of the 6th century BC. These numbers vary from 5,000 to 50,000 inhabitants for towns such as *Caere*, Tarquinia, Vulci, Veii, Chiusi, Populonia and Volterra. The figure for *Caere* is based on the extensive necropoleis which cover about 400 hectares. Huergon has calculated from the density of graves per unit that during a period of 650 years, 400,000 people with a mean age of 40 years, were buried around *Caere*. These numbers give an average of 25,000 inhabitants for the period 700 to 50 BC.[242] Calculations such as these seem haphazard and can easily be criticised for a number of reasons.[243] Therefore it is not my intention to present the figure of 25,000 inhabitants as a fact for *Caere* during the 6th and 5th centuries BC but rather as an indication for its civic character.[244]

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[236] Bedini 1981, 257.

[237] Pavolini 1981.

[238] Cornell 1995, 293-309; Bouma 1996, 192-5.

[239] *Gli Etruschi e Cerveteri* 1980, 59.

[240] *cf.* Bartoloni 1989, 211.

[241] Cristofani *et alii* 1988, 85.

[242] Huergon 1961, 176.

[243] The criticisms would either increase or decrease the number of inhabitants that was calculated by Huergon. For example, the density per unit can be questioned as well as the period of 650 years. Huergon considers the period 700 to 50 BC while the necropoleis started earlier. Both comments when applied to the calculations would decrease the figure of 25,000. On the other hand he did not consider the issue of selective representation in burial customs. If he would have applied this concept than the number of inhabitants would increase.

[244] There are scholars who consider 5,000 inhabitants a threshold for a city: *cf.* Wells 1984, 15-8. This threshold was definitely passed at *Caere* during the 7th century BC.

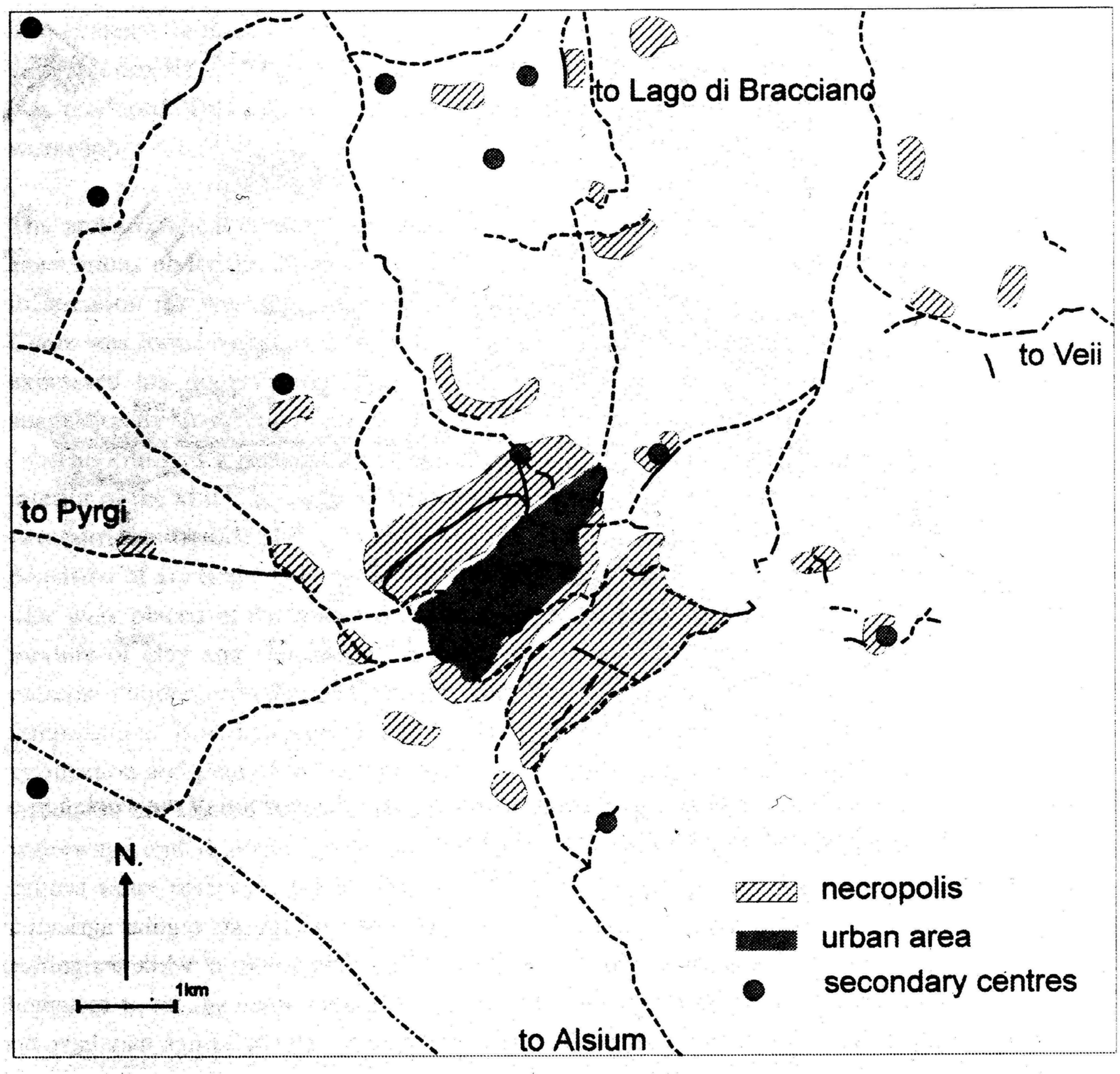

Fig. 32. Caere and its territory with roads, necropoleis and secondary centres.

The demand for ceramics was considerable due to the economic growth of the town and its territory (Fig. 32). Figure 32 illustrates the urban area and some of the necropoleis, roads and secondary centres in the hinterland of *Caere*. The relationship between the urban centre and its territory is reported in detail by recent surveys.[245] Enei, for example, did a survey of a section of the *Caeretan* region between 1985 and 1988 and his research reinforces the impression that during the 7th and 6th centuries BC, there was a considerable increase in the number of sites in the countryside. A demographic expansion is recorded which is related to a systematic colonisation of the territory, similar to the colonisation noticed in the territory of Veii.[246] Enei recognised 113 settlements. Some of these sites were located almost next to each other in the most fertile areas. They were separated by just 150 to 200 m which suggests regular agricultural plots. A limited number of sites covered an area that was larger than 1,000 m^2 while a significant number extend over an area of 400 to 900 m_2. The evidence implies small square or rectangular buildings

[245] Enei 1993; Maffei and Nastasi 1990.

[246] Potter 1985, 72-92.

of 20 to 50 m^2 covered with tiles of diverse provenance. The buildings may have been accompanied by wooden structures. The pottery found, included storage jars, cooking stands, loom-weights and grindstones. Much of the ceramics is made from a red-brown *impasto* while the table wares are predominantly *bucchero*. Attic pottery is rare though transport *amphorae* of different origin were frequently encountered. The evidence from the necropoleis in the surveyed region indicates the existence of:

a. urban necropoleis,

b. rural burial grounds with a limited number of tombs and

c. rural extensive necropoleis dated to the 7th and 6th centuries BC which cover several hectares and contain many graves including monumental tombs.

The evidence indicates a strong concentration of rural settlements in the course of the 5th and 4th centuries BC.[247] The surveys in the territory of *Caere* did not record any sites where pottery was produced. This makes it possible to speculate that ceramics were distributed via the urban workshops.

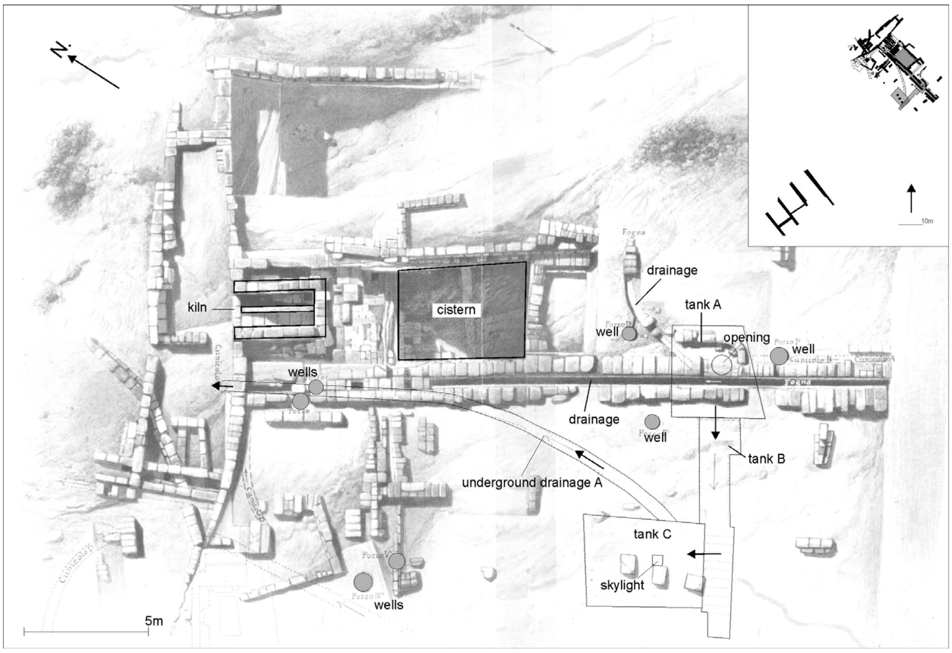

Fig. 33. Caere, Archaic urban pottery workshop; within the box the position of the workshop is related to other Archaic wall structures on the plateau.

The archaeological evidence on the urban development of *Caere* was recently augmented by excavations under the direction of Cristofani.[248] Though these excavations have revealed much information for workshop activities, a pottery workshop was not discovered. The only kiln at *Caere* was found by Mengarelli in 1913 who interpreted the area as a sanctuary.[249] Cristofani has expressed his doubts about this interpretation and proposed an industrial

[247] Enei 1993, 34-42.

[248] Cristofani *et alii* 1988; Cristofani 1992; 1993. The publications of 1992 and 1993 are predominantly catalogues of the pottery that was recovered in a huge basin of 12.20 to 12.80 by 4.75 to 5.25 m and 4.0 to 6.9 m deep. This basin was cut into the native tuff of the plateau on which *Caere* was built. The basin was originally a quarry for tuff blocks during the late Archaic period. Based on the pre-cut blocks at the bottom of the quarry it was calculated that about 2,000 blocks were extracted. It is noteworthy that this quarry existed in the centre of the plateau as if not hindered by previous and neighbouring buildings. The extraction of tuff blocks could have been related to specific building activities. The debris in the quarry contained mainly pottery but also fragments of columns and building blocks which can be related to the urban buildings at *Caere* during the second half of the 6th century BC. The basin was filled with material from destruction layers and contains fragments from the 7th till the early 5th centuries BC. On account of the quantity and variety of the ceramics in the basin, the pottery sequence that was published in the catalogues, presents a detailed outline of ceramics in central Italy from an urban context.

[249] Mengarelli 1936.

function.[250] This suggestion by Cristofani is based on the layout and context of the complex (Fig. 33).

The kiln had a rectangular plan with walls of tuff blocks which were levelled towards the interior of the kiln. The internal measurements are 180 by 340 cm and the kiln was bisected into two corridors by tuff slabs, 24 cm wide and 105 cm high. The floor level of the west corridor consisted of six large, pale terracotta tiles of 62 by 52 cm and 4.5 cm thick. The borders of the tiles were placed in the soil in order to make a flat floor. The internal walls were lined with a mixture of clay and sand which subsequently became to some extent vitrified because of the extreme temperatures obtained in the kiln. The surface of the tuff was also altered by the high temperatures. It was suggested that the firing chamber could be closed with two tuff slabs. The publication and plan of the site by Mengarelli require a reinterpretation. Most of the associated structures are related to waterworks. Mengarelli found several reservoirs, wells, subterranean waterways and drainage systems. The main elements of the plan presented are the kiln, the central water reservoir, the *piscina* and the drainage system which represent a coherent layout and which must have functioned simultaneously.[251] The subterranean basins A, B and C can be reconstructed as a series of basins at different levels which were probably used for preparing clays.[252] Mengarelli interpreted this area as a sanctuary even though the plan of the temple was not discovered. This interpretation is partly based on the excavated architectural terracottas which dated from the 6th to the 3rd centuries BC. Ceramics of the same period were considered to be votive offerings. Some Hellenistic vessels were painted or inscribed with the letters HPA, Hera. These sherds are the main reason for interpreting the area as a sanctuary of Hera. The scarce evidence on the sanctuary itself does not correspond with the complex as presented in Figure 33. Though a sanctuary could have existed nearby due to some of the votive offerings, the excavated complex by Mengarelli cannot be interpreted as a temple. The foundation walls and water works correspond with the layout of a pottery workshop as those found at Marzabotto where the workshop in *Regio* IV, *Insula* 2 also included a substantial water reservoir and kilns.[253] Four fragmentary moulds were published by Mengarelli which demonstrate the close relation with a workshop. The moulds indicate a late Archaic and 5th century BC production.[254] In the area of the workshop some fragments of

[250] Cristofani *et alii* 1988, 87-90.

[251] A recent investigation of the area revealed that only the major water reservoir was preserved: Cristofani *et alii* 1988, 88.

[252] Mengarelli describes an ingeneous subterranean system of waterworks which probably functioned in relation with the pottery workshop. It is essential for the following to acknowledge that Mengarelli and his assistents could draw a detailed map of this underground system and thus were able to enter in order to explore its workings. He describes that the basins A, B and C are correlated: Mengarelli 1936, 69. Once the first basin was filled with water, any excess of water would be drained by an opening or pipe into the next reservoir and once this was filled, the excess of water would be conducted into the third basin. A subterranean drainage could empty basin C of any excess water. This description by Mengarelli accords with a classical report of the installation that is required for refining clays: Hodges 1976, 20. Hodges describes this process as elutriation or levigation: '*The clay is mixed with water until the heavier particles have subsided. The remaining fluid is then decanted and the finer clay allowed to settle out of this. The process may be carried out in a small way using tubs or on a large scale employing settling tanks*'. The correlated basins at *Caere* are associated with a pottery kiln and this strengthens the hypothesis that they have to be interpreted as a sequence of settling tanks. The basins at *Caere* are however subterranean and I do not know any other underground system of levigation in running water. Series of basins at different levels are known at Athens in the Kerameikos: Young, 1951, 245-6, fig. 16. Probably they also existed at Arezzo: Peacock 1982, 54. Tanks A, B and C in Fig. 33 are associated with three wells and an opening to the underground tanks. It is likely that the basins were supplied with water by the wells through the opening. It could be that the clays were initially prepared in the open air and when necessary, subsequently submitted to levigation in a series of tanks underground. A skylight did provide tank C with daylight. Underground storage of pretreated clays might in addition assist workability of the clay: Rhodes 1979, 70-1.

[253] See section 2.6.7.

[254] Mengarelli 1936, 76-7, 81, fig. 4 and *Tavola* XXVII: Andrén 1940, 64. Mengarelli relates these moulds to terracottas that are dated from the 5th to 3rd centuries BC. The moulds for a nimbus from a female or satyr antefix is dated to the early 5th century BC. This mould can be related to terracottas known from *Ceare* and *Pyrgi*. The other fragmentary mould was intended for the manufacture of a large antefix with satyr and menade such as were recovered at *Satricum* and that are dated around 500 BC. The fourth mould was employed for the manufacture of a terracotta statue of a young man. Mengarelli dates this mould to the 3rd century BC though an earlier date cannot be excluded. On other Archaic terracottas from this area, I refer to: Nardi 1989, 52-5.

Archaic painted terracotta slabs and tiles were discovered. The context of these *lastre dipinte* which are also known from tombs, is interesting because it appears to confirm the close relationship between tomb paintings and terracotta manufacture.[255]

The kiln and the associated structures excavated by Mengarelli, are difficult to date precisely for want of a detailed publication. Nevertheless, the layout of the main structures, kiln, water reservoir and drainage system, as well as the moulds indicate a late Archaic and 5th century BC date.[256] This date is supported by the orientation of the structures uncovered during the recent excavations by Cristofani.[257] The illustration in the box of Figure 33 shows that the orientation of the main features of the workshop is parallel to other Archaic walls on the plateau.

The large-scale workshop complex at *Caere* described above, is the only primary evidence for pottery production at the site. It can be related directly to the production of architectural terracottas. Terracottas represent merely one group of the ceramics produced in or near the town.[258] In order to illustrate other groups of ceramics ascribed to potters who were working at *Caere*, I will discuss categories such as painted pottery, the red-ware terracotta tradition, *bucchero* and household vessels.[259]

Painted ceramics have been assigned to various craftsmen mainly on the basis of stylistic resemblances of the painted scenes. An attribution to a specific centre follows when the archaeological provenance of these vessels is known. Scholars have attributed to *Caere* a series of painters and workshops from the early 7th to the late 6th centuries BC.[260] *Caeretan* painters and workshops include:

- the *Pittore delle Cru* dated to the early 7th century BC and subsequently;
- the *Pittore dell'Eptacardo*;
- the potter Aristhónothos;
- the workshop of the *urna calabresi* among whom the *Pittore della Nascita di Menerva* can be distinguished;
- a group of polychrome painters;

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[255] Mengarelli 1936, 80-1, *Tav*. XXIX; Roncalli 1965, 55. *Lastre dipinte* are painted terracotta slabs about 100 to 136 cm high, 52 to 59 cm wide and 5 to 2.7 cm thick, which were employed for covering walls of tombs, sanctuaries and maybe civilian buildings. Roncalli has published a catalogue of 48 of these slabs and dates them from 560 to 440 BC: Roncalli 1965, 46-8. Most of the *lastre dipinte* were recovered at *Caere* while some were found at Veii and Falerii. Momentarilly they are dispersed over major European and American musea. The fabric of the slabs is divided into two groups:

a. with reddish colour, occasionally a blackish core and abundant minerals of volcanic origin, augites and micas (thickness of slabs 5 to 3.8 cm),

b. with bright red colour at fracture, powdery surface, less minerals and homogenous composition (thickness of slabs 2.7 to 3 cm).

[256] Damgaard Andersen states without presenting an argument that an Archaic date of the kiln is not probable: Damgaard Andersen 1993, 80-1.

[257] Cristofani *et alii* 1988, 90.

[258] In this thesis the production mode of ceramics is described while employing primary evidence like kilns, wasters, workshops remains etc. *Caere* is one of the major Etruscan towns which continued to exist into the Roman period. An examination of the pottery that was produced at this site can only partially be established on primary industrial evidence. A report of the secondary data that incorporate various stylistic workshop attributions which are based on a visual examination of the ceramics, is essential for illustrating the wide range of ceramics that were produced at the site. A presentation of the development of the pottery production at a major Etruscan town like *Caere*, had to be included for introducing fine wares as well as a more advanced stage of craft specialisation. I consider the high level of specialisation at *Caere* to be characteristic for the evolution at other primary sites in central Italy.

[259] I restrict this presentation to distinct wares from *Caere*. It is impossible to present all the fabrics that were recovered at *Caere*. The catalogues that were edited by Cristofani, give a detailed report of the various fabrics from the 7th to the early 5th centuries BC that were found at the site: Cristofani 1992; 1993.

[260] Many painters or workshops which have been indentified on stylistic grounds, cannot be attributed to a specific centre because the archaeological provenance of the artefacts is unknown.

- the group of the *anforoni squamati*, and
- the *Gruppo della Tolfa* which are associated with the *Caeretan* hydriae during the later part of the 6th century BC.[261]

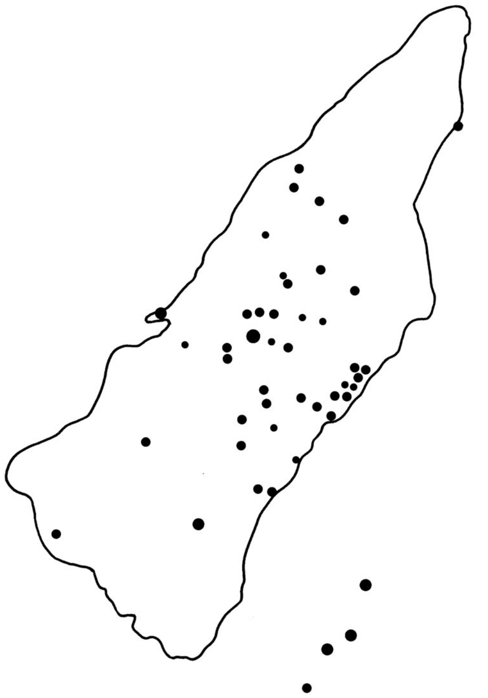

Fig. 34. Caere, distribution of architectural terracottas on the plateau.

This sequence suggests a continuous presence of pottery workshops at *Caere* producing ceramics which are directly or indirectly related to immigrant potters, imported ceramic vessels or to a local ceramic tradition. Martelli specifies a ceramic school that became established at *Caere* in the early 7th century BC and among whose associates were the *Pittori delle Cru e dell'Eptocardo*. The Aristhónothos potter was probably a prominent member working in the tradition of this school.[262] The red ware production at *Caere* covers the entire 7th century BC and chiefly concerns the larger ceramic shapes such as *amphorae*, *pithoi*, large *pyxides*, house urns and *sarcophagi*. The painted decoration is stylistically not consistent and thus reflects the hands of various painters. This feature of the painted decorations makes it probable that during the 7th century BC it is not yet possible to reconstruct a workshop in which specialisation had advanced into separate potters and painters. It is likely that the potter also painted the ceramics as has been suggested for the Aristhónothos potter.[263]

[261] These attributions to *Caere* are presented in: Martelli 1987. Rizzo points for the Geometric pottery to the role of Euboean potters from Euboea itself or from the colonies at *Pithekoussai* and *Cumae* in transmitting the technology and decoration schemes to central Italy. She introduces some late Geometric red-on-white vessels from *Caere* which are dated to the late 8th, early 7th centuries BC: Rizzo 1989. The impact of a Greek oriented pottery production on an established, advanced *impasto* tradition, is illustrated by the ceramic content of tomb 2006, tomb 78 *del Vecchio Recinto*, *tumulo* XXIV *sull'Altipiano* and the *Tumulo della Speranza* which are discussed in her article. I refer to Hemelrijk for the correlation between the Tolfa vases and the *Caeretan* hydriae: Hemelrijk 1984, 190-1.

[262] Martelli 1987, 264.

[263] The Aristhónothos crater is considered to be either the product of an immigrant potter who worked at *Caere* or an import. Martelli presents the various views on the Aristhónothos potter: Martelli 1987, 264. The opinion that it was an import is expressed by Orlandini who considers the crater to be an import from Sicily or *Cumae*: *Gli Etruschi e Cerveteri* 1980, 60.

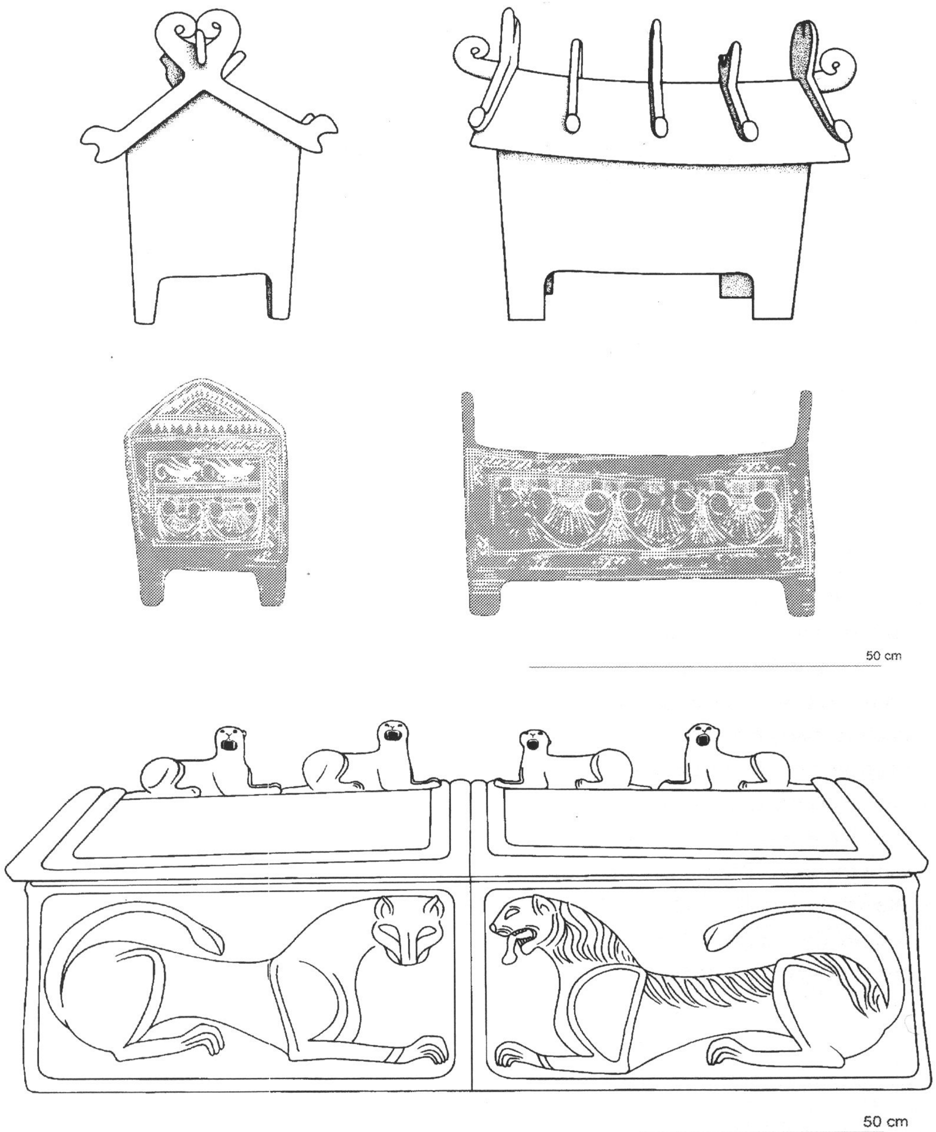

Fig. 35. Caere, manufacture of terracotta sarcophagi during the 7th and 6th centuries BC; their production is related to the local ceramic industry that made architectural terracottas and other wares.

A specific Caeretan group of jars, storage jars and basins which are decorated with stamps or cylinder stamps, is isolated by its decoration. This production may have descended from the red-ware tradition. The vessels were made in *impasto rosso* or a paler red-orange *impasto* during the late 7th to late 6th centuries BC. In addition to the stamps, the pottery is frequently decorated with motives applied in relief such as *bugne,* concentric circles, zig-zag lines and palmets. This group of vessels is distributed in the region around *Caere*.[264]

For Acquarossa and *Satricum* the close relationship between the production of rooftiles and larger ceramic vessels is substantiated.[265] To my knowledge no rooftiles of the painted red ware variety were found at *Caere*. It is, however, probable that the workshop involved in the red-ware production also made building materials such as

[264] Cianferoni 1991, 102, 107, 121-2; Rizzo 1990, 63, 79, 92; *Gli Etruschi e Cerveteri* 1980, 69-70.

[265] For Acquarossa see: Wikander, C., 1988, 132; Wikander, Ö. 1993 a, 101; section 2.6.5. The combustion chamber of kiln B at *Satricum* contained both late Archaic tiles, large vessels and other *impasto* pottery: section 2.6.1.

tiles.[266] The demand at *Caere* for building material must have been considerable which is implied by the distribution of architectural terracottas on the plateau (Fig. 34). The production of these terracottas enhanced the craft specialisation from the 7th century BC. The increase in specialisation is reflected by the manufacture of specific products such as sarcophagi and other distinctive ceramics (Fig. 35).

Early evidence for an emerging coroplast tradition at *Caere* are the statues from the *Tomba delle cinque Sedie* dated to the second half of the 7th century BC. These statues were modelled by hand, about 50 cm high and probably represented the male and female deceased.[267] The production of terracotta sarcophagi continues during the 6th century BC and includes outstanding examples such as the sarcophagus *dei Leoni* and the sarcophagi *degli Esposi*.[268] Briguet considers the manufacture of these sarcophagi to be the outcome of a long tradition in terracotta production at *Caere* which lasted for more than two centuries. It is suggested that besides the sarcophagi, the workshops also made large ceramic vessels, *lastre dipinte* and architectural terracottas.[269] Around 500 BC the terracotta production changed both stylistically as well as technically. The new production method continued during the 5th century BC and included the terracottas from temple B at *Pyrgi* and the terracottas from *Caere* exhibited in Copenhagen.[270]

In addition to the painted vessels associated with the terracotta production, it is suggested that Italo-Geometric pottery was made at *Caere* from the late 8th century BC onwards.[271] These vessels were made on a potters' wheel and imitated Greek painted pottery. This implies workshop conditions at *Caere* for certain types of ceramics from the late 8th century BC. The imitation of Greek pottery is a recurrent theme in the ceramic industry of central Italy. It is reflected by the production of Etruscan-Corinthian vessels and by the well-known *Caeretan hydriae*.[272] Of these hydriae about 40 have survived which form a closely related group of vessels with colourful figured scenes. They were produced over a period of 20 to 30 years during the late 6th century BC. Hemelrijk judges that the workshop producing these *hydriae*, was probably also involved in the production of other ceramics such as household vessels.[273] He also implies that the specialisation in the workshop had not yet broken down into potters and painters but that the master was both painter and potter. This master was presumably of east Greek origin because on one hydria the names of Odios, Ajax and Nestor were written in the Ionic alphabet.[274] An east-Greek homeland for some of the craftsmen in Etruria can be connected to the Ionicising influence on Etruscan art.[275] The potters of the *Gruppo*

[266] Compare for example the white-on-red storage jar that is assigned to the *Bottega dell'Urna Calabresi* with the painted jars and tiles from Acquarossa: Rizzo 1989, 36; Wikander, C. 1988, 75-96, 131-2, figs. 27 and 48. Cianferoni published two storage jars from *Caere* that are decorated in the red-ware tradition and dated to the late 7th century BC: Cianferoni 1991, 106-7.

[267] Prayon 1975 b.

[268] Sarcophagus *dei Leoni*, first half 6th century BC, l. 192 cm: *sarcophagi degli esposi*, 530-520 BC, Villa Giulia l. 199, h. 144, w. 70 cm; Louvre l. 194, h. 111, w. 69.5 cm.

[269] Briguet 1989, 102-4, 213-8. The analysis of the reddish-brown fabric of the sarcophagus at the Louvre, corresponds with geological data from *Caere*.

[270] Colonna *et alii* 1970, 402-5; Briguet 1989, 214-5. See also: Torelli 1983, 477.

[271] Rizzo 1989. I presume on account of the stylistic similarities of the painted decorations on the Italo-Geometric pottery as well as on the white-on-red ware production, that it is undetermined whether these ceramics were produced at *Caere* during the 7th century BC in separate workshops.

[272] Etrusco-Corinthian vessels were produced at *Caere* from about 625 to 550 BC: Cristofani 1992, 115. I refer to Hemelrijk for the *Caeretan hydriae*: Hemelrijk 1984.

[273] Hemelrijk writes that he cannot certify the other vessels which were produced at the workshop but *amphorae*, *alabastra* and simple household wares are suggested: Hemelrijk 1984, 63, 167.

[274] Hemelrijk 1984, 67, 160-2, 172.

[275] *cf.* Torelli 1982; Boldrini 1994, 262-4; Cristofani 1992, 134.

della Tolfa were probably directly inspired by the workshop that was making the *Caeretan hydriae*. These potters may have trained in this workshop as apprentices. The production in Etruria of Black Figure pottery continues into the 5th century BC.[276] Early Red Figure vessels of the second half of the 5th century cannot be definitely ascribed to *Caere*.[277]

Painted Etruscan pottery with figurative scenes imitating Greek vessels is outnumbered at the site by *bucchero* and, therefore, an examination of the *bucchero* production is more suitable for an account of workshop conditions in Etruria.[278] *Bucchero* production starts in the early 7th century BC at *Caere* after which its manufacture spread to other centres in central Italy.[279] Rasmussen suggests that only a single workshop may have been involved during the early years of the *bucchero* production.[280] The *bucchero* vessels from *Caere* are characterised by particular motifs and specific vessel forms though some of these characteristics are also encountered at other production centres in southern Etruria.[281] A complication is that the fabric of the *bucchero* from *Caere* is not homogenous in terms of its chemical composition.[282] Recently, *bucchero* from *Caere* was subjected to petrographic and geochemical analyses.[283] About 30 *bucchero* vessels chiefly dating to the 6th century BC, were analysed by various archeometric techniques. Microscopic examination revealed a division into two groups:[284]

1. Black, sandy sherds with an average thickness of about 4.2 mm, a compact dark matrix which contained angular quartz, plagioclase, sanidine, microcline, pyroxenes, small orange tuff fragments and some carbonates;
2. Dark-greyish sherds, slightly thicker with an average thickness of 5.6 mm, a yellowish calcite-rich matrix which colours black towards the edges. Group 2 contained less inclusions than group 1. The following inclusions are recognised: microfosils, shell fragments, less than 5% quartz and feldspars, orange fragments of tuff and black limonite concretions.

The XRF analyses confirmed the subdivision in two groups. Group 1 was made of an illite clay of sedimentary origin[285] which contained a large amount of inclusions, many of volcanic origin. Some of the samples seem to be

[276] Ginge 1987, 16. She mentions that Black-Figure pottery was produced in Etruria from about 540 to 475 BC. It can however, not be excluded that the manufacture of this variety continued into the second quarter of the 5th century BC.

[277] Pianu 1980, 3.

[278] This statement covers the whole period 700 to 400 BC and is mainly based on the fact that *bucchero* became increasingly an households ware during the 6th century BC. Cristofani states that the quantity of *bucchero* that is dated from 550 to 475 BC and that derives from an urban context at *Caere*, is substantial and is only succeeded by the quantity of common wares: Cristofani 1992, 174-7.

[279] Gran-Aymerich differentiates six chronological phases the earliest of which he dates from 680 to 630 BC: Gran-Aymerich 1993, 21. He locates the production of early vessels in *Caere* as does Rasmussen: Rasmussen 1979, 3-5. The manufacture of *bucchero* at other sites in central Italy is seldom dated before 650 BC.

[280] Rasmussen 1979, 159.

[281] Particular motives for the *Caeretan* production are rows of fans with dotted lines and zones of incisions or ribbing, animal and floral friezes, relief decoration, incisions or stamps on flat handles. Specific vessel shapes are the development of the globular amphorae with flat handles to the *Nicosthenic* shape, *chalices* on four supports with stamped decoration and the whole range of *kantharoi*. These characteristics of *bucchero* from *Caere* are reported by Gran-Aymerich and less definite by Rasmussen which is probably more realistic considering the diffusion of the production technique: Gran-Aymerich 1993, 24; Rasmussen 1979, 128-42.

[282] Gran-Aymerich *et alii* 1985. The application of advanced research techniques for provenance studies can result in a discrimination which is occasionally difficult to relate to archaeological meaning. More simple techniques like refiring programmes and thin-sectioning on a significant number of *bucchero* vessels might be able to distinguish the various fabrics into more obvious categories: *cf.* Burkhardt 1992.

[283] Burkhardt 1992.

[284] The analyses of the thin-sections are more detailed than the thin-sections of *bucchero* from *Caere* that are described by: Mannoni 1993, 223. The results of both analyses are, however, not incompatible.

[285] Burkhardt used the term *terrestrischen Ton*: Burkhardt 1992, 181.

mixed with marine clays containing carbonate. Group 2 was made of a plastic, marine clay containing few inclusions of which the microfossils and foraminiferae are characteristic. The orange tuff fragments in both groups can be related to the orange tuff from the plateau of *Caere*. One of the clay samples dug around *Caere* could be related positively to group 2 but none of the samples corresponded with group 1. Burkhardt made a distinction between the firing process of both groups. Group 1 was fired in a strongly reducing atmosphere which probably caused some absorption of carbon while the dark colour of group 2 is mainly caused by a reduced atmosphere and the subsequent reduction of the iron-oxides in the clay. It is likely that the shift towards group 2 during the second half of the 6th century BC, can be associated with the use of a different clay deposit. This demonstrates that during the second half of the 6th century BC the resources for pottery production changed significantly. Besides the shift from red to pale architectural terracottas, Burkhardt presents evidence for an analogous change of clay for the *bucchero* manufacture.

The early 7th century BC *bucchero* vessels have a limited range of vessel shapes such as *amphorae*, jugs and *kotylai*. They were carefully made of fine clay and turned on the wheel. The vessels have thin walls and do not yet have standardised, stamped motifs of palmettes and animal friezes. This early *bucchero* is found in the same strata as the fine brown *impasto* vessels which were made on a wheel and highly polished.[286] The potters from *Caere* exported some of their *bucchero* vessels to other emerging towns in the region during the 7th century BC. There was also a demand for *bucchero* overseas. Moulding contributed to the transformation in the quality of the *bucchero* vessels which became more standardised during the late 7th and 6th centuries BC. This reflects the efficiency that is associated with workshop conditions. *Bucchero* remained a ware group for domestic vessels such as bowls and plates during the fifth century BC.[287]

The modelling and surface treatment of *bucchero* differs to such an extent from the manufacture of painted Etruscan pottery with figurative scenes, that it is probable that they were made in separate workshops. The early *bucchero* from *Caere* was labour intensive, the artefacts were carefully made and their production does not reflect the mass production of workshops.[288] The standardisation of the *bucchero* repertoire which emerged in the second half of the 7th century BC, reflects a succesful transformation of the production method which had to compete with the workshop mode of production of ceramics imitating Greek pottery.

The development of the fine ware pottery at *Caere* during the 6th century BC can be divided into two categories:
1. A continuation of the production of painted pottery modelled on a potters' wheel. This production is reflected by artefacts attributed to the group of polychrome painters, the group of the *anforoni squamati* and the *gruppo della Tolfa*;
2. A change in the *bucchero* production which became more and more standardised.
The transformation of the *bucchero* production is also reflected by the production of other common table wares. The typology of these Archaic wares is directly related the late *bucchero* production and incorporates groups such as:
a. The *brocchette ceretane* which are made from a levigated clay with small mica and augite inclusions and coated with a pale firing slip, dated to the first half of the 6th century BC;[289]
b. The *ceramica acroma arcaica* which incorporates *attingitoi*, *brocchette*, *calice* and *kantharoi*. They are made from a depurated, slightly powdery clay[290], and

[286] These *impasto* vessels were also made on a wheel and subsequently burnished and polished: *cf*. Cristofani 1993, 253.

[287] Pandolfini 1992.

[288] *cf*. Bonamici 1972.

[289] Cristofani 1992, 118-28. He reports besides *brocchetti* also lids, bowls, plates and *pisside*.

[290] Cristofani 1992, 129-33. This ware group is dated to the last quarter of the 6th and early 5th centuries BC.

c. The Etruscan black glazed pottery which became produced at *Caere* from the late 6th, early 5th centuries BC.[291]

A quantification of *impasto* household vessels compared with fine table wares demonstrates that the common *impasto* wares comprise the principal group at *Caere*. This group includes specific products such as the red-orange *impasto* jars on a high foot dated to the late 8th and first half of the 7th centuries BC as well as the undecorated *impasto rosso* ceramics the production of which ceases around the middle of the 6th century BC.[292] During recent excavations on the plateau of *Caere*, more than 5,000 fragments of Archaic and late Archaic *impasto* were found which could be divided in cooking jars and other household vessels.[293] Common impasto wares are in quantity the main ceramic group. It is therefore unfortunate that a presentation of the manufacture of these common wares has to be general for lack of detailed information. Cristofani emphasises that the absence of fabric analysis and of primary evidence for workshops making these vessels, hampers the evaluation.[294] A general account is not available because scholars have focussed on specific wares or distinct groups of artefacts. Nevertheless, during the 6th century BC the typology of these vessels becomes standardised in the territory of *Caere* while the paste composition varies. This implies that various production centres employing different raw materials may have existed in the region. Within each production unit the fabrics became increasingly homogenous as has been noticed at other sites in central Italy. Due to the absence of primary evidence, it is difficult to relate the production of common household vessels to either household industry or to the workshop mode of production. The increase in standardisation during the 6th century BC indicates an intensification in the production which would have advanced household industries and, therefore, may reflect workshop conditions. Thus it is deduced that the common household vessels in *impasto*, started to be mass produced during the 6th century BC which is reflected in the typology and the increasingly homogenous fabric. This development would have supported latent workshop conditions.

As mentioned above there were, during the 6th century BC, visible changes in paste compositions employed in the pottery production at *Caere*. *Bucchero* started to be made with another clay while the resources used by the coroplasts, were also replaced. These craftsmen changed the red-brown fabric for a pale firing clay. Moreover, the *impasto rosso* tradition was replaced by a paler red-orange *impasto* as can be seen from the pottery decorated with stamps or cylinder stamps. This evidence for the transformations in resource management cannot be related to an overall change in the organisation of the workshops. The only primary evidence from *Caere* is the large-scale workshop in the urban centre that produced architectural terracottas. The relationship of these products to the surrounding clay resources is neither substantiated except for the *bucchero*.

This account of the ceramic industry at *Caere* establishes that several workshops existed simulataneously but a nucleation as was encountered at Laurentina-Acqua Acetosa, cannot be proven. At Marzabotto the workshops are dispersed over the urban area and this may have occured at *Caere*.[295] Inspite of the lack of primary evidence on nucleation of workshops at *Caere*, the various urban workshops which are deduced from the secondary findings, must have co-operated.[296] The production of specific types of pottery at the *emporia* of *Caere* that may be related to immigrant potters, can be expected but is so far not recorded.[297] The common *impasto* household vessels may even

[291] Cristofani 1992, 133-8. He reports *skyphoi*, cups and plates.

[292] *cf*. Cianferoni 1991, 116. I refer to Cristofani for the *impasto rosso*: Cristofani 1993, 261-71.

[293] Cristofani 1993, 273.

[294] Cristofani 1993, 312-3.

[295] See section 2.6.7.

[296] I refer to Peacock for a discussion on nucleation and co-operation: Peacock 1982, 39-43.

[297] Hemelrijk for example, considers that the workshop that produced the *Caeretan hydriae* could be located either in *Caere* or in *Pyrgi*: Hemelrijk 1984, 193.

have been made at several production sites in the territory of *Caere* but these rural workshops have not been recorded either. Therefore a reconstruction of the organisation of pottery production at *Caere* and its territory remains speculative for lack of primary evidence. Some of the options mentioned such as rural workshops, urban nucleation and production at *emporia*, may have co-existed because the demand for ceramics was substantial.

The report on the pottery production at *Caere* from the 8th to the 5th centuries BC indicates that during the 7th century BC several pottery workshops existed for the production of:

1. red-ware ceramics;
2. *bucchero*, and
3. painted pottery made on a potters' wheel.

Caere itself prospered from the late 8th and early 7th centuries BC onwards and it has been suggested that its development was slightly later than its neighbouring towns, Veii, Tarquinia and Vulci.[298] During the 8th century BC much of the common *impasto* wares for preparing, storing and serving food were probably still made within the household either as household production or as household industries. It is likely that this mode of production continued for the common *impasto* wares during the 7th century BC. Therefore during this century the pottery that was produced by the workshops was partially augmented by the common wares that were made within the household. The role of household production declined, however, with the impulse of the demand for architectural terracottas during the 7th century BC. The manufacture of ceramic building materials in workshops gradually absorbed the *impasto* production. For example, some of the larger household vessels started to be manufactured in the red-ware tradition as were the tiles. In addition, the export of fine wares from *Caere* to its hinterland and other regions from the second half of the 7th century BC stimulated specialisation of the potters' craft.[299] A fraction of the *bucchero* production was even distributed along the coasts of the western Mediterranean and at Carthage. The increase in the output during this period indicates an expansion of the production facilities which may reflect larger workshops or a growth in the number of workshops. A major stimulus for specialisation was the building activity both in the urban area as well as in the necropoleis. Gradually the huts on the plateau were replaced by buildings covered with terracottas.[300] This process continued during the 6th century BC. The remains of a large scale workshop for the manufacture of terracottas at *Caere* dates from the late 6th century BC and covers an area of more than 400 m^2 merely for the kiln, drainage system and settling tanks. This demonstrates the substantial size workshops could obtain during this period. In the vicinity of this workshop, Cristofani discovered additional industrial waste products and inscriptions. The debris indicates that various materials such as bone, metals, textiles and pottery were manufactured here. He suggests that during the 6th century BC, this area of the plateau was inhabited by artisans who were partly literate and who belonged to a middle class.[301]

Pottery production at *Caere* during the late 6th and 5th centuries BC developed into a production mode which was chiefly directed by internal demand. The export of pottery to other regions waned. The table wares became ordinary and this signals the undistinguished efficiency of their manufacture which was already dormant in the 6th century BC. The lack of distinction will not have advanced the value of the vessels nor the status of the potter. The demand for ceramics at *Caere* would, however, still be sufficient to sustain several pottery workshops. The terracotta moulds found at the workshop on the plateau, indicate that production continued here during the 5th century BC.[302] Furthermore, the manufacture of common *impasto* household vessels and of table wares made on a potters' wheel, continued including the manufacture of black glazed pottery.

[298] Bietti Sestieri 1992 b, 43-4; Bartoloni 1989, 109, 211.

[299] *cf*. Bartoloni 1989, 211.

[300] *cf*. Cristofani *et alii* 1988, 85-8; Nardi 1989. Nardi reports tiles, *imbrices* and terracottas on the plateau of *Caere* from the 7th century BC.

[301] Cristofani 1993, 504-5.

[302] Mengarelli 1936, 76-7, 81, *Tav*. XXVII, 1-3.

The economic development of *Caere* during the second half of the 5th and 4th century BC has been described as one of decline.[303] The interest of the *Caeretan* elite became less directed towards external activities and increasingly focussed on domestic affairs. This process was possibly forced by circumstances like military defeats, for example the failure to win the battle at *Cumae* in 474 BC. Nevertheless, the riches plundered at *Pyrgi* in 384/383 BC records the accumulation of wealth at sanctuaries, an accumulation which was also established during the 5th century BC.[304] Therefore I prefer not to use the term decline. Apparently the resources of *Caere* and its territory were still affluent during the 5th century BC. The failure to direct these resources towards expansion became eventually fatal especially in relation to the increasing influence of Rome that continued to expand its territory and standing.

2.6.5 *Acquarossa*

The late Iron Age and Etruscan site of Acquarossa is located north of Viterbo, about 70 km NNW of Rome. It is situated on a tuff plateau and the urban area covers about 25 hectares. Excavations have revealed huts dated from the late 8th, early 7th centuries BC[305] but the site is best known for its buildings and the associated architectural terracottas. The huts were replaced by buildings with stone foundations and tiled roofs from about 640/620 BC. Construction works proceeded and the town grew in a relatively short period to approximately 1,200 buildings at the time of its destruction around 550/525 BC.[306] The site is included in this study because of the existence of detailed reports on the *impasto* ceramics and the possibilities for quantification of the output. It is noteworthy that the evidence from Acquarossa demonstrates once more that the building activities were essential for increasing specialisation in the ceramic industry.

Inspite of the fairly extensive excavations, only a fraction of the urban area was uncovered. The excavators have so far not found any kilns nor workshops and imply that these may have been located outside the town on the assumption that workshops are generally not located in urban centres in antiquity.[307] The evidence for the workshops discussed in this study makes this statement relative. Many workshops appear to be located within centres during this period. For example, the workshops at Laurentina-Acqua Acetosa are located just outside the old habitation centre but within an urban layout while at Marzabotto the pottery workshops are located in various quarters of the town. Nevertheless the evidence implies a tendency from the 6th century BC to establish workshops on the edge of urban centres.

The detailed publications of the ceramics found at Acquarossa involve mostly *impasto* fabrics. The majority of the monographs on the excavations discuss single groups of architectural terracottas such as plain tiles, *antefixes, simas*, painted revetments and *akroteria*. The presentation of these ceramics in separate volumes makes it difficult to assemble information on the terracottas which belong to one construction phase of a building. Recently, Ö. Wikander catalogued 49 roofs combining the available information on the architectural ceramics from Acquarossa.[308] Stylistic examination of the ceramics from this site is correlated to fabric and technical analysis. The early production at Acquarossa is characterised by a dark, reddish-brown fabric while the terracottas modelled by

[303] *cf. Gli Etruschi e Cerveteri* 1980, 60.

[304] For historical dates see: Prayon, 1981. See also: Cristofani 1984.

[305] Östenberg 1983.

[306] The figure of 1,200 buildings is obtained by extrapolation since less than 4% of the urban area was excavated: Wikander, Ö., 1993 a, 137-9.

[307] Wikander, C., 1988, 73-4; Wikander, Ö., 1993 a, 138.

[308] Wikander, Ö., 1993 a, 87-99.

using a mould and dated from 580/560 BC, are classified as a light buff ware.[309] Fabrics as well as samples from clay deposits around the site were investigated by various archeometric techniques. Analysis of trace elements by X-ray Fluorescence (XRF) revealed several clusters. From these analyses it is deduced that the composition of the paste used for the modelling of cooking stands is very close to the pastes of the wall plaster or daub. The composition of the pottery and tiles is not related to this group. Trace element analyses of *impasto* household wares and terracottas indicate a close relation in raw materials.[310] Scheffer has isolated the cooking stands and associates them with household manufacture on account of variations in size, shape and decorations. This evaluation coincides with the paste composition. Nevertheless, professional potters were involved in the production of the architectural terracottas. Chemical analysis of terracottas and one sample of a storage jar demonstrate that they are identical in composition.[311] This implies that workshops made household ceramics as well as terracottas. Stylistically this is confirmed by the direct correlation between painted pottery and painted architectural terracottas from Acquarossa.[312]

Thin-section analysis of the tiles reflects that the clays were deliberately tempered because chamotte or grog is present in all samples. Furthermore, the temper included quartz, feldspar, augite, ore, basalt and slag.[313] The wares vary distinctly and five ware groups could be identified. This implies changing or different workshop characteristics. The analysis of the roof terracottas and clay samples indicates the exploitation of several claybeds around Acquarossa.[314] This may suggest that more than one workshop was involved in the manufacture of tiles, architectural terracottas and household ceramics.

The existence of several workshops is also indicated by a quantification of the output. This quantification can be criticised but for this research the calculations made by Wikander need to be examined.[315] As mentioned above, it was estimated that at the time of its destruction, Acquarossa numbered 1,200 buildings. This figure is based on the fact that almost 4% of the urban area was excavated and that more than 40 houses were uncovered while it was possible to identify 49 roofs. The whole urban area could contain about 1,200 buildings. The percentage of the excavated area can be considered representative for the whole urban area because the various excavation zones are located all over the plateau.[316] Wikander assumes that 1,700 buildings were erected over a period of 100 years because half of the buildings were constructed on top of previous buildings. On average the houses at Acquarossa cover about 60 square metres which would have required approximately 300 standard pan-tiles, 270 standard cover tiles and 12 to 21 ridge tiles. This accounts for about 1,100,000 ceramic artefacts for 1,700 buildings including 10% for repairs. Moreover, a percentage of the houses was decorated with terracotta antefixes, raking simas, revetment plaques and some additional ceramic artefacts. Thus, Wikanders' estimation for the output of the terracotta workshops at Acquarossa suggests that *per annum* an average of about 11,500 artefacts were produced over a period of approximately 100 years. However his analysis rests heavily on the reconstruction of the total number of

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[309] Wikander, C., 1988, 131.

[310] Scheffer 1981/1982, 23-5; Wikander, Ö., 1993 a, 100-2, Appendix 2, 168-70.

[311] Wikander, Ö., 1993 a, 101, Appendix I, 164-7, Appendix 2, 168-70. See also: Lundgren and Wendt 1982, 31-43.

[312] Wikander, C., 1988, 75-118, 130.

[313] These tempering materials are locally available: Judson 1983.

[314] Wikander, Ö., 1993 a, 167. The firing temperatures vary from 500/600°C to 800-1,000°C.

[315] Wikander, Ö., 1993 a, 138-9. The massive data on architectural terracottas that were recovered at Acquarossa, and the extensive excavations of the urban area makes this site suitable for quantification. Criticism would evolve around the number of buildings erected or the density of buildings per hectare. Wikander also evaluates the estimations of the number of inhabitants in Acquarossa which alternate from 1,250 to 4,000/7,000. According to his analysis 4,000 to 7,000 inhabitants is a reasonable assessment.

[316] Wikander, Ö., 1993 a, Fig.28. Moreover, preliminary investigation trenches denote that the whole urban area was inhabited: Wendt *et alii* 1994.

houses erected at the site and this number appears to be debatable.[317] On the other hand, the estimated figure does not represent storage jars and other household vessels which were probably also produced in these workshops. The output of 11,500 ceramic artefacts per year has to be related to the output of tileries recorded in antiquity. The output of these tileries varies enormously from about 1,000 tiles a year by a team of 7 workmen in the Isthmia experiment to 220 tiles a day by one craftsmen as recorded by some Roman graffiti.[318] A rate of 220 tiles a day refers to the modelling and does not include other activities such as the transport of the clay or firing. The figure of the Isthmia experiment includes the whole process from the extraction of the clay to the distribution of the fired product. The substantial size of the architectural terracottas from Acquarossa would affect the production time and makes a figure of 220 tiles a day unlikely.

Considering the upsurge in building activities at Acquarossa which is reflected in the estimated output, it is probable that several small workshops existed simultaneously. This corresponds with the distinctive ware groups for the tiles and the exploitation of various claybeds in the vicinity of Acquarossa. Simultameously, a continuation of the household production is suggested at least for the cooking-stands. It is likely that the workshops modelling the ceramic building materials increasingly absorbed the manufacture of other *impasto* wares. In time the household production will have declined.

2.6.6 *Poggio Civitate*

Poggio Civitate is located near the modern village of Murlo in the region of Siena, about 70 km south of Florence. The site is situated on an isolated hill overlooking the surrounding countryside and lies between the Sienese clay district and the Colline Metallifere. It is located between the interior Etruscan towns of Chiusi and Arezzo and the coastal centres Roselle, Vetulonia and Populonia. Poggio Civitate and the neighbouring site of Montalcino control the river crossing of the Ombrone which is the natural route between the Tyrrhenean coast and central Etruria. The site is included in this report because of the considerable evidence for manufacture.

Among the architectural ceramics found at the site, there are quite a few which belong to the earliest examples in central Italy. These ceramics can be related to advanced construction techniques. The life-sized, human ceramic figures which decorated the ridge of the monumental early Archaic roof and the substantial terracotta drainage pipes exemplify the outstanding competence of the artisans who erected these complexes.[319] The social-economic level of the site is advanced which is documented by the excavations and shown in the structures and artefacts.

Poggio Civitate is somewhat an anomaly in the archaeological record and, therefore, its interpretation has become enigmatic.[320] Interpretations of the site include so far, palatial complex, seat for a Northern League, meeting hall, religuous centre and political sanctuary. Whatever the explanation the analysis has to include the fact that it was a production centre as well.

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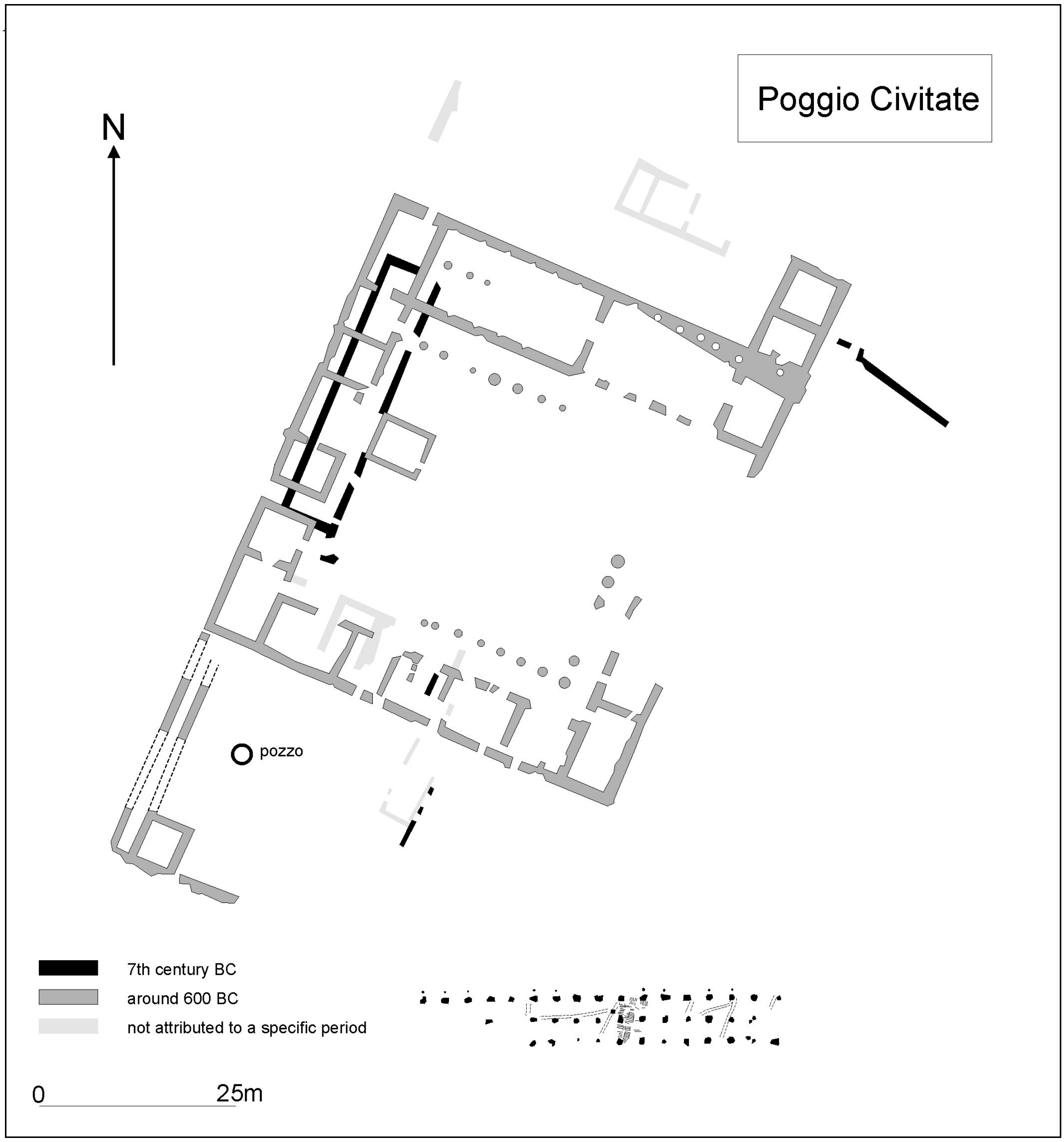
[317] Wikander, Ö., 1993 a, 137-9; Person 1994.

[318] Rostoker and Gebhard 1981. The Roman graffiti are recorded by for example, Peacock and Tomlin: Peacock 1982, 143; Tomlin 1979, 233, 236.

[319] Unfortunately the excavations await final publication. For a general report on the site see: Phillips 1993. The extensive annotated bibliography in this publication illustrates the interest Poggio Civitate has aroused. The drainage pipes are published in: *Case e palazzi d'Etruria* 1985, 127-8. Twelve tubes were recovered which had been inserted into each other. Two tubes were published maesuring a length of 76 to 84 cm and a diameter from 44 to 51 and from 38 to 56 cm. The Etruscan character of the site is not just reflected by the pottery but also by an inscription on a small ivory lion's head. The inscription is dated to 630-600 BC and is translated into *I am from Avile*: Cristofani 1975, 9. Rathje implies that the Near Eastern influence is notable at the site: *cf*. Rathje 1988.

[320] Though it is an anomaly, the architectural complex at Poggio Civitate should not be considered a curiosity. One can expect similar, early structures elsewhere in central Italy: Torelli 1983, 482; Rathje 1988, 87-8.



Since 1966, excavations have revealed several early monumental buildings which are dated from around 650 to 530 BC (Fig. 36). Two major building phases are reported. The first phase dates to the seventh century BC and consists at least of a large rectangular building and the southeast building or stoa-workshop. The rectangular building of about 37 by 8 m, had one floor and is dated around 650 BC. The ground floor contained rows of storage jars set into the earthen floor.[321] This building was destroyed by fire during the late 7th century BC. Considerable amounts of carbon were found in and around the storage jars and probably derive from the burnt wooden beams that had supported the first floor. Another indication for the first floor is the scatter of household ceramics in and around the *dolia* as if fallen from above when the building collapsed during the fire. The roof of the building was covered with terracotta tiles and decorated with *acroteria* and *antefixes*. The affluent character of the site is recorded by the artefacts preserved *in situ*. The artefacts associated with this building include local *bucchero*, imported Greek and

[321] A concentration of carbonized beans and seeds is associated with the 7th century BC building: Nielsen 1991, 250.

Etruscan pottery, common *impasto* household vessels, metal objects, jewellery and much carved ivory and bone. It was claimed that the *bucchero* vessels belong to an elaborate banqueting service.[322]

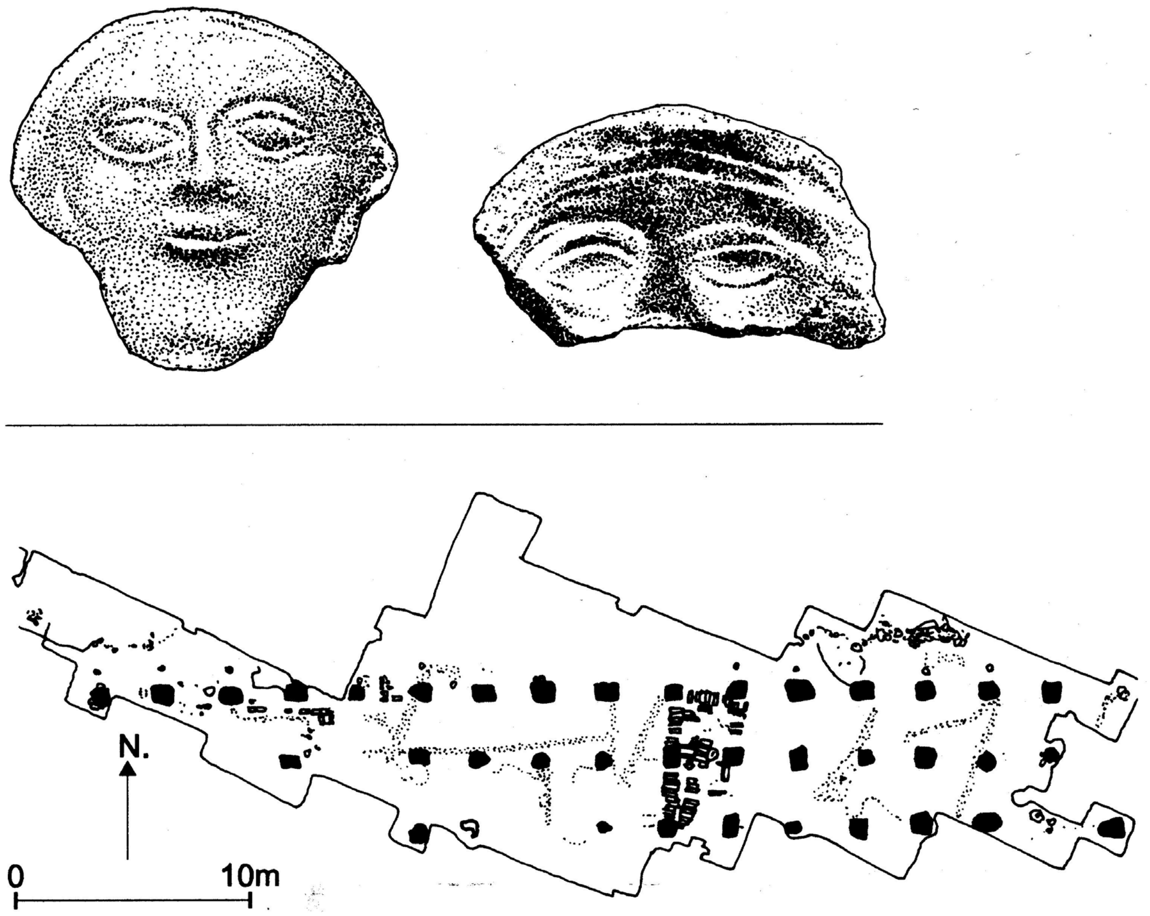


Fig. 37. Poggio Civitate, plan of the southeast building or stoa workshop and the ceramic mould and cast of a canopic head.

The southeast building or stoa-workshop is an elongated structure of about 48.5 by 6 m with a triple row of columns (Fig. 37). It appears to be an early form of an open stoa since no stone wall foundations were discovered. It was a spacious, roofed area, open on all sides for adequate light and ventilation. The complex is dated by Nielsen to around 630 BC mainly on account of the architectural terracottas which decorated the structure.[323] It was erected with the Italic/Oscan foot as measuring unit and this is the earliest example in central Italy of the employment of a historically known linear unit for construction works.[324] Between the column bases, 67 covertiles were found, lying directly on the hard packed floor. They had not yet been fired but had been neatly laid out to dry in several rows. The general appearance of the area is that of a workshop. This is supported by the mould of a canopic head found

[322] Berkin 1994.

[323] Nielsen 1987, 116-9.

[324] Nielsen 1987, 91-2. I refer to Wikander for a comparison of units of length in central Italy based on architectural ceramics: Wikander, Ö., 1993 b. His sceptical judgement on the early use of measures is not supported by the evidence that is presented in chapter IV of this study.

against one of the column bases (Fig. 37).[325] Moreover, industrial waste of the processing of other materials such as ivory, bone and metals were found in and around this structure.[326] Therefore one of the functions of the building was to serve as manufacturing area. A kiln is not reported yet but can be expected in the vicinity. At one stage the building was destroyed by fire.[327]

The southeast building represents the oldest architectural, workshop structure in central Italy. The labour involved in its construction and decoration does not suggest a semi-permanent building that was erected to serve the craftsmen who built the other monumental buildings at Poggio Civitate. Within this context one can quote Nielsen who wrote: '*That so large a structure was devoted to the practical needs of a workshop must raise some questions on the general interpretation of the site. Furthermore, that so utilitarian and unceremonial a building was decorated in such an elaborate fashion will necessitate a reconsideration of the identification of buildings and their functions solely on the basis of their architectural members*'.[328]

After the fire that demolished the 7th century BC rectangular building of about 37 by 8 m, this building was replaced around 600 BC by an edifice of imposing proportions with a large colonnaded central courtyard. The complex has an almost square layout, each side measuring about 60 m. The walls were of mudbrick and *pisé*, that is rammed earth and the building was elaborately decorated with architectural terracottas. A series of life-sized human figures, both seated and standing, and some animal statues were positioned along the ridgepole. Other moulded or hand modelled terracottas for the protection of the wood and the decoration of the roof, included Gorgon and feline representations, daedalic heads and frieze plaques with horse races, banquet and procession scenes. This building was deliberately dismantled around 550/530 BC.

The pottery production at Poggio Civiatate includes architectural terracottas and household ceramics. A stylistic, close relationship between the local *bucchero* and the terracottas was observed especially for the mould-made sections. For example, the canopic heads which decorated the stoa-workshop are related to the *potnia theron* handles in local *bucchero*.[329] Cristofani identified other common features of the pottery decoration and the architectural terracottas. This homogenous style in both the terracottas and the pottery at Poggio Civitate reflects an organisation of the ceramic production which involved both potters and coroplasts.[330] Elemental analyses of the ceramic fabrics of Poggio Civitate confirm the compositional similarity of wares. Two main clusters were identified. One group of wares included the architectural ceramics, coarsewares and *impasto*. The other main group incorporated *bucchero*, orange wares and some fine orange wares. The differences are attributed to the preparation of the clays and the firing technology rather than to different clay deposits. The archaeometric information supports the impression that the majority of the ceramics at the site are of local manufacture.[331]

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[325] Besides this mould, a fragment of a mould for a lateral *sima* was found near the well, south of the Archaic building complex: Nielsen 1991, 245.

[326] See section 3.6.8.

[327] During the fire the unfired tiles turned into ceramics. The footprints on some of the tiles are related to the confusion during the fire. '*Several persons ran over the soft clay tiles, flattening them and leaving behind clear sets of footprints*': Nielsen 1987, 92.

[328] Nielsen 1987, 119. Nielsen concentrates on an interpretation as workshop though it could be that this buildings served other functions as well. Damgaard Andersen presents some Archaic workshops in central Italy which are decorated with architectural ornamental terracottas: Damgaard Andersen 1993, 71-2, 79-81.

[329] Nielsen 1987, 116-8.

[330] Cristofani 1975, 11-2. He suggests that the coroplast who worked at Poggio Civitate, was used to model pottery and that this would account for the unsofisticated appearance of the terracottas. Thus, it is feasible that this potter who probably worked in a small team, produced terracotta statues, building materials like tiles and drainage pipes, as well as pottery.

[331] Tobey *et alii* 1986. The authors differentiate between coarse wares and *impasto*. *Impasto* pottery is more depurated and the vessels have thinner walls than coarse wares. This distinction is usually not followed by other scholars.

During its existence, the workshop which decorated the various monumental buildings did not alter the paste for the terracottas which indicates continuity. The Orientalising and Archaic terracottas are modelled with the characteristic Murlo fabric.[332] Progress in efficiency is recorded by the rooftiles because the early pan and cover tiles are not as standardised as those of the Archaic building.[333] The moulds used by the potters must have been numerous. The twenty-five terracotta heads from the stoa-workshop derived from five different moulds.[334] In addition to moulding, hand modelling continued. Both human and animal statues as well as the feline spouts of the lateral simas were modelled by hand.[335] The combination of modelling techniques for terracottas by hand and mould at Poggio Civitate, demonstrates the close relationship between the production of architectural ceramics and the coroplast tradition.

Local pottery production is attested by the significant number of household vessels.[336] The common *impasto* household wares were described by Bouloumié and Bouloumié-Marique.[337] The coarse wares include ovens, braziers, baking-covers or cooking-bells and cooking-stands some of which are made from the same paste as the terracottas.[338] As well as the red-brown *impasto,* other locally employed fabrics include *impasto buccheroïde*, grey *bucchero* and a fine yellowish fabric with a red-brown engobe. These pastes were used for the manufacture of plates, bowls, cups, mugs, ribbed jars and lids. A total of 400 to 500 shallow plates were excavated which shows regular production.[339] *Bucchero* drinking cups are also frequently encountered. The potters at Poggio Civitate imitated the *bucchero* repertoire in various fabrics and Bouloumié-Marique implies a simultaneous production of *bucchero* and *impasto* wares especially of those forms which are identical but modelled from various pastes.[340] This reflects the situation as encoutered at S. Pietro a Sieve where among the wasters from a pottery workshop various fabrics are recorded including *bucchero* and *impasto*.[341] Thus the pottery workshop at Poggio Civitate made common table wares as well as elaborately constructed *bucchero* cups with moulded handles. The cups may have been made on commision. The employment of various fabrics in the same workshop could be a feature which is characteristic of pottery workshops in the smaller, secondary centres of central Italy.

The three monumental structures from Poggio Civitate illustrated in Figure 36, are incorporated in a settlement area because defence structures and tombs were discovered. The limited area so far excavated, does not permit a reconstruction but the site obviously required protection due to the defence system. Remains of this system included a *fossa* and two parallel walls separated by a passageway. The inner wall was preserved to a height of 185 cm. while the outer wall was lower. In one corner of the passageway, a concentration of sling stones was found which was probably intended as munition.[342] Tombs were located on the Poggio Aguzzo, a small adhering hill to Poggio

[332] Phillips 1993, 27; Wikander, C., 1988, 131.

[333] Phillips 1993, 56.

[334] Nielsen 1987, 102.

[335] Phillips 1993, 20. The statues were constructed in segments and are hollow. The segments were attached to each other in order to fire the clay figure as one artefact. Openings in the statues ensured ventilation which kept the interior dry.

[336] Cristofani 1975, 11.

[337] Bouloumié 1972; 1978; Bouloumié-Marique 1978; Phillips 1993, 61-72.

[338] Bouloumié 1978.

[339] Phillips 1993, 61.

[340] Bouloumié-Marique 1978, 110-2.

[341] De Marinis 1991. A ribbed jar similar to the jars from Poggio Civitate is illustrated by De Marinis in Fig. 17. See for some additional information on this site section 2.1.

[342] Nielsen 1991, 245-6.

Civitate.[343] Among the finds associated with the tombs, are copper alloy buckles with iron inlay, a copper alloy helmet, an iron spear point and a few *fibulae*. The finds date to the early Archaic period. Both the defense system and the tombs indicate that the buildings were incorporated in a settlement. Moreover, loom weights, spools and spindle-whorls are common and demonstrate that textiles were produced at the site. This indicates that the settlement was permanently inhabited.[344]

The suggestions concerning the local production made by Phillips, are twofold. He implies that skilled craftsmen thrived on the demand generated by the inhabitants of the site itself but also that the local industry could have been a major source of income for the inhabitants of Poggio Civitate.[345] If the monumental structures at the site had a public function than visitors were given or might have acquired commodities that were made locally. The analysis of Cristofani who considers Poggio Civitate to be a rural centre with a residential complex of a dominant family, could account for the additional settlement traces such as the defence system.[346] This interpretation can accommodate as well the evidence on craft specialisation. Thus, the craftsmen who worked at the site, are related to the demand generated by the leading family as well as by the centre itself.[347] These artisans were involved besides the manufacture of prestige items, in the production of more ordinary wares.

2.6.7 *Marzabotto*

Marzabotto is the most northern, ancient town presented in this study. It is located about 30 km SW of Bologna and is included because the site illustrates a different model of workshop nucleation. At Marzabotto several pottery workshops were excavated during campaigns which started in the last century (Fig. 38). All in all, four workshops dated to the late 6th or 5th centuries BC, could be identified by means of kilns, wasters and other primary evidence related to the manufacture of ceramics. These four workshop contexts will be presented individually.

The workshop in *Regio* IV, *Insula* 4 was excavated in 1885 (Fig. 39). Brizio reports six kilns for firing pottery, five of which were situated in a long building of 10 by 7 m. The sixth kiln was in the south-west corner of the next room in which a well was also excavated. The kilns are of type I with an average size of about 110 by 100 cm. The soil around the kilns was black and contained much carbon. Household ceramics, such as storage vessels, cups and *oinochoai*, were found inside the kilns. Some of the kilns contained long bricks which probably supported other large bricks with which the internal floor of the firing chamber were constructed. The illustrated brick in Figure 39 has some ventilation holes and two notches which, according to Brizio, makes it likely that several of these bricks constituted the internal floor of the kiln. The *oinochoai* and other vessels found in the kilns as well as in the nearby well, date this complex to the 5th century BC.[348]

343 Phillips 1993, 2-4.

344 *Case e Palazzi d'Etruria* 1985, 149.

345 Phillips 1993, 72, 81. In addition, he suggests that some of the rooms of the Archaic building might have been shops: Phillips 1993, 10. This is one of the remarks that denote that the speculations on the site are abundant.

346 Cristofani 1975.

347 Principal members of this family might have combined in their position both political and religious power: Adembri 1992. Thus, they could generate additional demand for goods because both positions required ornamentation as well as artefacts for redistribution.

348 Brizio 1889, 281-3. The bricks for the internal floor were made of refractory clay and measured 42 by 27 by 11 cm.

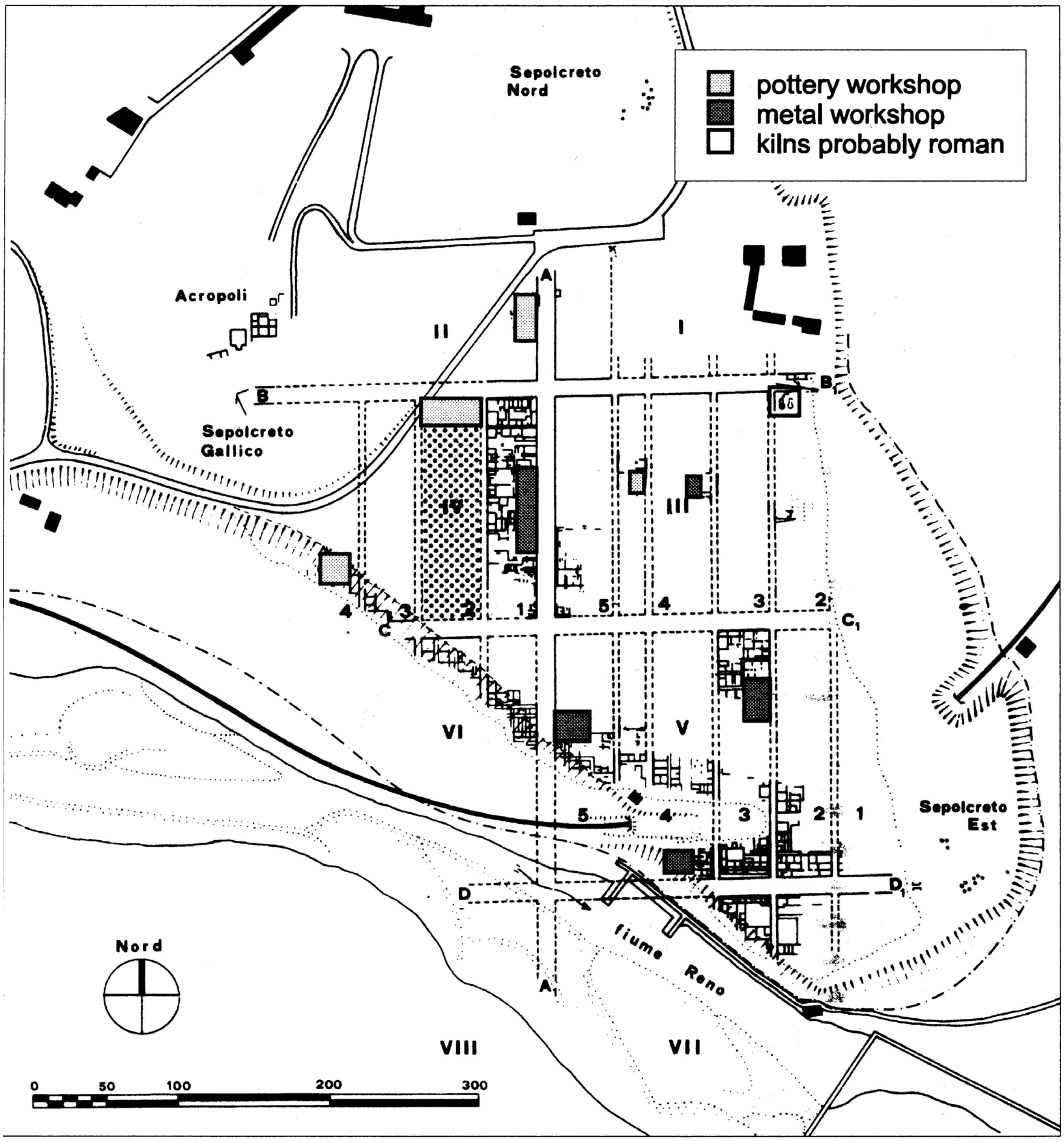

Fig. 38. Marzabotto, general map with location of workshops.

During excavations in 1964 the workshop in *Regio* II, *Insula* 1 was discovered. A detailed report on the features of this workshop was provided by Saronio.[349] Because the workshop is exceptionally well preserved, it demands a full description (Fig. 40).

It was situated along the main road A near the northern border of the city and the area excavated measures 36 by 17 m. The workshop was already in use during the late 6th century BC as shown by some remains that could be dated to the period prior to the rectangular, regular layout of Marzabotto. The building of the kilns for example, can be subdivided in an earlier and a later phase as can the construction of the basins or tanks which are situated near the water supply. During the first stage the basin was a circular pit lined with pebbles after which it was filled with wasters from the kiln in order to form a platform for the rectangular tank. This tank was directly linked to the water

[349] Saronio 1965.

supply in order to collect the water which derived from more elevated quarters of the town.[350] The rectangular tank was constructed with tiles and must have provided the workshop with water since a well was not found. A second rectangular container of 120 by 150 cm was filled with yellow clay. This container was probably already in use during the first phase of the workshop as a reservoir for preparing clay.[351] In one room an area of 5 by 5 m. (no. 6 in Fig. 40) was covered with a substantial quantity of *tegulae* and *imbrices* which had been regularly disposed. The tiles measured 65 by 45 cm which is the usual size at Marzabotto and some of the cover-tiles had plain antefixes. Further details are missing but since the excavator mentions a large quantity of tiles which had been arranged, I suggest to interpret this room as a store for fired artefacts.

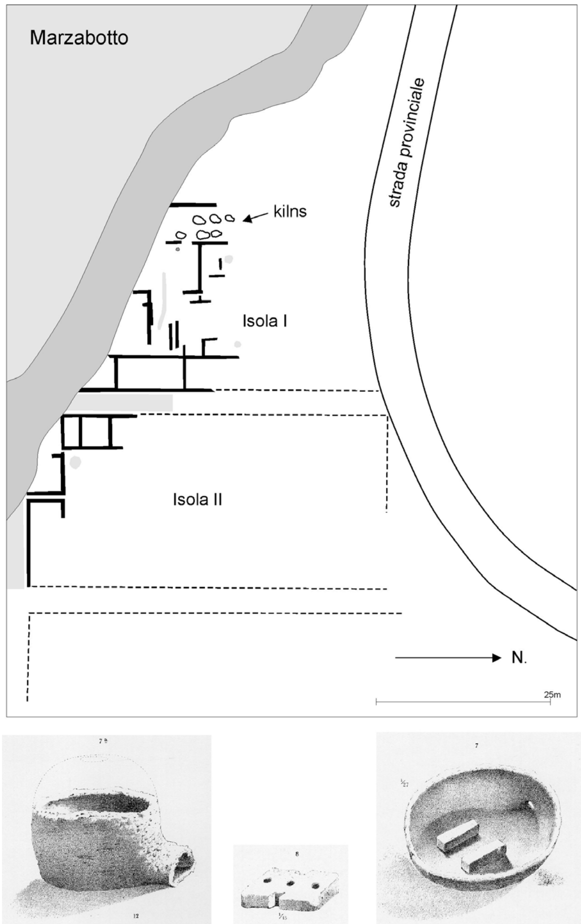

Fig. 39. Marzabotto, pottery kilns and building remains in Regio IV, Insula 4 combined with drawings of a kiln and its structural features.

The kiln has a north-south orientation, is rectangular in shape and measures 510 by 240 cm. The floor of the combustion chamber was constructed of fired earth while the walls were made of porous *impasto* bricks. The opening of the kiln is to the north where the earth was mixed with ash and carbon. To the north-east of this kiln, a smaller kiln was discovered which measured 95 by 105 cm. This smaller kiln was probably used during the first phase of the workshop. Near the kiln some rings of refractory clay were found which are likely to have separated the indidual vessels in the firing chamber. To the south of the kiln, there was a room partly paved with tiles near which a large terracotta basin and a storage jar was placed together with some bowls and a pitcher (no. 7 in Fig. 40).[352] This area was probably used for storing water and for washing. Remains of a wooden floor were found underneath the

[350] Sassatelli 1994, 57.

[351] Saronio 1965, 396.

[352] The basin had a diameter of 105 cm and a height of 21 cm. The storage jar had a height of 45 cm and a width of 42 cm.

basin.[353] Along the streetside of the interior of the house, the excavators detected a row of post holes which were interpreted as an open roofed area where the unfired artefacts could dry (no. 8 in Fig. 40).[354]

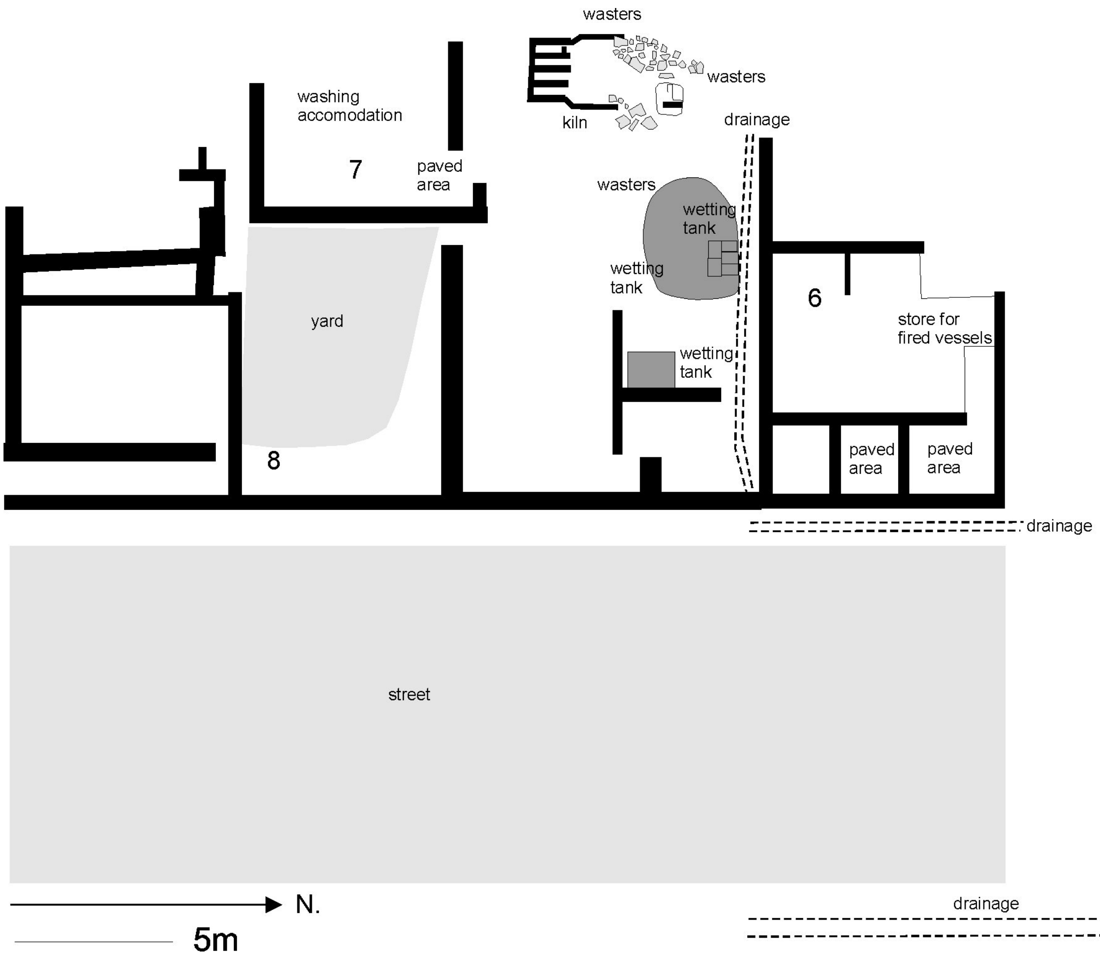

Fig. 40. Marzabotto, pottery workshop in Regio II, Insula 1.

Several terracotta antefixes were found near the workshop and could have decorated the building or might have been produced here.[355] The wasters confirm that the workshop produced building materials such as tiles and bricks.[356] Sassatelli reports the production of domestic wares and even mentions some fragments of moulds, one of which represents a male head which could have been used for making appliques for the decoration of large ceramic artefacts.[357]

[353] Saronio 1965, 407-12.

[354] Sassatelli 1994, 57.

[355] Damgaard Andersen 1993, 79-80.

[356] Saronio 1965, 416.

[357] Sassatelli 1994, 57.

Saronio doubts whether potters actually lived in this building and considers it to be merely a production unit. However no function has been attributed to some of the southern rooms and these could well have been used for dwelling. Moreover, the west side of the building is only fragmentarily preserved. These considerations, the washing facilities as well as the size of the complex make it, in my opinion, probable that some space was designated for habitation.

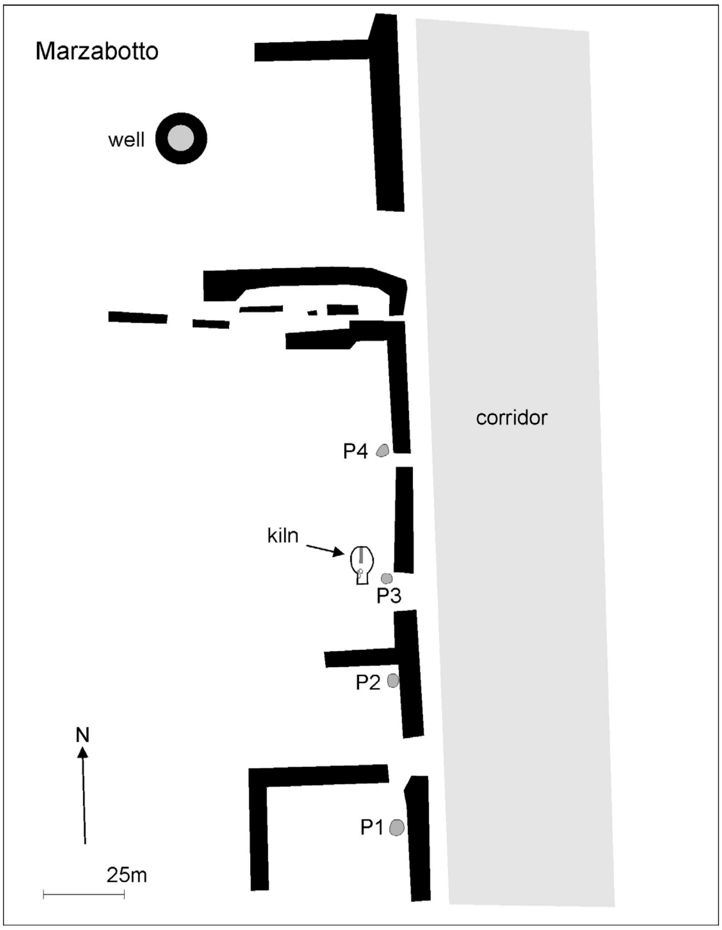

Fig. 41. Marzabotto, remains of pottery workshop in Regio III, Insula 4.

The workshop in *Regio* III, *Insula* 4 was excavated around 1970. It is poorly preserved but identified as a workshop because of the presence of a small kiln of type I (Fig. 41). The kiln was oriented north-south with the opening towards the south and was situated against the east wall of a building. It measures 115 by 70 cm and was probably domed. The kiln had a combustion and firing chamber and was bisected by an interior wall which supported the raised oven floor. Much carbon was found on one side of this wall. Traces of foundation walls were identified near the kiln but could not be reconstructed in detail as workshop remains. A well was situated near the building. Four post holes were preserved along the wall which resembles the situation in the workshop in *Regio* II, *Insula* 1. The post-holes are in line but not spaced regularly. It is suggested that they are the remains of a shelter or drying shed for unfired pottery. In my opinion, the post-holes are too close to the wall and kiln. This makes it difficult to assume a separate structure contemporary with the other features. Further details are missing due to poor preservation.[358]

[358] De Maria *et alii* 1978, 68-9. The description by De Maria reveals that the workshop was located in *Insula* 4b on the opposite side of the alleyway when compared to its location as indicated by: Mansuelli 1979 a, Fig. 1. To the north of *Regio* III, *Insula* 2, two kilns for firing *laterizi* were recovered. These kilns are dated to the late Republican or early Imperial period: De Maria *et alii* 1978, 81-91.

The fourth workshop was excavated recently in *Regio* IV, *Insula* 2 and measures 20 by 35 m over the full width of the *Insula*.[359] Figure 42 presents the preliminary plan of this workshop. A functional interpretation of the various rooms is made difficult first by past agricultural activities which have severely disturbed the habitation levels of the building, and secondly, by the preliminary character of the reports so far available. Several kilns were recorded which had not been in use simultaneously. It appears that from the beginning one of the functions of this area was related to the manufacture of both pottery and building materials. Within room E the remains of a kiln were excavated which had been used to fire architectural terracottas. The kiln was dismantled and became filled with ceramics, carbon, some fragments of the internal floor of the kiln and wasters of tiles and cover-tiles.[360] Other traces of workshop activities were found underneath some walls and thus predate the building. Two basins are reported which could hold water for wetting clay[361] as well as a large rectangular substructure which was probably used as a cistern.[362] In room N two rectangular kilns of different size were excavated (Fig. 42). The large kiln measures 2 by 1.2 m and the small kiln 90 by 80 cm. On account of the size of both kilns, it is suggested that the large kiln was employed for firing tiles besides other vessels while the smaller kiln was only used to fire pottery. Near the north wall of room O other traces of workshop activities were found. It is reported that remains of at least three kilns were found. These kilns had been partly reused to construct in a later period other kilns with a different size, shape and orientation. At least two kilns have a circular plan while the other is rectangular. There is also some evidence which suggests that metals were worked near this building because a small copper alloy ingot, many slags and some moulds for casting copper alloys were found. This workshop revealed various inscriptions one of which was probably a complete alphabet. This could imply that at least some of the artisans were literate.

The evidence from Marzabotto demonstrates that several pottery workshops existed simultaneously. The features of the remains of workshops excavated differ. The workshop in *Regio* II, *Insula* 1 had a functional layout of several compartments which can be attributed to aspects of the manufacturing process while the workshop in *Regio* IV, *Insula* 4 consists mainly of a collection of kilns. Two workshops have preserved a stratigraphy which illustrates that they were intended from the beginning to be pottery workshops.[363] During the 5th century BC, these workshops became incorporated in the orthogonal layout of the town. They are situated within the urban grid and not transferred to the outskirts. Urban nucleation with a relocation of the workshops to the outskirts is recorded at Laurentina-Acqua Acetosa while the evidence from Marzabotto exemplifies another model in which their position is a continuation of their original location within the settlement. The pottery workshops in *Regio* II, *Insula* 1 and in *Regio* IV, *Insula* 2 are characterised as large, spacious complexes which probably included living quarters. The washing facility and rooms with wooden floors of the workshop in *Regio* II, *Insula* 1 implies that the workshop was used partly for habitation. Some craftsmen and traders had, therefore, living quarters along the main roads of the town.[364] The size of the workshops does not indicate that artisan families were of subordinate status. Mansuelli suggested that an aspect of Etruscan town-planning was egalitarianism. This hypothesis is based on the proportions of the houses at Marzabotto, the domestic objects found in these houses and a comparison between the situation at

[359] For reports on this workshop see: Sassatelli and Brizzolara 1991, 1995; Sassatelli 1994, 91-2. Since these are preliminary reports some details have not been presented yet.

[360] Sassatelli and Brizzolare 1991, 389.

[361] From the reports it is deduced that these tanks are like those of the workshop in *Regio* II, *Insula* 1.

[362] This substructure measured 4.3 by 2.8 m with a depth of 2 m. It had perfect straight walls and was filled with ceramics and building materials. As such it resembles the cistern and basin documented at *Caere*: see section 2.6.4.

[363] Mansuelli 1979 a, 38-40. He states that the settlement from the beginning was inhabited by artisans and that a 6th century BC metal workshop was subsequently incorporated into the regular grid which is dated to the beginning of the 5th century BC.

[364] Mansuelli 1979 b, 358.

Marzabotto with the *Crocifisso del Tufo* cemetery at Orvieto.[365] Though the social stratification was not egalitarian, the evidence from Marzabotto implies that stratification might not always have been expressed in the size of the building plots for private houses because many late Archaic houses and even workshops are considerable in size.[366]

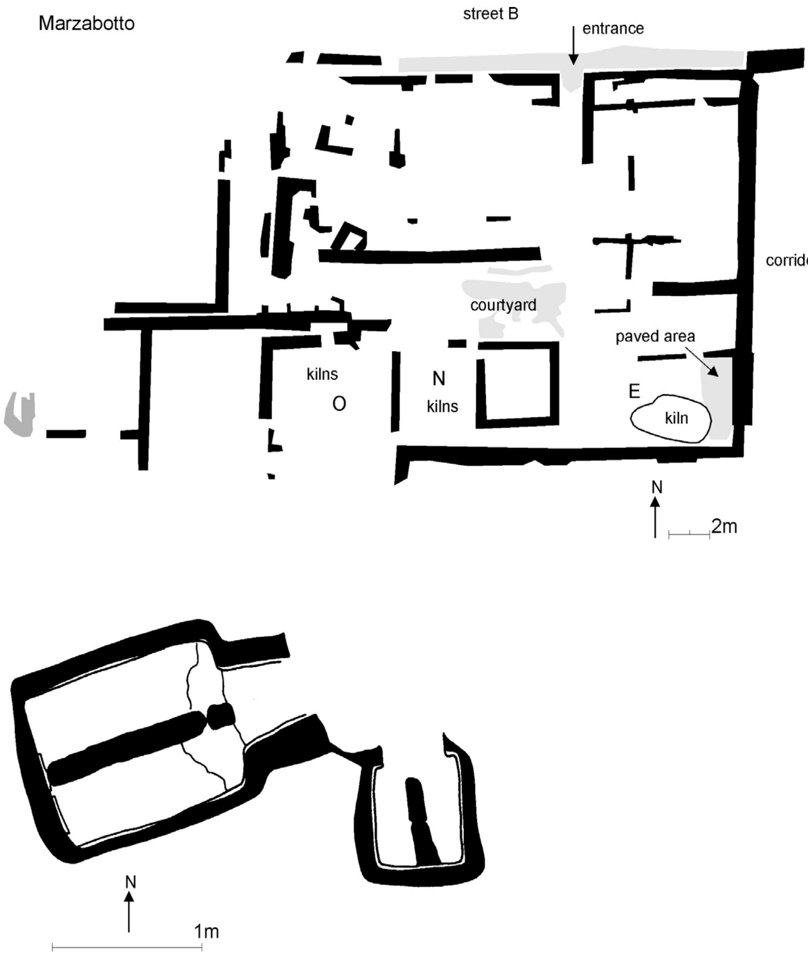

Fig. 42. Marzabotto, pottery workshop in Regio IV, Insula 2 combined with an illustration of two kilns in room N.

The wasters in or near the pottery workshops substantiate the argument that they were mainly involved in the production of building materials and domestic ceramics. The potters predominantly produced subsistence goods for local demand. As yet, no evidence was found which supports the idea that the potters at Marzabotto were involved in the production of luxury vessels or terracotta statues though the mould for terracotta appliques from the workshop in *Regio* II, *Insula* 1 establishes that this workshop produced decorated large vessels as well as architectural terracottas. The evidence from Marzabotto illustrates once more the close relationship between the production of building materials and large ceramic vessels. The demand for earthenware was encouraged by the rapid expansion of the town at the beginning of the 5th century BC. This expansion required substantial amounts of building

[365] Mansuelli 1979 b, 358, 360.

[366] It is suggested that the buildings at Marzabotto merely had a ground floor: Mansuelli 1979 a, 42. Thus, the workshops with living quarters in *Regio* II, *Insula* 1 and in *Regio* IV, *Insula* 2 measure about 700 m^2. In comparison with other workshops, the workshops at Marzabotto are the most spacious in central Italy. The houses which were excavated by Carandini since the mid-1980s on the northern slopes of the Palatine and which are dated to the late 6th century BC have a ground floor which is slightly larger than the workshops at Marzabotto. The buildings in Rome are however, reconstructed with a first floor: *Grande Roma* 1990, 97-9. According to the director of the excavations these houses were private residences which were inhabited by the Roman aristocracy. It is suggested that these Roman houses remained the ancestral homes of the leading families for many centuries to come: Cornell 1995, 96-7.

materials such as tiles, bricks and other architectural terracottas. Tiles and cover-tiles were used at Marzabotto not only for roofs but also for pavements, basins and covering drains and water supplies.

An impression of the quantity of the domestic vessels derives from a typological study of local ceramics by Bouloumié.[367] His study is based on pottery that was excavated from an area of approximately 3 by 3 m of house III in *Regio* 4, *Insula* 1 (Fig. 62). In these 9 square metres about 340 kg of ceramics were found. The wares which are dated from the late 6th to the late 5th centuries BC, varied in fabric from fine, semi-fine to coarse and the colours that were obtained during firing are greyish-black (*bucchero*), brown, red, yellowish or pale. This implies that the potters at Marzabotto used various clay deposits simultaneously from which they made several fabrics according to the type of vessel being produced. Some of the ceramics were coated with a slip which indicates levigation of the clays. The vessels incorporate the whole range of ceramic types known from other sites. They include *amphorae*, *oinochoe*, *olpai*, *skyphoi*, *kylikes*, jars, small jars, cups, lids, bowls, goblets, plates and basins. Bouloumié reports that 40% of the examined batch consisted of bowls, 25% of goblets or cups, 25% of jars while the remaining 10% consisted of the other types. He mentions that the bowls were made on a semi-industrial scale[368] but it appears from the evidence presented in this section, that a workshop could produce the whole range of vessels types.

When compared with Felsina which is just 30 km distant from Marzabotto, the cultural features at Marzabotto seem distinct.[369] It is, therefore, probable that Marzabotto had its own social-economic territory. This implies an economy based on an internal flow of commodities with an urban centre which functioned as a market place for its territory. this accounts for the relatively large number of workshops at Marzabotto. Mansuelli characterised Marzabotto as a '*concentration of production in relation to lines of communication*'.[370] An *agora* or *forum* has not been discovered yet. Available information suggests that the transfer of the commodities produced locally, is closely related to the individual workshops.

The rapid development of Marzabotto can be associated with the reorganisation of the *pianura padana* during the second half of the 6th century BC. From 540-530 BC, old centres such as Felsina were revitalised and urban centres for example Spina, Mantova and Marzabotto were founded *ex novo*.[371] The foundation of these new centres was supported by the original inhabitants and was the result of the increasing economic importance of the region. This stimulated denser communication routes and the development of commerce.[372] The invasion of Etruria by Gallic tribes at the beginning of the 4th century BC induced radical changes in the Po Valley and to the south of the Appenines. Marzabotto lost its urban characteristics. Consequently, it existed chiefly as a town during the 5th century BC when several artisan families were among its inhabitants.

2.7 *Ancient literary texts*

Except for some inscriptions that can be related to potters such as *Aristhónothos* or *Kusnailise*, there is no literary

[367] Bouloumié 1976.

[368] Bouloumié 1976, 114.

[369] Mansuelli 1979 a, 40, 44.

[370] Mansuelli 1979 b, 366.

[371] Sassatelli 1990 a, 60-2.

[372] Sassatelli 1990 a, 68-9. He concludes on account of inscriptions from Bologna and Marzabotto, that mainly indigenous families were involved in the reorganization of the area but that Etruscans cannot be excluded. A different view was expressed by Mansuelli who suggests that the developments in the Reno valley cannot be explained predominantly in terms of a local development: Mansuelli 1979 a, 36-7.

evidence for craft specialisation in central Italy between 800 and 400 BC.[373] Most of the later texts known, describe specialisation as a process which crystalised during the *Formazione della Città*. These texts date to Imperial Rome but are based on earlier writings.[374] For example, Plutarch mentions in his description of the life of Numa,[375]
'*... that of all his measures, the one most admired was the distribution of the people into groups according to their trades or arts. He distributed them into musicians, goldsmiths, carpenters, dyers, leatherworkers, curriers, braziers and potters*', Plutarch Numa, 17.[376]

Pliny, who lived from about 23 to 79 AD, records two of the seven *collegia* of craftsmen established by Numa Pompilius. These are the copper/bronze workers (*NH* 34, 1) and the potters. Pliny's text on the potters is quoted at the beginning of this chapter.

According to Florus, who lived in the 2nd century AD, it was not Numa Pompilius but Servius Tullius who[377]
'*... entered the people on a census-roll and arranged them into classes, being distributed into divisions and corporations. The state was so organised that all distinctions of inheritence, dignity, age, employment and office were committed to registers and thus a great state was ruled with the exactitude of a small household*', Florus I,6.

The seven *collegia* recorded for Rome by the ancient authors belong to the oldest guilds and already Waltzing alludes to the specialisation involved. He indicates that the artefacts produced by these guilds do not belong to what is normally made within a household.[378] The specialisations mentioned by Plutarch are usually considered to be among the oldest since they are the same as those recorded in the Homeric poems. Other evidence of an early date for the establishment of *collegia* is to be found in the *XII tabulae*. These tables record the early legislation of Rome and refer to *collegia*. They are securely dated to the first half of the 5th century BC but could relate to customs that had been established in the previous century.[379]

There appears to be a discrepancy in the literary texts for the period in which the *collegia* emerged. Some texts mention Numa Pompilius as the instigator while others consider Servius Tullius as the author of the *collegia*. It is noteworthy that quite a few, new manufacturing techniques which required the establishment of workshops, were introduced to central Italy during the second half of the 8th century BC, the period that is traditionally ascribed to King Numa. The actual institution of *collegia* must have been later and could date to the 6th century BC, the period ascribed to Servius Tullius because my study records several towns with industrial quarters from the late Archaic period. The nucleation of workshops is recorded in these quarters. The urban development of Rome and the subsequent building activities would have established a demand for ceramics which makes nucleation of pottery workshops feasible for the 6th century BC. Pliny mentions that the *collegium figulorum* was established as the last *collegium*. He alludes to the potters' wheel and thus describes the workshop mode of production; Pliny, NH 35, 159. He also explicitly refers to bulk products such as *amphorae*, tiles and bricks. Terracotta rooftiles, *amphorae* and mud-bricks are recorded in central Italy from the 7th century BC but in this respect one should not take his text *verbatim*. For example, *amphorae* production during the 7th century BC has not been assigned to Rome but to some major Etruscan towns such as Vulci. Pliny also mentions earthenware drainage pipes. Some early terracotta drainage

[373] Martelli on *Kusnailise*: Martelli 1989. *Aristhónothos* is discussed by: Martelli 1987, 264. See also: Colonna 1975.

[374] Cornell on the literary evidence for the early history of Rome: Cornell 1995, 1-26.

[375] Plutarch lived from the second half of the 1st to the beginning of the 2nd century AD. Numa's reign is traditionally dated from 715 to 673 BC. He is the mythical successor of Romulus.

[376] I refer to the bibliography for references to the translations used in this study.

[377] The reign of Servius Tullius is traditionally dated from 578 to 535 BC.

[378] Waltzing 1895-1896, part I, 61-85.

[379] *Formazione* 1980, 177. I refer to *Formazione* for a presentation of ancient literary epigraphic sources on craft specialisation: *Formazione* 1980, 173-9. See Smith and Cornell for a discussion of the Twelve Tables: Smith 1996, 187, 192, 211; Cornell 1995, 272-92.

pipes dated to the early 6th century BC, were found at Poggio Civitate.[380] Pipes from this period are, however, exceptional and their bulk production is probably from a later date. Pliny may actually refer to his own lifetime since the large scale production of fired bricks in Rome started after the great Neronian fire.[381]

In time, the *impasto* pottery started to be made by specialised craftsmen who may initially have been involved in the manufactue of ceramic building materials. The workshops producing the architectural terracottas gradually absorbed the *impasto* production. This could account for the continuing *impasto* tradition in central Italy. This transition must have been gradual and can be dated to the period second half of the 7th and early 6th centuries BC. It can be illustrated by fabric analyses and requires a distinction between levels of standardisation. The local production of non-standardised, coarse household wares is recorded at several proto-urban and urban sites side by side with more standardised and technologically advanced pottery. The manufacture of these coarse wares is usually reconstructed as a domestic activity which appears to continue into the 6th century BC. For example, Scheffer has isolated the locally made cooking stands of Acquarossa which are associated with the Archaic houses. The production of these stands is not correlated with craft specialisation but with household manufacture on the basis of variations in size, shape and decorations.[382] A similar development can be noticed at *Satricum* where coarse, non-standardised fabrics appear to dominate the repertoire until the Archaic period. During the same period one can detect the upsurge in workshop conditions as is reflected in the manufacture of *bucchero*. In this chapter it is suggested that these workshops could also produce a range of other fabrics during the 7th and 6th centuries BC, especially in the secondary centres such as Poggio Civitate, *Satricum* and probably the settlement at S. Pietro a Sieve. The manufacture of these wares reflects increasing craft specialisation leading to workshop conditions.

The ancient authors refer specifically to the situation in Rome and not to other major towns in central Italy. The existence of a *collegium figulorum* presupposes urban workshop nucleation as has been demonstrated for Laurentina-Acqua Acetosa and Marzabotto. The archaeological evidence from *Caere* suggests the simultaneous existence of several workshops from the 7th century BC. Rome was, by the 6th century BC, a substantial town and urban nucleated pottery workshops are likely to have existed from then on.[383] These workshops must have cooperated but it remains uncertain whether this cooperation became institutionalised into a *collegium figulorum*. Therefore the archaeological information and the ancient literary texts coincide to some extent. There are many reasons for accepting an early date for the introduction of labour division according to the specialisations recorded by the ancient authors.

The mere presence of workshops in Rome during the 6th century BC demonstrates that the craftsmen are sedentary. They satisfied the increasing demand for ceramics by a growing urban population. There are, however, other literary sources which in my opinion, have overshadowed a discussion on established workshops in central Italy. This is primarily due to the reconstruction of travelling artisans based on texts related to famous coroplasts such as Diopos, Eugrammos, Eucheir and Vulca. Pliny reports:

'*.... that when Demaratus, who in Etruria became the father of Tarquin king of the Roman people, was banished from the same city (Corinth) he was accompanied by the modellers Euchir, Diopus and Eugrammus, and that they introduced modelling to Italy*'; Pliny, *NH* 35, 152.[384]

Livy discloses that Tarquinius Superbus asked for craftsmen from Etruria to build the temple of Jupiter in Rome; Livy I, 56. In addition Pliny mentions Vulca who:

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380 *Case e Palazzi* 1985, 127-8.

381 Peacock 1982, 133.

382 Scheffer 1981/1982, 23-5.

383 Cornell 1995, 173-210; Smith 1996, 129-232. Both authors describe the urban development of Rome during the 6th century BC. They do not present any data on the *collegia* or on craft specialisation.

384 *cf.* Torelli 1983, 472-7. Tarquinius Priscus's or Tarquin's reign is traditionally dated from 616 to 578 BC.

'... *was summoned from Veii to receive the contract from Tarquinius Priscus for a statue of Jupiter to be consecrated in the Capitol, and that this Jupiter was made of clay and consequently was regularly painted with cinnabar; and that the four-horse chariots about which we spoke above on the pediment of the temple were modelled in clay; and that the figure of Hercules, which even today retains in the city the name of the material it was made of (Hercules Fictiles), was the work of the same artist. For these were the most splendid images of Gods at that time; and we are not ashamed of these ancestors of ours for worshipping them in that material*'; Pliny, *NH* 35, 157.

Related to the craft of the coroplasts is the art of painting. According to Pliny, the Greeks Damophilos and his associate Gorgasos were most highly praised as modellers and painters and in 493 BC '*they decorated the Shrine of Ceres in the Circus Maximus at Rome with both kinds of their art, and there is an inscription on the building in Greek verse in which they indicated that the decorations on the right hand side were the work of Damophilus and those on the left were by Gorgasus*'; Pliny, *NH* 35, 154.[385]

These texts refer to the activities of coroplast workshops which were established during the 6th century BC. The evidence from Poggio Civitate and Acquarossa demonstrates that these workshops already existed during the second half of the 7th century BC. The amount of work executed by these workshops and the infrastructure necessary, for example *pozzi*, canals, kilns and buildings, do not imply temporary facilities and travelling workshops. These coroplasts masters established workshops that were semi-permanent. With increasing urbanisation these workshops may even have become permanent. Considering the construction works and architectural terracottas required in central Italy during the 6th century BC, it appears likely that at many sites only the coroplast masters, possibly accompanied by some assistants, would travel and were requested for specific assignments, but not the whole work force. Damgaard Andersen for example, mentions that by the late 6th century BC, the building of temples can almost be considered an industry.[386] Regarding the immigration of craftsmen such as Eucheir, Diopos and Eugrammos, some valuable remarks were made by Ridgway in his contribution *Demaratus and his predecessors*.[387] He underlines that these craftsmen were definitely not the first to arrive in central Italy and that the Demaratos story should be read *in terms of interaction between equals*. This interaction arose both between the Etruscan nobility and Demaratos as well as between the indigenous craftsmen and their immigrant counterparts.

2.8 *Conclusion*

A cross-cultural analysis of 185 societies by Murdock and Provost to examine the division of labour by sex, supports the argument that pottery production is an activity which becomes assigned to males when:
- simpler production techniques are replaced by more complicated procedures,
- residences become more settled,
- agriculture intensifies,
- complex civilisations are developing which results eventually in the assignment to male specialists of even the most female tasks such as cooking and making bread.

These four features are attested for central Italy during the period 800 to 400 BC. The general principle is that '*greater technological complexity is associated with a shift in sexual allocation of the more complex tasks from females to males*'.[388] The production of ceramics in central Italy changed significantly during the centuries reviewed.

[385] See: Torelli 1983. Other references to the ceramic industry are found in Pliny *NH*, VII, 205; XXXV, 15-17, 151-155.

[386] Damgaard Andersen 1993, 85.

[387] Ridgway 1992 b.

[388] Murdock and Provost 1973, 216.

The transformation is based on the adoption of fundamentally different production mechanisms on a local level. Around 800 BC the majority of the pottery was produced within the household by women who were either completely or partially independent in their ceramic requirements. Towards 400 BC the bulk of the ceramics was made by men within a workshop mode of production be it full-time or part-time occupation. Women may have assisted in these workshops but apparently men could claim control over the primary subsistence activities of their family.[389] From ethnographic findings it was established that the production of pottery made by hand in slabs or by using an elementary mould or turntable and subsequently fired in a simple kiln without separation of combustion and ceramics, is mainly the activity of females who make pottery during household tasks, pregnancy and nursing. Thus, pottery making is accomplished within the household by using simple technology due to which the production chain can be interrupted when other household tasks need to be tended to first. Usually, women are allocated those sequences of activities which entail low risk tasks close at home.[390]

The production of fine table wares using more elaborate and efficient technology such as a potters' wheel and an updraught kiln, involves artisans and reflects a men's craft. With increasing specialisation the pottery started to be made predominantly by men. However the production of ceramics could involve all members of a household in conditions that reflect a family workshop. Another option is the master workshop where labour depends mainly on assistants.[391]

The technological and social-economical transformation of the ceramic industry is mirrored in the pottery itself. It is a facet of the process of specialisation which is related to the early urbanisation of the region. As mentioned above pottery technology became more complex during the period 800 to 400 BC while male craftsmen took over its manufacture. This transformation occurred gradually and involved various processes since a more complex mode of production does not exclude a simple one. The evolution of the potters' craft depended on factors such as the quality of the agricultural land and the extent of the local and regional market. The distinction between household and workshop industry may have faded slowly in the developing urban centres while in the smaller centres it probably did not disappear at all. In many smaller centres, pottery production remained a part-time activity and probably was organised around a family unit. The production of ceramics progressivily evolved towards craft-specialisation. Until the 6th century BC, the local hand-made pottery used for preparing and firing food, may have been made within a household tradition. Simultaneously, ceramics are encountered which were made by craftsmen who utilised levigated clays and a fast wheel. These artefacts are known as fine-wares and were mainly used for eating and drinking. During the Orientalising Period the demand for these vessels is related to new consumption patterns and to a cultural change. Luxury ceramics started to be used during rituals such as the *symposia*.[392] The ceramic vessels employed during these rites can be described as highly valued artefacts and luxury wares. Besides changing consumption patterns, demand is also affected by increase in population size and the number of households. According to Arnold, a household replaces three to six vessels a year and a population of about 1,000 would result in sufficient demand for utilitarian wares to induce specialisation. Thus any process which increases the number of households such as settlement nucleation and urbanisation, would eventually lead to full-time craft specialisation.[393] A significant feature for central Italy is that the production of the plain wares became assigned to workshops during the 7th and 6th centuries BC. I suggest that this reallocation is closely associated with the manufacture of ceramic building materials. These ceramics started to be produced in bulk from the second half of the 7th century BC as is demonstrated by the developments at Acquarossa, *Caere* and other settlements. The

[389] The role of slaves within workshops is discussed at a later stage. It is probable that at this date slaves were mainly employed in domestic service and not in craft- or agricultural production: *cf.* Cornell 1995, 280. See also: Colonna 1975.

[390] Arnold 1989, 100-8.

[391] Scheibler 1984.

[392] *cf.* Rathje 1983; 1990.

[393] Arnold 1989, 156-7.

relationship between building materials and household ceramics is also recorded for the workshops at *Satricum*, Laurentina-Acqua Acetosa and Marzabotto dated to the late 6th and 5th centuries BC.[394] The manufacture of architectural terracottas and household vessels together in one workshop is probably the main cause for the continuing *impasto* tradition in central Italy.

The emergence of workshops which produced utilitarian ceramics is, therefore, primarily related to an increasing demand due to the rise in the number of households during the 8th to 6th centuries BC. During the 5th century BC this development may have altered into population pressure and an associated marginalisation of the agricultural base of households which can be observed in changing settlement patterns.[395] Marginalisation would also affect the conditions and organisation of workshops and the social position of potters. Increasing social-economic pressure is reflected by the disappearence around 500 BC of various centres such as Acquarossa, Poggio Civitate and Laurentina-Acqua Acetosa. It is also indicated by the pottery itself. For example, the development of the *bucchero* production has been described as '*pièces de prestige (au VIIe s), pièces de demi-luxe perpétuant une tradition aristocratique (fin du VIIe et VIe s) et pièces utilitaires communes (fin du VIe au IVe s)*'.[396] This transformation of the *bucchero* production characterises the changes of the whole ceramic industry. From the 7th to the 5th centuries BC workshops gradually became involved in the production of subsistence goods for a local market. The nature of the ceramic product that was made in a workshop progressively altered from luxury to subsistence goods. The lasting evolution of the ceramic industry from a household activity to a workshop enterprise is correlated to this change in the character of the product. Workshops conditions were initially fostered by the elite who required luxury vessels while these enterprises became gradually also involved in the manufacture of subsistence goods. Moreover, one can detect from the evidence presented in this chapter a shift from small scale arrangements to large scale installations. The excavated workshop remains at Poggio Civitate, *Caere*, Laurentina-Acqua Acetosa and Marzabotto demonstrate the substantial size these enterprises could obtain.[397]

The general development of the ceramic craft is presented above and is characterised by:
- the evolution from a household activity to a workshop industry and the related sexual reallocation of tasks,
- the role of the elite and the increase in the number of households,
- the close relationship between ceramic building materials and household wares,
- the transformation from luxury to subsistence goods,
- the increase in the size of the enterprises and
- emerging marginalisation of the craft during the 5th century BC.

In order to support this outline, I would like to continue the account in chronological order.

During the 8th century BC the pottery production was primarily organised as a household activity or industry. The early kiln structures at Lavinium, Rome and Cures Sabini are simple.[398] It is not certain whether in these

[394] Torelli suggest an increase in craft specialisation around 500 BC. He implies that the manufacture of ceramic building materials became distinct and separated from the pottery production: Torelli 1983. His hypothesis is not supported by the primary data that is presented in this chapter.

[395] See for example, Arnold for a discussion of the principle of marginalisation of the pottery production: Arnold 1989, 199.

[396] Gran-Aymerich 1993, 35.

[397] The 8th and 7th centuries BC workshop remains indicate simple, small scale structures which were mainly located in settlements that still consisted of huts. The lay-out of the workshop at *Caere* has not been excavated completely but the kiln, levigation tanks and waterworks cover an area of about 350 square meters while the workshops with living quarters at Marzabotto in *Regio* II, *Insula* 1 and *Regio* IV, *Insula* 2 are about 700 square meters.

[398] Negroni Catacchio 1995, 280-3; Carafa 1995, 255. This chapter presents some early kiln structures at Lavinium and *Satricum*. Barbaranelli interprets an early Iron Age feature that he excavated at Torre Chiarucchia which is located along the coast, 7 km to the north of *Pyrgi*, as a pottery kiln: Barbaranelli 1956. This interpretation is ambiguous. For example, the feature does not have a combustion hole. He

structures the fire is separated from the pottery but an increase in the ability to control the firing circumstances is demonstrated by the pottery itself.[399] This reflects conditions for household industries. Elementary household production must have continued though simultaneously workshops conditions were introduced for a restricted production of Italo-Geometric wares.

The ceramics from the 7th century BC exhibit an increase in specialisation along several lines. Workshop conditions are reflected by the continuing production of Italo-Geometric wares. A response of the indigenous potters is the *bucchero* production and elaborate fine *impasto* vessels. The demand for these luxury table wares was instigated by the elite and their changed consumption patterns. Examples of highly intricate drinking vessels from Ficana and Poggio Civitate are mentioned in this study but one can equally recall the production of the rudimentary workshops at *Satricum*, Vetulonia and Roselle.[400] These workshops did not exclusively produce fine *impasto* vessels but also coarser fabrics. Thus, they manufactured a range of pottery wares some of which are highly elaborate. This reflects increasing craft specialisation leading to workshop conditions and, therefore, I have described these arrangements as rudimentary workshops. Authentic pottery workshops are characterised by efficiency and mass production which is not the characteristic feature of these early workshops. It is tempting to apply in this context the concept of energy expenditure which implies that in pre-state societies, pottery can be elaborately made while in state societies pottery becomes standard.[401] This concept can only be employed for the 7th century BC if one incorporates Voutsaki's comments that

1. labour in pre-capitalist societies is not a commodity, and

2. value is not crystalised at the moment of production, but can be redefined during exchange.[402]

In chapter IV, I will demonstrate that market mechanisms were introduced in central Italy at least from the second half of the 7th century BC but that these mechanisms were adopted reluctantly. The confrontation between the market mechanisms of the Levantine and Greek societies versus the essentially, non market mechanisms of Italian communities appears to be contained in the quality of the attractive early *bucchero* and fine *impasto* table wares. This indigenous tradition can be contrasted to the production mode of the standardised wheel-turned pottery imitating the imported ceramics and that was characterised by a necessary increase in efficiency and full-time occupation. The labour intensive production of the fine *impasto* and early *bucchero* wares was probably not directly translated into value because their exchange was not regulated by a market. Therefore it seems that an immediate response of the indigenous potter to the efficiency of the workshop mode of production was an elaboration of the previously established *impasto* tradition. This idea is supported by the meticulous burnishing of these vessels which is a technique basically alien to wheel-throwing.[403] The local potter adopted the majority of the shapes of the imported ceramics but did not embrace the associated technology and related market mechanisms. Nevertheless, the efficiency of their manufacturing techniques increased rapidly and the production of the *bucchero* and *impasto* table wares became more standardised during the second half of the 7th century BC. From the middle of this century the manufacture of ceramics intensified at various sites. Late Italo-Geometric and Etrusco-Corinthian wares were

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neither reports firing traces along the walls. Therefore, the site is not included in this study.

[399] See section 2.5. It implies that during this period updraught kilns became commonly adopted and that vertical moulds were used for vessels with an elaborate plastic decoration: *cf.* Bietti Sestieri 1992 b, 94.

[400] For Ficana and Poggio Civitate see: *Case e Palazzi d'Etruria* 1985; Phillips 1993. For *Satricum* I refer to: Beijer 1991 b. The workshop at Vetulonia is discussed by: Gregori 1991. The *atelier delle rosette* at Roselle is presented by: Donati 1991. See also sections 2.6.1 and 2.6.6.

[401] *cf.* Rice 1991, 259-60, 272. See also: Moorey 1994, 141, 157. Mooreys' chapter 4 on the Ceramic and Glassworking Crafts, presents an illuminating analogy when compared with chapter II of this study because several disputes coincide.

[402] Voutsaki 1995, 9.

[403] The sealing of wheel-thrown pottery is characterised by the application of slips and paints or is effected by the chemical composition of the clay.

produced *en masse* in Etruria. At the expense of labour investment per artefact, fine *impasto* and *bucchero* pottery started to be made in series. This successful transformation may also account for the long-term changes in the *bucchero* production which were characterised as developing from prestige ceramics to semi-luxury vessels. Eventually *bucchero* became one of the fabrics for common table wares.[404]

A major impetus for the ceramic industry was the replacement of huts by houses with stone foundations. These houses were roofed and faced with architectural terracottas. At settlements such as Poggio Civitate and Acquarossa, the manufacture of these ceramic bulk wares started about 650-640 BC. It is probable that this process occured also at other settlements in central Italy.[405] The building activities in central Italy from about 650 BC had a far more enduring impact on the ceramic industry than the altered manufacture of luxury table wares. The manufacture of ceramic building materials created a massive demand and assimilated the production of coarse household wares within the workshop mode of production. The considerable demand for the architectural terracottas is reflected in the calculations from Acquarossa where the construction of an average house required about 600 tiles. This quantity at first outnumbered the ceramic household wares required by the family-unit living in the house. The workshops producing the ceramic building materials, absorbed the manufacture of household wares of similar *impasto* fabric. A workshop would produce architectural terracottas as well as ceramic vessels such as storage jars, jars, bowls and basins. At Poggio Civitate for example, it has been established that the tiles, the ceramic statues and the *impasto* household wares were made from the same clay deposit.[406] This implies that these wares were modelled in the same workshop that made the tiles and other ceramic building materials. In particular, the local red ware production at various sites in central Italy can be related to the manufacture of tiles. This was substantiated in this chapter by a description of the red ware production at *Caere* which could be related to the local coroplast tradition. It was an *impasto* production employing slab building and for the vessels, turning on a slow wheel. In quantity this *impasto* production far outnumbered the production of the fine wares made on a fast wheel. This indicates that specialisation of the pottery craft in central Italy depended chiefly on the production of bulk wares, that is the *impasto* tradition. This hypothesis is recently substantiated in a study by Docter who could distinguish the manufacture of transport *amphorae* in central Italy from other regions in the Mediterranean. In central Italy these *amphorae* were modelled by hand and finished on a turntable while in most other regions they were made on a wheel.[407]

The increased demand for ceramics during the 7th century BC probably established early nucleation of workshops at primary centres such as Tarquinia, Vulci, Vetulonia and *Caere*. In this chapter this hypothesis is supported by an examination of the secondary evidence of the pottery production at *Caere*. At smaller sites the process of specialisation in the ceramic craft occurred as well but nucleation was not feasible. In these settlements, rudimentary workshops had to produce a range of wares. This is implied by the evidence presented from *Satricum*, S. Pietro a Sieve and Poggio Civitate. Other options for the progress of craft specialisation in these smaller settlements during the 7th century BC are:

- that craftsmen besides pottery manufacture may have been involved, in other activities such as agriculture or
- that within a single workshop several materials may have been processed. For example, a combination of carving and pottery manufacture is possible and is suggested by the stoa workshop at Poggio Civitate.[408] The close

[404] Gran Aymerich 1993, 22-3.

[405] *cf*. Prayon 1975 a.

[406] Tobey *et alii* 1986. See also section 2.6.6.

[407] Docter 1997, 89-90, 155-6, 191, 192-215, 244-7. The transport amphorae from central Italy that could be examined by Docter, Annis and Jacobs were made with various modelling techniques such as moulding the base, coiling the walls and finishing by rotation on a turntable or slow wheel. Eventually a slib was applied: Docter 1997, 215. Phoenician and Attic transport amphorae were made in a workshop employing a fast wheel. Corinthian transport amphorae were, however, modelled by hand employing coiling techniques and rotation on a slow wheel: Docter 1997, 245-6.

[408] See sections 2.6.6 and 3.6.8.

relationship between the early *bucchero* production and the metal craft is reflected not merely in the decorative techniques but also in firing conditions. This implies that these materials were probably processed in an industrial compound of a settlement where various materials were handled.

The export of Etruscan pottery overseas from the second half of the 7th century BC, demonstrates the effective evolution of the local organisation of the ceramic industry. The *bucchero* production expanded in line with a widening market and was able to compete on foreign markets during the late 7th and first half of the 6th centuries BC.[409] The export of bulk commodities is recorded by the Etruscan transport *amphorae*. These vessels are distributed along the west-Mediterranean coasts from about the last quarter of the 7th to the late 6th centuries BC. The transport *amphorae* are recorded in substantial quantities at sites in southern France which reflects directional trade between Etruria and the Mediterranean coastal settlements of France.[410] An account of the organisation of the manufacture of the Etruscan *amphorae* would be interesting because it represents administered economic structures. Unfortunately this aspect is barely understood due to lack of inscriptions, homogenous fabrics and standard measurements. The early *amphorae* types are especially miscellaneous. Bound, for example, noticed that the Etruscan *amphorae* from the Giglio shipwreck and dated around 600 BC, lack standardisation in dimensions and fine detail.[411] They are labelled Etruscan *amphorae* because their production cannot be attributed to specific sites in central Italy though Vulci is frequently implicated as the major production centre.[412] Type Py 5 which is attested during the 6th century BC and which is found in Etruscan merchant vessels, appears to have more uniform dimensions.[413] The *amphorae* excavated at *Caere* in a settlement context include 112 fragments of Etruscan origin which is less than the imported *amphorae*. The fragments of the imported transport *amphorae* derive from various places around the Mediterranean. Besides some Punic and Graeco-Italian *amphorae* the provenance of the *amphorae* is ascribed to Attica, Chios, Samos, Corinth and Marseille.[414]

The report on the export of Etruscan ceramics takes this chronological account into the 6th century BC. The primary evidence presented in this chapter demonstrates that the association of ceramic building materials and the household wares is still valid for the Archaic period and the pale Archaic wares. This is indicated by the kiln complex B at *Satricum*, the workshops at Laurentina-Acqua Acetosa and at Marzabotta which demonstrates that this relationship continued into the 5th century BC.

The evidence of the Archaic period provided the first example of nucleation of workshops. The industrial quarter at Laurentina-Acqua Acetosa is probably the result of a reallocation of settlement functions. The workshops were located next to each other in a new urban development just outside the centre. This demonstrates the high level of planning that is obtained at specific sites in central Italy. The nucleation of workshops in industrial quarters must have induced cooperation and communal organisation of tasks. Whether this led to the institution of a *collegium figulorum* remains open to debate but the hypothesis that some kind of corporation was established during the Archaic period is supported by the evidence for nucleation.

A different kind of workshop nucleation when compared to the situation at Laurentina-Acqua Acetosa, is

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409 Gran-Aymerich 1993, 19.

410 Bouloumié 1982, 58.

411 Bound, 1991, 203-8. He emphasises that the profile of every rim fragment is different.

412 Rizzo 1990, 27-8; Bouloumié 1982, 52.

413 In her catalogue Rizzo published four Py 5 amphorae which have corresponding measurements: Rizzo 1990, 122, 141, 146. Bouloumié who examined the content of the Etruscan merchant vessel that was recovered at Antibes and dated to 540-530 BC, suggests that some of the 180 Etruscan amphorae contained 21 liters while others contained 7 liters: Bouloumié 1982, 3-10.

414 Cristofani 1993, 319-49.

attested at Marzabotto where the workshops are not located next to each other but dispersed over the urban centre. This pattern is the result of a continuation of previous arrangements because some of the 5th century BC workshops at Marzabotto are preceded by late 6th century BC establishments. A similar continuation is attested for complex A at Lavinium and the pottery workshop on the plateau of *Caere*. This pattern is counterbalanced by the location of other workshops in central Italy such as workshop C at *Satricum*, complex B at Lavinium and the workshops at Laurentina-Acqua Acetosa which began to be located on the outskirts of urban centres. This shift of location towards the periphery is not recorded before the 6th century BC. The evidence suggests that originally the production facilities were concentrated in the emerging urban centres. None of the archaeological examples of pottery workshops that could be examined for this chapter illustrates a rural or semi-permanent workshop. The examples of pottery workshops in *Latium Vetus* and Etruria that are presented, are all located within settlement nuclei, emerging towns and towns. They are situated in settlement centres which consist of at least several buildings. In addition, the primary evidence demonstrates that these workshops produced a range of artefacts. Their location in settlement centres and towns indicates an additional demand for ceramics stimulated by the increasing number of households. The workshops producing the ceramic bulk materials for the building activities would not have been located far from the construction works. The absence of evidence for rural or semi-permanent workshops does not in my opinion indicate that they did not exist but rather that their role was limited in relation to the workshops that could be presented in this chapter. To me it seems probable that the emergence of rural workshops is basically of later date and is related to the marginalisation of the crafts. These workshops as well as estate production probably developed during the Republican period. The devaluation of the pottery production is displayed by the gradual degeneration of the quality of the ceramics from the 5th century BC. It is reflected by the output of workshop C at *Satricum*. Colonna suggests a similar decline in the local ceramic production at *Pyrgi* which can be compared with the pottery found in votive deposit II at *Satricum*.[415] It is also demonstrated by the quality of the coroplast tradition and is apparent if the 6th century BC statues are compared with terracotta statues from *Caere* and Lavinium dated to the 5th and 4th centuries BC.[416] The established pottery workshops produced progressively for a local demand within an economy that created less oportunies for growth. This affected the characteristics of the ceramic products as well as the social position of the potters.

[415] Colonna 1988/1989, 18-20, 68-110. Bouma presents the development of the Republican pottery production at *Satricum*: Bouma 1996.

[416] See sections 2.4, 2.6.4 and 2.6.2. See also: Groppo Moretti 1990.

Chapter III *METALS*

'... *hence men agreed to employ in their dealings with each other something which was intrinsically useful and easily applicable to the purposes of life, for example, iron, silver, and the like*'.

Aristotle, Politeia 1257a, 35-40.[1]

3.1 *Introduction*

This chapter on metallurgy includes both the extraction of mineral resources and the manufacture of metal artefacts. It is the metallurgical pendant of the previous chapter on pottery though the role of metals in economic terms is far more decisive than the ceramic industry as is suggested by the quotation cited above. I acknowledge that the exploitation of the rich ore deposits of Tuscany became important for the position of central Italy in the Mediterranean trading network from the early Iron Age. It is not a coincidence that this region became the home ground of the Etruscan civilisation. Bietti Sestieri in a contribution in *L'Etruria Mineraria*, relates the emergence of this civilisation to the increasing metal production and the advance of settlement nucleation during the 9th century BC. Clusters of relatively densely settled, small villages of probably less than 100 inhabitants concentrated on larger plateaux during the early Iron Age. It is recorded that originally the communities on these larger plateaux were topographically separated. Each community was likely to have had its distinct settlement area on the plateau as well as its own necropolis. On these plateaux the future Etruscan cities such as Veii, *Caere*, Tarquinia, Vulci, Vetulonia and Populonia would materialise. The nucleation with its aggregation of resources was one of the preconditions for the urbanisation process during later centuries. It also enhanced the subsequent social stratification. The premise is that the concentration of communities as well as the increase in population during the late Bronze, early Iron Age supported the local manufacture of metal artefacts.[2] This is supported by the regional and eventually local typology of metal objects dated to this period. It indicates that metalworking was an economic activity controlled by the indigenous communities. During the previous centuries the typology of the artefacts was related to wider regions and could even include the whole peninsula. The threshold from diffused to local manufacture described by Bietti Sestieri is dated to the late Bronze - early Iron Age. It is reflected in an increased range of copper alloy artefacts such as special tools, weapons and hammered, luxury objects. These metal artefacts represent an earlier stage of local craft specialisation than the evolution of the ceramic industry described in the previous chapter. It eventually induced regulated exploitation of the mineral resources and surplus production. This indicates an increase in regional, interregional and international exchange activities which involved metals and affected the subsistence economy thoroughly. Because economic exchange was predominantly directed by metals and not by ceramics, the local exploitation of the metal resources in central Italy prior to the 8th century BC would have provided a sound base for the indigenous population to engage in systematic exchange activities with foreign communities. In order to support this opinion I will give an account of some archaeo-metallurgical sites in central Italy dated to the late Bronze Age - early Iron Age.

The settlement at Scarceta is an example of an early metalworking site dated to the late Bronze Age. It is

[1] In this section of the *Politeia*, Aristotle reports the development of means of exchange. The exchange of intrinsically useful materials like iron, silver and the like, is presented as an intermediate stage which eventually culminated in the emergence of coinage. This passage of Aristotle is also relevant for the archaeological evidence that is presented in chapter IV where this heading will be discussed in detail.

[2] Bietti Sestieri 1981; forthcoming.

located near the mining region of Manciano. Metallurgical traces that could be dated to 10th century BC, were found in sectors D and E of the excavations. One structure produced six sandstone moulds for casting axes, arrow points and other artefacts. A floor level related to hut XIII is interpreted as a metallurgical workshop and contained waste products of copper alloy casting, a fragment of a tuyère and fragments of one ceramic and two sandstone moulds. The area around this hut incorporates various structures which were inhabited. This reflects a stable, resident community including a workshop for metalworking. The industrial activities which besides metalworking, involved cloth manufacture and bone working, were combined with agriculture, cattle breeding and fishing.[3] The processing of metals was, therefore, reconstructed as a part-time activity.

Other late Bronze Age, early Iron Age sites in central Italy with evidence for metalworking include Elceto, Sorgenti della Nova and Luni sul Mignone.[4] For example, at Elceto the evidence consists of casting debris of copper, iron ores and pretreated quartz which may have been used as a flux. This material was found in a context dated to the *bronzo finale* period.[5] The copper alloy adhering to the late Bronze Age crucible from Luni sul Mignone contains about 92% Cu and 8% Fe which could indicate the exploitation of the iron-containing copper ores of the nearby mineral deposits.[6] At Sorgenti della Nova the evidence for local metalworking includes a sandstone mould for the casting of a sickle and a fragment interpreted as a copper alloy ingot. This evidence in combination with the range of metal artefacts discovered at the site, indicates that metal was worked by a resident smith on a part-time base.[7]

The archaeo-metallurgical information from the excavations at Gran Carro, a site dated to the 9th and early 8th centuries BC, are included in section 3.6.

The mineral resources available in central Italy include copper, iron, silver and tin ores. The extraction of copper and iron ore deposits has been proven for antiquity. The iron-containing sulphidic copper ores are elemental in the region and it has been suggested that the smelting of these ores and the production of iron are directly related during the early Iron Age (table I).

Some of the production stages represented in Table 1, are optional. For example, it is not necessary to roast some categories of iron ores, though the removal by roasting of sulphur from the sulphidic copper ores is essential. In addition, the hardening of iron can be obtained during smelting as well as smithing. Iron artefacts can be made harder than copper alloy artefacts and this quality is one of the advantages of the metal iron. To what extent this quality was exploited in central Italy is not known because the techniques for hardening metals are intricate. Therefore one of the topics examined in this chapter, is the control over variables which regulate the hardness of metals. Other subjects are an introduction to the various metals, that is gold and silver, copper alloys and iron. This is followed by an account of the ore deposits and the archaeological evidence. As in the previous chapter, the main information reported derives from refuse materials and workshop remains. Bachmann emphasises that refuse materials such as slags should not be seen as isolated evidence but as a component within a metalworking context.

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[3] Poggiano Keller 1988, 162-4. The author mentions another large oval hut with traces of ironworking. Bone was worked in sector D where semi-manufactured pieces were recovered. Cloth manufacture is recorded by spindle whorls and loom-weights.

[4] *cf.* Giardino 1995, 114-5; Zifferero 1991, 213-5. At Luni sul Mignone two crucibles were excavated which demonstrate that copper was worked in this settlement during the period 1300 to 1150 BC: Östenberg 1967, 75, 90, 114, 125.

[5] Zifferero 1992, 88.

[6] Craddock 1986, 271; Giardino 1995, 109-15.

[7] The copper alloy artefacts found at the site are not numerous but reflect the range of objects required for agriculture, clothmaking and personal use. The metal artefacts are dated from the 12th to the 8th centuries BC. Absent are weapons if one excludes an axe which could also have been employed as a tool: Negroni Catacchio 1995, 375-82, 403.

As a result, he presented a check list for investigating archaeo-metallurgical sites and this list includes, besides the technical ceramics such as crucibles and tuyères, various types of slags and associated finds such as hammer stones, crushing plates and structures.[8] This wider framework is the basis for this study. As far as possible, the metalworking context of the individual sites discussed in section 3.6 incorporates references to the various items listed by Bachmann. Furthermore, a reconstruction of the metalworking activities is supplemented by experimental archaeology and ethnographic findings.

Copper	**Production stages**	Iron
	Minerals	
CuFe-sulphides		Fe-oxide/hydroxide/carbonate
	Mining	
	Pre-treatment (sorting and grinding)	
	Roasting	
Removal of sulphur		Removal of water, carbondioxide
	Smelting in shaft-furnace	
	with ore, carbon and fluxes	
Black copper + *Eisensau*		Bloom + iron-silicate slags
+ iron-silicate slags		
Reprocessing by smelting		*Removal of impurities* by heating
of the *Regulus*		and smithing (the *Eisensau* can also be
		refined during this process)
Alloying and casting		*Smithing (+ enhancing carbon-content*
		of iron or smithing iron), hardening
Copper alloy artefact		Iron artefact

Table 1. Production stages of early Copper and Iron Manufacture.[9]

A fundamental reorientation of the metalworking craft in central Italy occurred during the 8th and 7th centuries BC with the extraction of iron ores and the processing and distribution of the metal iron. During the 8th century BC, iron tools gradually replaced copper alloy tools and this meant a considerable investment in labour and resources. The copper which was previously used for tools might have been hoarded, exchanged or employed for the manufacture of ornaments. Simultaneously, a community had to substitute copper for iron. This means that iron ores had to be smelted at an increasing rate depending on the pace with which iron replaced copper alloy artefacts. In a stable community this process would probably have continued until there was a new reserve of iron in the form of a repertoire of iron artefacts. These artefacts would have functioned as a contemporary stock which could be reused once they became scrap metal. However, in a developing economy the demand for iron was affected by aspects such as the increasing population, the value of iron in relation to other metals and exchange activities. These aspects are incorporated in the following sections.

Other metallurgical features and technologies which became apparent on a local scale during the period 800 to

[8] Bachmann 1982, 6-7.

[9] After Sperl 1981, 32-4.

400 BC are:
- ornamentation by granulation,[10]
- hammering and stamping of gold and silver,[11]
- mass production of copper alloy fibulae,[12]
- hammered copper alloy artefacts as, for example, the manufacture of copper alloy basins,[13]
- specific smelting, alloying and casting techniques of copper alloys,[14]
- new furnaces[15] and
- the hardening of iron,[16]

These aspects are included in this account of the development of metallurgy in central Italy.

I will conclude this introduction with a discussion of the topics itinerant versus sedentary metalsmiths, the degree of specialisation and the status of metalworkers. These topics are related but difficult to assess in a general sense because various options are likely to have co-existed. Thus, Bietti Sestieri and Bartoloni report that metalworkers were originally itinerant in central Italy. On account of the diffused typology of copper alloy artefacts and the existence of metal hoards during the late Bronze Age, Bietti Sestieri suggests that metalworkers were not resident.[17] Bartoloni implies that they were still not settled during the early Iron Age. This assessment is based on the distribution in various Etruscan centres of specific copper alloy artefacts during this period.[18] Their remarks on migrant craftsmen depend on assemblages of finished articles while the excavators of archaeo-metallurgical sites which are dated to the late Bronze - early Iron Age, indicate the presence of settled metalworkers. The metalworking evidence from sites such as Scarceta and Sorgenti della Nova is interpreted as debris associated with resident though part-time metalsmiths.[19] With the advance of settlement excavations and the incorporation of ethnographic findings, one can recognise a preference for sedentary craftsmen. This is a general trend in archaeology.[20] The controversy between migrant or resident craftsmen is charged by the history of the archaeological discipline itself. A previous partiality for the diffusionist model is counteracted by a more recent favouring of local developments. However a biased approach will not clarify the historical processes involved. Itinerant craftsman function within a given community and in my opinion it should be one of the archaeological principles to examine first this community before introducing migrant artisans. A mere reference to itinerant smiths without an account of how these craftsmen functioned within the communities they visited, makes metallurgical activities in a sense imperceptible or non-existent as a social-economic phenomenon.

The manufacture of metals in central Italy by 800 BC was by the nature of the skills and activities involved,

[10] Nestler and Formigli 1993.

[11] Strøm 1971, 207-14.

[12] Bietti Sestieri 1992 a, 479-84.

[13] Albanese Procelli 1985.

[14] *cf.* Formigli 1993; Wiman 1990.

[15] Nijboer 1997 and this chapter.

[16] Nijboer 1993-1994.

[17] Bietti Sestieri 1981, 226.

[18] Bartoloni 1989, 154.

[19] Poggiano Keller 1988, 162-4; Negroni Catacchio 1995, 375-82, 403.

[20] *cf.* Wells 1984, 20-2, 57-74.

specialist labour. Seasonal activity of metallurgists has been implied for many societies and could have existed at sites in central Italy.[21] In addition, one can differentiate between degrees of specialisation. For metal production there is a correlation between the level of specialisation, the technical skill required to produce an object and the distance travelled in trade by the finished metalwork product.[22] Thus resident, part-time metalworkers may have been involved in repairs, the manufacture of common tools and the production of standardised, mould-made artefacts. Full-time specialisation is suggested for the production of certain weapons and luxury goods which would require particular technical skills. These specialist pieces are distributed over a much wider area and may be correlated to either exchange activities or to itinerant craftsmen who worked on commission. Working on commission will have continued throughout the period discussed. For example, the casting of large copper alloy statues during the late 6th and 5th centuries BC was probably commissioned and may have involved itinerant, master craftsmen.[23] Unfortunately, few early monumental bronzes have survived in central Italy which makes a technical and stylistic comparison difficult. Large, early statues are known from Arezzo, Todi, Ariccia and Rome.[24] For instance, it is suggested that the *Lupa capitolina* in Rome dates to the first half of the 5th century BC though it is debated whether it could have been cast by a native workshop.[25] The discovery at Marzabotto of a fragment of a mould for casting a statue which was about 1 m high, demonstrates that there were workshops in central Italy which made monumental bronzes by the 5th century BC.[26] A parallel of the situation which probably existed in central Italy as well, is provided by Schneider and Zimmer. They interpreted the 6th and 5th centuries BC workshops at Athens and Olympia as temporary arrangements for casting life-sized statues. The examination of the debris implies that the itinerant artisans did not transport other materials besides their tools. In a workshop such as the one excavated at Olympia, 10 to 12 workmen were necessary, two of whom might have been masters, one for the artistic execution and one for the casting procedures. It is argued that the group of itinerant craftsmen who travelled from commission to commission may not have been larger than 4 to 5 people while the other assistants were recruited locally.[27]

The social difference between master and assistants reflects workshop conditions and distinction in status. The master blacksmiths may have been independant and wealthy though impoverished circumstances must have occurred as well. The master-assistant interdependence is only one of the possibilities for workshop relations. Ancient literary texts refer to large factories during the late 5th, early 4th centuries BC. Demosthenes, for example, describes the property of his father at a trial: '*My father, men of the jury, left two factories, both large businesses. One was a sword-manufactory employing thirty-two or thirty-three swordsmiths, most of them worth five or six minae each and none worth less than three minae. From these my father received a clear income of thirty minae a*

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[21] *cf*. Rowlands 1973, 595-6. Rowlands suggests that in southern Britain during the middle Bronze Age, smiths worked seasonally when they would produce a stock of semi-finished artefacts. This stock could be used to meet an estimated demand at a time when the smiths would be involved in subsistence activities such as agriculture.

[22] Rowlands 1973, 596.

[23] I refer to Zimmer for an account of itinerant workshops that produced monumental copper alloy statues in Greece: Zimmer 1990.

[24] *cf*. Cristofani 1985, 29-53, 288-300. He reports the development and technical features of Italian bronzes. Craddock mentions that the late 5th century BC Mars from Todi is a leaded bronze while the 4th century BC Chimera from Arezzo contained little or no lead: Craddock 1986, 233. The date of both statues derives from Cristofani: Cristofani 1985.

[25] The *Lupa capitolina* is 83 cm high and 136 cm long: *Roma* 1992, 57; *Grande Roma* 1990, 144-5; von Vacano 1973. Von Vacano states that the *Lupa capitolina* might be from the second half of the 5th century BC but could also be later. He indicates that the style of the statue is related to Etruscan art.

[26] Rasenna 1986, 102, fig. 53. The context of this mould is presented in section 2.6.7.

[27] Schneider and Zimmer 1984. At Olympia these artisans exploited local clays for the manufacture of the technical ceramics. The authors distinguished two clays which had been processed in antiquity according to the properties required.

year. The other was a sofa-manufactory employing twenty sofa-makers, given to my father as a security for a debt of forty minae. Besides this he left ivory and iron, used in the factory worth about eighty minae; and gall and copper which he had bought for seventy minae'.[28] Thus, the owner of a factory was not necessarily a craftsmen himself. The workshop was probably directed by a foreman under whose supervision the slave-smiths worked. This fragment also specifies that there were slave metalworkers of different grades.[29] The above reflect possible conditions during the 5th century BC which need not apply to previous centuries. Workshop conditions arose in central Italy during the period examined and are related to the early urbanisation process and emerging markets. Whether circumstances as described by Demosthenes could have occurred in central Italy has to be examined. An increase in the size of the workshops was recorded in the previous chapter but remains to be established for the metalworking craft.

In this study it is assumed for central Italy that servile labour in workshops gradually increased over the centuries. During the 8th and 7th centuries BC slave labour may have been restricted to personal care but probably did not involve the specialised crafts. In relation to status, it is likely that the range of social positions of metalworkers during this early period was more diversified, less restricted than in later centuries.[30] Wason considers that craft specialisation itself is a form of social differentiation and that even part-time specialists differ from non-specialists. He reports that craft specialisation '*is also widely associated with inequality, but this is largely an empirical observation. The problem is that specialists are not themselves elites though they may gain respect through their skill*'.[31] This seems to be less relevant for metalworkers than for other groups of artisans. The status of smiths is frequently reported as inconclusive ranging from highly regarded sometimes of chiefly status, to low status.[32] Rowlands for example, recorded that the Basakata metalsmiths in Congo are hierarchically ranked on the basis of the metalwork they can produce. Thus, '*the production of parade objects and insignia could only be done by the master-smith who also happened to be the village chief*'.[33] Scott presents documentary evidence which demonstrates that during the Irish Iron Age, at least some of the artisans who manipulated iron enjoyed an elevated social status, while Heidinga and Offenberg present information on the high reverence for elite smiths during the early Middle Ages in Western Europe.[34] Another ethnographic example indicates that the status of Mande blacksmiths in west Africa is ambiguous. They are both respected and feared for their magical powers.[35] This respect and fear for smiths is based on their specific knowledge which is not shared by their fellows. They may, therefore, be credited with superhuman powers. At certain stages of social development, the mastery over metals and especially over iron could result in an important position of smiths in affairs of ritual and magic.[36] The ancient Greeks, for example, believed that ironworking was invented by various demons and elves which corresponds with an originally ambivalent attitude towards smiths who appeared to combine sorcery with craftmanship.[37] Tylecote

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[28] Demosthenes 27,9. After Demosthenes, Private Orations, I, Against Aphobus, I, 9: Heinemann 1946. These lines are discussed by: Pleiner 1969, 21-2. See also: Bakhuizen 1976, 77.

[29] Pleiner 1969, 22.

[30] See section 1.6 where the model of Bonghi Jovino is presented.

[31] Wason 1994, 107.

[32] Tylecote 1987, 12-8.

[33] Rowlands 1973, 594.

[34] Scott 1986; Heidinga and Offenberg 1992, 118.

[35] McNaughton 1993, 1-21, 146-61.

[36] Motz 1983, 3, 13.

[37] Pleiner 1969, 7-8, 36-7.

concluded that the status of smiths varies from:
1. highly regarded, often with eminent status;
2. equal to other craftsmen with no special position, and
3. low status of servile nature.[38]

The status obtained depends on the society examined. For the situation investigated in this study, option 3 may have occurred during later periods. However during the 8th and 7th centuries BC the status of smiths could have included option 1. It is probable that during the period 800 to 400 BC there was a general transformation of the status of metalworkers which is related to the stratification process itself as well as to the value that is attached to the artefacts they made.[39] Since the value of the finished objects decreased so may have their social position. Pleiner implies indirectly for Greece a similar reduction in status of the metalworker as well as in value of the finished metal artefact.[40] Some of his deductions appear to be relevant for the transition of the metalworking craft in central Italy. For example, he reports two possibilities for the smelting of iron ores which includes during an earlier period, smelting clans and families living nearby mines while for the classical and later periods, slaves may have operated the mines and bloomeries.[41] In relation to a decrease in the status of the metalworker it is relevant to refer to some archaeo-metallurgical sites in central Italy. Poggiano Keller for example, suggests that at Scarceta there was a direct link between political power and metallurgical activities.[42] Moreover, the excavation of the stoa-workshop at Poggio Civitate demonstrates the close relationship between the main building and the elaborately decorated workshop.[43] The remains discovered at Lago dell'Accesa, are discussed in section 3.6 but it is appropriate to recall at this stage that they illustrate that mining could still be combined with other activities during the 6th century BC. Mining at this site seems to have been a part-time communal activity of several families. Moreover, the site indicates that conditions at mining settlements did not have to be destitute. The archaeological evidence rather suggests that several families combined their efforts and that the community could obtain a relatively comfortable style of living.[44] The last example presented, derives from *Satricum*. At this site some of the metallurgical debris is concentrated in an activity area connected to building AA and hut VII. The context is dated to the 7th and early 6th centuries BC. The associated finds includes *bucchero*, fine *impasto* wares, some pottery of depurated clays and a small terracotta head. The pottery indicates that at this site a relatively affluent family was involved in metalworking.[45]

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[38] Tylecote 1987, 12.

[39] The value of metal artifacts is discussed further on in this chapter.

[40] Pleiner 1969.

[41] Pleiner 1969, 14, 34-5.

[42] Poggiano Keller 1988, 162-4. Her suggestion is in itself ambiguous since the character of the link is not specified. The implication is based on the location of the metalworking area which is close to an important hut.

[43] Nielsen 1987.

[44] *Etruria Mineraria* 1985, 126-78; van Dommelen forthcoming.

[45] Nijboer, 1993/1994; Beijer 1991 a; Maaskant-Kleibrink 1992, 92-7, 99-100; The catalogue numbers 2239 to 2541a in Maaskant-Kleibrink, present an illustration of the pottery with which the iron slags can be associated. In addition, slags are found in this area during recent excavations which await final publication. Beijer reports that one of the important families at *Satricum* occupied this area: Beijer 1991 a, 24. On account of the metallurgical waste material excavated in the 7th century BC strata of hut VII and the timber building, it is probable that at least one of the activities in which this family was involved, was metalworking.

3.2 *Gold and silver*[46]

The change in the manufacture of gold and silver artefacts during the late 8th and 7th centuries BC is revealing because of its brisk progress.[47] A new metallurgical technique which started to be applied locally, is granulation. Granulation is an arrangement of small globules of metal on a metal surface in an ornamental or figurative design. The manufacture of the granules, the diameter of which could be less than 0.1 mm, involves tiny snippets or filings of gold. These snippets are placed in a ceramic vessel in alternating layers of charcoal powder and filings. The gold particles should not be in contact with each other. The vessel is closed with a ceramic lid and heated to about 1,100°C. Around this temperature, the gold snippets and filings will contract to granules.[48] Subsequently, the granules are arranged on the metal artefact. They are joined to the metal base with a *chrysicolla* suspension as solder. The copper in the *chrysicolla* will react with gold at a lower temperature than the smelting temperature of gold. Thus, the granules and the metal base obtain a brazed joint.[49]

The granulation technique reached central Italy during the late 8th, early 7th centuries BC, probably directly through Levantine craftsmen. It is an elaborate and highly specialised process which necessitates a transfer of technological knowledge. Thus, the local application of intricate jewellers' techniques such as granulation and filigree, supports the hypothesis that techniques diffused from the East to the West during this period.[50] Several scholars support the hypothesis that it were people from the Levant who transferred these techniques to central Italy. The stylistic examination of the artefacts indicates direct influence from the Near East and not through mediation of the Greek communities.[51] The rapid introduction of goldsmithing-techniques to central Italy has been acknowledged since the last century. By the 7th century BC the standard of gold and silver smithing was high which indicates that these new techniques were adopted successfully on a local level.[52]

Another significant feature is that there are no gold deposits in central Italy. Therefore gold had to be imported and obtained through exchange. It could have been imported from various areas in the Mediterranean and central Europe.[53] However the main trade routes with central Italy during the late 8th and 7th centuries BC show that it was probably obtained through Levantine and Greek intermediaries. The relatively substantial increase in gold and silver jewellery and artefacts during the 7th century BC in central Italy reflects, therefore, the nature of at least one of the exchange mechanisms. This exchange was not restricted to gift exchange as will be demonstrated in chapter IV.

Mineral deposits from which silver could be obtained are known in Italy in the area around Serravezza and in the *Colline Metallifere* though the exploitation of these deposits in antiquity has not been established conclusively.

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[46] Gold and silver are discussed in combination because it is assumed that during the period 800 to 400 BC, both metals were worked by one craftsman. The specialisation process did probably not evolve into separate craftsmen for either gold or silver.

[47] Some golden artifacts that are dated to the early Iron Age are presented by Cristofani and Martelli: Cristofani and Martelli 1983. They present a general account of the development of Etruscan gold artifacts.

[48] Nestler and Formigli 1993, 41-54.

[49] Brazing refers to hard soldering processes above 450°C: Moorey 1994, 216-7, 228-32. The soldering process is discussed in: Nestler and Formigli 1993, 29-40.

[50] Filigree is a decoration technique of very slender wires or threads of gold or silver which are soldered in an ornamental pattern onto a metal base. It is often applied in combination with granules: Moorey 1994, 228-9.

[51] Nestler and Formigli 1993, 14-5; Strøm 1971, 201-16, 212. Strøm considers that much of the jewellery of the early Orientalising Period is the result of '*a co-operation of immigrated Syrian and local Etruscan craftsmen*': Strøm 1971, 201-16, 212.

[52] Nestler and Formigli 1993, 15, 28; Markoe 1992, 62; Scarpignato 1985, 12-7. Scarpignato attributes a goldsmithing workshop to Vulci.

[53] Sperl mentions the Alpine region, the Ungharian-Romanian region and the Orient (Egypt): Sperl 1985, 39. See also Giardino and Tylecote: Giardino 1995, 153-78; Tylecote 1987, 44-7. Maus reports various gold deposits in central Europe: Maus 1993, 16-8.

The presence of ornaments of Antimony dating to the last phase of the Rinaldone culture, indicates the early exploitation of resources which accompany the silver deposits in Tuscany.[54] However this is no evidence that silver was obtained from local minerals during the Orientalising Period. Giardino reports various deposits of galena which contain a small amount of silver.[55] Galena has to be smelted first to produce metallic argentiferous lead before the silver can be extracted by cupellation. Cupellation is a refining process involving the heating of the argentiferous lead in strongly oxidising conditions. The lead is oxidised to litharge which can be absorbed by the cupel, that is a porous dish-shaped crucible or by other porous materials placed in the cupel, leaving behind the silver as molten globules.[56] The quantity of silver that is obtained by cupellation depends on the original silver content of the lead ores. Generally galena contains 0.05 to 0.25% silver and the smelted lead about 0.5 to 2% silver. Therefore 50 to 200 kg of argentiferous lead is required to produce by cupellation, 1 kg silver.[57] The process was known in antiquity and it might have been used as a refining process in central Italy though no industrial debris that can be related to this process, has been reported. At Gran Carro, one fragment of probably a lead ingot, contained a small amount of silver. The associated elements suggest that a local mineral deposit was exploited.[58] This could demonstrate that the raw material for the cupellation process was available and exploited in central Italy during the early Iron Age but it does not establish that the refining process had been adopted. According to Markoe, the argentiferous deposits were exploited by cupellation during the 7th century BC for a number of reasons. He considers that the '*sheer number, variety and distribution of Etruscan silver products found in Campania and Etruria point to an active and productive silverworking industry in central Italy from the late 8th century BC on*'.[59] He continues to report that '*given the availability of the silver-bearing mineral deposits in Etruria and the necessary technology to work them, it is not unreasonable to conclude that the numerous silver products of Etruscan manufacture were actually produced from locally obtained silver*'.[60] Moreover, Markoe suggests that this industry ended during the second half of the 7th century BC and that it was originally under direct influence of resident oriental craftsmen who probably worked at Vetulonia.[61] It is regrettable that these assumptions cannot be supported by actual metalworking debris as found in southern Spain.[62] In central Italy, the activities of gold and silver smelting and smithing are not recorded by factual archaeological traces and, therefore, these metals will scarcely be examined in the remaining sections of this chapter.

[54] Giardino and Gigante 1995, 316; Negroni Catacchio 1981, 98-9; Tylecote 1987, 42, 144-7. The last phase of the Rinaldone culture is dated to the early 2nd millenium BC: *cf*. Östenberg 1967, 184-8; Peroni 1994, 214, Fig. 79.

[55] Giardino 1995, 109-33.

[56] Tylecote 1987, 195-9; Moorey 1994, 232-3.

[57] Bachmann 1993.

[58] Giardino and Gigante 1995, 319-22.

[59] Markoe 1992, 68-9.

[60] Markoe 1992, 73.

[61] Markoe 1992, 68-9, 77-8. Silver vessels were replaced by copper alloy items during the second half of the 7th century BC. In my opinion this implies that the supply of silver decreased during this period. This does not support a large-scale, local exploitation of the argentiferous minerals as suggested by Markoe, because the silver-bearing mineral deposits in Etruria were not exhausted.

[62] *cf*. Chamorro 1987, 199, 202 n.24, 223.

3.3 *Copper alloys*

This section on the copper alloys will report some technical features of copper smelting and alloying after which the manufacture and distribution of some specific copper alloy artefacts is discussed. The exploitation of the rich copper ore deposits of central Italy is presented in the section on mineral resources.[63]

Ores are usually carefully pretreated before smelting. They were crushed, sorted, ground and washed in order to remove most of the gangue and to concentrate the metal content. Gangue are the inert particles, the unwanted part of the ore which is removed by the mineral pretreatment as well as by successive smelting. Fluxes could be added during the smelting process for a reaction with the gangue. If the ore contained much silica as gangue then iron oxide could be added as flux while iron rich ores required additional silica. Flux and gangue combine as fluid slag which is lighter than the molten copper. The copper will, therefore, settle at the bottom of the furnace. There are numerous copper ores which basically can be subdivided in carbonates, oxides or sulphides.[64] During smelting, copper carbonates would be reduced according to the equations:

$$2C + O_2 \;\; \text{----->} \;\; 2CO$$
$$CO + CuCO_3 \;\; \text{----->} \;\; 2CO_2 + Cu$$

Copper oxides are reduced according to the reaction:

$$Cu_2O + CO \;\; \text{----->} \;\; 2Cu + CO_2$$

Copper sulphide ores require roasting for the removal of the sulphur after which it can be reduced with a flux to a matte, that is copper sulphide mixed with iron compounds, and to slags.[65] Subsequently, during the secondary smelting process, the matte was roasted and smelted in order to produce a metal with more than 90% Cu.[66] The *ramo secco* bars from Italy provide evidence for this process. These bars are dated from the 6th to 3rd centuries BC and were probably employed as primitive currency. The bars contain a significant amount of iron and metallographic sections revealed inclusions of both copper and iron sulphides. It is suggested that '*the metal was run straight from the smelting furnace into the mould*'.[67] Therefore the bars represent one of the stages during the smelting process of iron rich copper sulphide ores which occur in various deposits in central Italy. The temperatures obtained in the furnace must have been over 1,400°C in order to produce copper in which 30% of iron is dissolved. In addition, the atmosphere in the furnace needs to be extremely reducing. These conditions can be obtained by increasing the proportion of charcoal in the furnace.[68] Usually, under normal conditions the reduction of copper ores requires a temperature around 1,100-1,200°C which is achieved by charging the furnace with charcoal and ore in

[63] The predominance of the copper sulphide ores in central Italy as well as their smelting procedure was described in section 3.1 in relation with early iron smelting.

[64] Tylecote presents a table with 19 different copper and copper-related minerals: Tylecote 1987, 11.

[65] Bachmann presents a range of possible reactions during the smelting of various copper ores: Bachmann 1982, 21-3.

[66] Giardino 1995, 181-2; Tylecote 1987, 31-3, 128-31.

[67] Burnett *et alii* 1986, 127-8.

[68] The *ramo secco* bars that were analysed, contain up to 35% iron. The high iron content was probably intended to increase the weight of the bars. Burnett, Craddock and Meeks report experiments employing primitive furnaces for copper smelting which regularly resulted in copper with high iron contents: Burnett *et alii* 1986, 128. This high iron content can be moderated by secondary smelting since the iron had to be removed because it renders the copper almost unsuitable for subsequent working.

about a 1:1 ratio, while employing clay tuyères and bellows for excess air.[69] The data that derive from the analysis of the *ramo secco* bars demonstrate that much higher temperatures could be obtained in antiquity. Rehder reports temperatures up to 1,600°C which were secured in a simple charcoal furnace by increasing the intensity of blowing in combination with a higher ratio of charcoal to ore.[70] It is, therefore, probable that in antiquity the temperature in the furnace was manipulated by both means.

A distinction has to be made between the smelting of the ore and the smelting of the copper bar in a crucible. The heat necessary to reduce an ore into molten metal is much greater than the energy necessary to melt the bar-metal. It is reported that the fuel required for smelting the ore, is about 10 times higher than for melting a copper bar.[71] In order to produce 1 kg copper from copper ores it is stated that 20 kg charcoal is needed.[72] The actual amount of charcoal necessary for smelting the ore or melting the bar depends largely on the quality of the raw materials and on the operating conditions. For example, ethnographic findings of early copper mining and smithing methods from central Africa imply that after a careful pretreatment of the copper ore, 50 kg of this high quality ore produced 12-15 kg copper after smelting.[73] Under these conditions, the amount of charcoal needed for smelting would have been much less than reported by Horne.

During the smelting of the copper bar other metals could be inserted into the crucible in order to obtain specific alloys.[74] Artefacts could have been made from copper that was not alloyed such as a *patera* from the *Tomba Regolini Galassi* but the analyses indicate that most artefacts were made of copper that was intentionally blended with other metals.[75] Analyses of Etruscan copper alloys of the 7th and 6th centuries BC demonstrates that there was a different alloying practice for casting and hammering. The cast statuettes tended to be leaded while sheet metalwork only contained traces of lead since copper-lead alloys may split during hammering.[76] Also the early cast Etruscan mirrors are unleaded because lead would reduce the reflecting qualities.[77] The analysis of a 7th century BC fibula demonstrates that zinc was added to copper and, therefore, suggests that brass may have been intentionally made by the Etruscans.[78] *Blenda*, that is zinc-sulphide is reported at the 6th century BC mining site at Lago dell'Accesa and, therefore, indicates that zinc ores were exploited.[79] This could suggest that the zinc was used to produce brass though the early manufacture of brass by the Etruscans requires further analyses of copper alloy artefacts since a regular use of brass is of later date.[80]

The smelting of copper ores and the casting and smithing of copper alloys, results in waste materials which can

[69] Formigli presents the experimental reconstruction of 5th century BC bellows: Formigli 1993.

[70] Rehder 1986.

[71] Rehder 1986.

[72] Horne 1982; Zifferero 1991, 217; Moorey 1994, 282. Horne reports ratios of charcoal to copper from 40:1 to 20:1.

[73] Clark 1991.

[74] The differences in alloying practices is one of the main reasons for the persistent employment in this study of the term copper alloy.

[75] Craddock 1986, 267-8.

[76] Craddock 1986, 223-4.

[77] Wiman 1990 31-43, 227-9, 243-5; Craddock 1986, 227-8.

[78] Craddock 1986, 219-23, 237-8.

[79] Camporeale 1985, 170. The excavators mention that *blenda* was recovered though it is not reported how these pieces of ore were identified. Craddock states that blende is zinc-sulphide: Craddock 1986, 219-20. Tylecote refers to zinc blende (ZnS): Tylecote 1987, 134.

[80] Tylecote 1987, 143-4, 287.

be discovered on archaeological sites. Among these materials are slags and technical ceramics. Slags from smelting copper ores can be chemically distinguished from slags produced during iron manufacture, by a slightly raised copper content.[81] The technical ceramics include crucibles, melting pots, tuyères, moulds, small furnaces, furnace lining and interior core and exterior mould of individually cast, hollow artefacts made with the *cire perdue* method. Other metallurgical evidence consists of furnaces, copper alloy droplets, working tools, metal bars and scrap metal.[82] Tools which are probably associated with smithing are found in the San Francesco hoard at Bologna. This famous hoard was found in a large storage jar buried not far from a hut. The copper alloy artefacts in this hoard date from the late Bronze Age to the early 7th century BC. The artefacts in the San Francesco hoard include 4 moulds, 3 small anvils, 1 hammer, 2 files, 10 saws, 6 chisels and a large number of semi-manufactured fibulae.[83] The excavations of the workshop of Phidias at Olympia and the workshop on the Agora in Athens have resulted in a wide range of debris materials.[84] A comparable context has not yet been reported for central Italy during the period 800 to 400 BC. The evidence presented in section 3.6 is based on a smaller range of workshop debris.

Ethnographic information can provide information for reconstructing the activities at foundries. Some of these accounts are relevant for the workshops of the 6th and 5th centuries BC. A foundry might be a small individual workshop which could be a station for a travelling craftsmen or a factory employing many skilled crafsmen. They occupy a range of locations from a hut in the outskirts of a village to the yard of an ordinary house in a town. Foundries can also be attached to a yard in a separate building or they could be entered from a street. As a rule foundries produce to order and only a few workshops hold stock. The customer may have to pay in advance for the metal and the charcoal or he has to purchase these materials himself. On the other hand the workshop could be large enough to employ a number of craftsmen while having artefacts in stock. The layout may incorporate a shop and storage room apart from furnaces, open rooms and outer workshop areas.[85] Besides casting copper alloys, activities in a workshop can include hammering and decorating. A vivid description of a small modern metal workshop at Chania on Crete is given by Wiman.[86] Several functions were combined in this workshop. The foundry was located at the rear of the workshop and contained some minor smelting furnaces. The workshop itself incorporated a room which opened onto the street. In this room the artefacts are finished by polishing and final decoration. In addition, the objects were sold in this area. A similar combination of functions probably existed in the major Etruscan towns and will be illustrated by the workshops at Marzabotto.[87]

The remaining part of this section on copper alloys will present an account of the evolution of specific copper alloy artefacts. These include Italic fibulae, statuettes, basins and mirrors. The development of the manufacture of these artefacts marks the changes in metallurgy during the period 800 to 400 BC. A principle point of departure is that the Tuscan ores were exploited long before the appearance of the Etruscan culture. This is demonstrated by the analyses

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[81] Sperl 1981, 40-4. The slags might also be classified microscopically. Tylecote as well as Bachmann emphasise that it is difficult to distinguish between slags from copper and iron working without chemical analysis: Tylecote 1987, 300; Bachmann 1982, 4.

[82] Furnaces for smelting copper ores and for working copper alloys are discussed by for example, Coghlan and Tylecote: Coghlan 1975, 26-37; Tylecote 1987, 106-33, 179-83. Some furnace designs are presented in the section 3.4.

[83] Bentini and Mazzeo 1993.

[84] Zwicker 1984; Schneider and Zimmer 1984; Zimmer 1990; Mullwitz and Schiering 1964; Schiering 1991.

[85] Armbruster 1993, 155.

[86] Wiman 1990, 228.

[87] Moorey presents some archaeological examples of metal workshops from Mesopotamia and the Near East: Moorey 1994, 265-9. Lucas reports evidence for copper working in Egypt while Zimmer describes the archaeological evidence for the production of copper alloy artifacts from Greece: Lucas 1989, 199-224, 460-2; Zimmer 1990.

of early copper alloy artefacts.[88] In Etruria during the 9th and first half of the 8th centuries BC, particular traits of the material culture imply the existence of local metal workshops. This development is correlated to the emergence of polities.[89] The developments indicate an increase in the output of the metal workshops. In *Latium Vetus*, metallurgical analyses of fibulae from Osteria dell'Osa established an intensification of the local production during the 8th century BC. The fibulae of the 9th and early 8th centuries BC were individually reworked after casting. The metallographic structures demonstrate intensive hammering and reheating. This thorough reworking was absent from the metallographic structures of the fibulae that are dated around 750 BC. It indicates that these fibulae were manipulated to a lesser extent after casting. Casting in moulds with limited processing afterwards implies a production in series and a standardisation of the manufacturing process when compared with the manufacture of fibulae during the previous period.[90] The time involved in the production of one fibulae around 750 BC would, however, still be considerable because the spring, needle and needle holder of each fibula required individual handling. Repairs to these delicate parts of the fibulae are abundant and mending broken artefacts was one of the tasks of the local smith. The numerous semi-manufactured fibulae of the San Francesco hoard illustrate the production process. From this hoard, 360 fibulae dated from about 750 to 700/675 BC, were examined for details on their manufacture.[91] Two techniques could be distinguished. The fibulae were either made in a piece-mould or by the lost wax method. The clasps which were made in a piece mould are characterised by casting-seams at the closure of the moulding pieces and by excess metal from the header, that is the gate in the mould into which the metal was poured. After casting, these fibulae were decorated and processed individually though their manufacture can be classified as production in series. The second technique is known as the *cire perdue* method. The fibulae which are made with this method are unique and could be either solid or hollow. Most of these fibulae were cast from a wax model that had been decorated. Therefore the decoration process of these fibulae was more efficient than of the mould-made clasps though this efficiency was counterbalanced by the uniqueness of the pieces.[92] When a hollow fibula was produced with the *cire perdue* method, the position of the core of the fibula was secured by a pin. While removing this pin from the cast clasp, the fibula was occasionally damaged. Defaults could be mended by inserting a precut piece of copper alloy sheet which was decorated with a pattern corresponding the decoration of the cast fibula. Moreover, the examination of the 360 fibulae from the San Francesco hoard revealed 10 fibulae which were cast in a piece-mould but which were hollow. The core of these clasps would have been made of a clayey paste which was held in position in the mould by a pin. This pin fell into a recess carved in the mould. In addition to the manufacture of fibulae, the local smith would mend damaged fibulae. Numerous repairs to the delicate parts of the clasps were noted among the 360 fibulae. This involved various intricate techniques as, for instance, renewal of the spring or catch by inserting a prefabricated component into the broken clasp.[93]

The technical inspection of the fibulae from central Italy during the 9th to early 7th centuries BC indicates various production techniques and methods for repair. The local smiths were aware of these techniques which implies a high degree of specialisation during this period. The production process altered slightly during these

[88] *cf.* Craddock 1986, 214. The analyses of copper alloy artefacts and archaeo-metallurgical sites dated to the late Bronze Age, early Iron Age, are presented in sections 3.1, 3.5 and 3.6.5.

[89] Bietti Sestieri 1992 b, 35-45.

[90] Guida and Marabelli 1992, 479-84. Formigli describes the various stages in the production process of similar fibulae in detail: Formigli 1971.

[91] Bentini and Mazeo 1993.

[92] This is one of the reasons why I consider the concept of efficiency difficult to use for manufacturing processes in antiquity. The employment of this concept in historical research requires a knowledge of all variables involved before and after the introduction of new techniques.

[93] Bentini and Mazzeo 1993, 128.

centuries. The manufacture appears to have been directed towards production in series though the artefacts still required considerable individual handling after casting. Another illustration of the craftmanship of smiths during the early 7th century BC is the deposit of exquisite copper alloy artefacts found at Tarquinia. The shield, axe and *lituus* (Fig. 3) are luxury items while fibulae had become common. It is, therefore, probable that in the major centres one could distinguish the master smith from his more average colleagues.[94]

Stylistic analyses of copper alloy statuettes which were either intended as an individual artefact or a decorative element of a larger metal object, implies that their production became increasingly assigned to local workshops.[95] It is suggested that during the 8th century BC, Tarquinia and Bisenzio may have been production centres of these small bronze figurines. During the next century their manufacture has been accredited to smiths working at Vetulonia, Arezzo and *Satricum* while the archaeo-metallurgical evidence from Poggio Civitate demonstrates that decorative statuettes were also made in relatively small centres.[96] During the 6th century BC, the figurines display a remarkable stylistic diversity which is interpreted as a diffusion of the production process over a large number of sites. This suggests that these artefacts became incorported in the repertoire of local smiths. Deposits of similar statuettes at Arezzo, Fiesole, Rome, Gabii, Lavinium and *Satricum*, show that the *Korai* and *Kourai* were produced in series during the second half of the 6th century BC. Moreover, the deposits imply that production may be allocated to these sites and that manufacture was possibly related to the sanctuaries where the statuettes were amassed.[97] During the late 6th and 5th centuries BC the production of copper alloy figurines seems to shift to northern Etruria and Umbria. At Vulci and Chiusi the production appears to be restricted to the casting of decorative elements. During this period Praeneste is considered to have been a production place of high quality copper alloy artefacts in *Latium Vetus*.[98]

The account of the stylistic investigation of the cast copper alloy statuettes is difficult to correlate with the technical examination of the fibulae. The establishment of local workshops producing amongst others large amounts of fibulae during the 8th to 6th centuries BC makes it probable that these smiths made the statuettes as well, since there are no technical restrictions. The statuettes were cast and afterwards moderately worked. The manufacture of these small copper alloy figurines was technically less complicated than the working of fibulae for which delicate components such as the spring, pin and catch had to be manipulated separately after casting. In addition, the quantity of statuettes produced during these four centuries are a mere fraction of the fibulae. Therefore it is probable that the local workshops started to produce statuettes when demand emerged. There is, however, a major difference between both types of artefacts. Small Italic copper alloy statuettes are chiefly found in votive deposits and were intended as votive offerings. Fibulae were also found in votive deposits but are described as personal ornaments and are, therefore, mainly known from tombs and hoards. The difference in context reflects a difference in date as well as in cultural significance because it can be associated with monumental sanctuaries.[99] At this stage it is noteworthy that the intricate manufacturing techniques of the fibulae dated to the 8th and 7th centuries BC can be distinguished from the fairly average production process of the statuettes which are primarily discovered in contexts dated to the 6th

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[94] Bonghi Jovino and Treré discuss the manufacture of the items in this copper alloy deposit at Tarquinia in detail while emphasising the craftmanship of the master smith: Bonghi Jovino and Treré 1987, 66-77.

[95] *cf.* Galestin 1987, 157-70; Cristofani 1985. Galestin implies frequently that stylistic analysis might not be the most appropriate method for allocating production centres.

[96] See section 3.6.8.

[97] Galestin 1987, 169. For the statuettes from Rome, Gabii and Lavinium, see for example: *Grande Roma* 1990, 56-7, 161-3, 187-8. Bonacasa presents the copper alloy statuettes from *Satricum*: Bonacasa 1957.

[98] *Grande Roma* 1990, 164-5, 262-4; Bordenache and Emiliozzi 1992; Jurgeit 1986; Bordenache Battaglia and Emiliozzi 1990.

[99] The increasing role of sanctuaries is for example, stressed in the sections 1.7, 4.1 and 4.2.

and 5th centuries BC.[100] This development of the metal production of two specific types of copper alloy artefacts corresponds with a similar transition in the ceramic craft recorded in the previous chapter.

A related change was noted by Albanese Procelli for the copper alloy bowls and basins.[101] With increasing production during the 7th century BC, the character of these vessels transformed from luxury to semi-luxury items. This transformation is, in my opinion, correlated to a general reduction of the value ascribed to artefacts that were increasingly made within the workshop mode of production. The decline in value is noticed in the context of the depositions and may communicate a depreciation of the factor labour. Originally, during the 8th and early 7th centuries BC the production of these basins was limited. The intensification of their manufacture during the second half of the 7th and early 6th centuries BC is associated with an increasing demand of the elite and emerging classes as well as with typological diversification. This indicates an increase in the number of workshops involved in their manufacture. It is probable that in addition to vessels, these workshops produced other metal artefacts.

The bowls and basins were made from hammered copper alloy sheet and decorated along the rim with a punch. The diameter ranges from 15 to 40-45 cm. In time the small bowls became gradually larger and evolved into basins. The function of these vessels was probably related to various activities such as banquets, washing or preparing food. The bowls and basins are known mainly from Etruria but are also found in *Latium Vetus*, southern Italy, Sicily, the Faliscan area and in southern France. They have been found in princely tombs and votive deposits as well as in tombs of the lower echelons of the elite once the bowls began to be produced in series. The vessels are widely dispersed throughout the second half of the 7th and early 6th centuries BC when in particular the production at Vulci is attested. It is assumed that at Vulci and Tarquinia manufacture continued from the 8th to the early 5th centuries BC. An early production centre is attributed to *Latium Vetus*. In addition, Albanese Procelli considers that during certain periods, basins were produced at Populonia, *Caere*, Marsiliana d'Albegna, Vetulonia, Orvieto, Chiusi or environs, the Faliscan territory and possibly at Gela.[102] These attributions are based on distribution and stylistic analyses. In combination with the production of the cast fibulae and votives, I assume that casting and hammering of copper alloys was practised in almost every polity in central Italy. The production of statuettes and basins probably supplemented the repertoire of the established local workshops. Craft specialisation for individual types of copper alloy artefacts during this stage, seems to me unlikely. However a reconstruction of this craft in central Italy is made clearer in section 3.6 where the primary evidence on metalworking is presented.

The manufacture of the Etruscan mirrors during the 5th century BC is in contrast with the devaluation that was noticed in the production of the above mentioned copper alloy artefacts. Craddock reports, however, that the high quality control during the early production of mirrors abated in later centuries.[103] The production of the well-known Etruscan mirrors was limited during the 5th century BC and consists mainly of tang-type items which were cast from an alloy of about 90% copper and 10% tin.[104] During this period the mirrors were probably still status symbols and had not yet become as popular as in later centuries. In addition, there was no experimentation with mirror alloys or disc sizes during the 5th century BC. It is not likely that scrap bronze was employed during the smelting of the alloy because it would have complicated the control over the composition of the metal. For alloying the artisans apparently employed metals which had not been previously used and which might have derived directly as ingots from the mining regions. The reflecting qualities are achieved through polishing which was the last phase in the manufacturing process. The various production phases during the manufacture of mirrors require collaboration

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[100] This does not apply to the corpus of so-called, high quality, decorative copper alloy statuettes: *cf*. Galestin 1987; Cristofani 1985.

[101] Albanese Procelli 1985.

[102] Albanese Procelli 1985.

[103] Craddock 1986, 237. See also: Wiman 1990, 227-9, 243-5.

[104] Wiman 1990, 31-43, 227-9, 243-5.

which is best obtained within one workshop. Wiman suggests that mirrors may have been produced in Marsiliana d'Algbagna, Vulci, Orvieto, *Caere* and Volsinii.[105]

It is noteworthy that the account of specific types of copper alloy artefacts produced in central Italy during the period 800 to 400 BC is restricted to the development of categories such as ornaments, statuettes, vessels, decorative elements and implements for personal care. In the centuries before the 8th century BC, copper alloys had an additional function as weapons or tools for agriculture and other activities. This use of copper alloys was transferred to iron during the 8th and early 7th centuries BC partly because the cutting edge of an iron tool could be made harder and sharper than the cutting edge of a copper alloy tool. I will not digress on the advantages of harder cutting edges for agricultural purposes, but to make a harder and sharper cutting edge, knowledge of carburisation and quenching is essential to the smith. These skills became gradually available in central Italy from the 8th century BC as was demonstrated by metallurgical examinations.[106] As a result of the replacement of copper alloy tools by iron tools, the employment of copper alloys became increasingly restricted to decorative elements, luxury items and precision implements. Iron became the predominant metal for manufacturing weapons and tools neccessary for the primary economic sector, that is agriculture. The decrease in the number of copper alloy hoards in central Italy during the 8th century BC is associated with metalsmiths who settled permanently within communities.[107] Another hypothesis is that this decrease was associated with the shift from copper alloy to iron tools. Copper and tin had to be imported by many local communities in central Italy and, therefore, their administration was essential as long as they were required for subsistence activities. This might have resulted in hoarding.[108] Iron could in most cases be obtained from nearby sources since iron ore deposits are numerous and occur in most regions. Minerals that contain iron are common when compared with copper and tin ores. Eventually this resulted in a vast devaluation of iron.[109] Once the technology of smelting and smithing iron was mastered on a local level, the need for hoarding base metals probably decreased.

3.4 *Iron*

In this section I will first present the technology of iron manufacture after which the social-economic impact of its introduction is discussed.

The technology of iron manufacture depends largely on the empirical knowledge of the individual smelter and smith since the quality of the iron artefact can be manipulated at both production stages. The properties of a specific

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[105] Wiman 1990, 227-9, 243-5.

[106] See section 3.6.2.

[107] Bietti Sestieri 1992 b, 45; Bartoloni 1989, 32-5.

[108] Hoards may be interpreted in various ways depending on assemblage and context: *cf*. Hoekstra 1997. It is not relevant for this reseach to list the options, variables and contexts of the numerous hoards in central Italy since most of these hoards are dated prior to the 8th century BC. A merely economic interpretation of hoards is a minimal approach towards a complex topic which incorporates features such as ritual depositions of metals, treasure-trove, hoarding and accumulation. For example, the interpretation of the San Francesco hoard at Bologna as a metal hoard of a smithy is probable but does not explain the quantity nor the supervision over this hoard: Bentini and Mazzeo 1993. The economic hypothesis that I presented, is therefore one of the options for interpreting hoards. However, it is a probable interpretation for those hoards which incorporate metallurgical tools and debris. Part of the 8th century BC hoards might actually have been formed at smithies by exchanging copper alloy artefacts for iron items. Bietti Sestieri suggests that the disappearence of copper alloy hoards is related to the transition from itinerant to sedentary metal craftsmen since hoards became increasingly associated with settlements during the late Bronze Age - early Iron Age: Bietti Sestieri personal communication and forthcoming paper in the 1997 issue of the Proceedings of the Prehistoric Society.

[109] See section 3.4.

Fig. 43. Production stages during the processing of iron ores.
1. mining iron ores, 2. roasting the ore, 3. pretreatment of the ore, 4. production of carbon, 5. construction of a shaft furnace, 6. firing of shaft furnace, 7. smelting the ore while charging the furnace with additional carbon and ore, 8. and 9. removal of the bloom from the furnace, 10. primary smithing.

iron object depend on a number of variables which could be controlled.[110] These variables are examined here.

The origin of iron production in central Italy may have been associated with the smelting of copper ores.[111] It is

[110] The presented account on the metallurgy of iron is predominantly based on: Tylecote 1987; Bachmann 1982; Sperl 1980; 1981; Moesta 1983 and Coghlan 1977.

[111] See Table I in section 3.1.

probable that during the Bronze Age, iron was occasionally produced as a by-product while smelting copper ores. The distinct characteristics of iron will, however, have prevented its exploitation during this period. For example, iron did not smelt at temperatures normally obtained in ancient furnaces while a contamination with sulphur makes it unsuitable for further processing. Moreover, the carbon content of iron requires close control. Specifications such as these will have reduced the practical value of iron retrieved as a by-product during the smelting of copper ores.

A discussion of the development of iron metallurgy during the Iron Age involves a distinction between the smelting of iron ores to wrought iron and the manufacture of a steel. The separate steps leading to the production of a bar iron which can be forged into an artefact are presented in Figure 43. The manufacture of steel depends on the percentage of carbon in iron. Figure 44 presents a table of the carbon content in iron with its nomenclature and properties.

Carbon content %	*Modern name*		*Archaeological name*		*Phases present*		*Properties*				
0–0.008	wrought iron		wrought iron	'wrought iron'	ferrite mixed with carbon	+ slag in 'wrought iron'	very malleable	increase in hardness	increase in hardness on quenching due to martensite		increase in strength
0.008–0.07											
0.07–0.15		dead mild / low carbon steel	carburized iron (steel)		ferrite + pearlite						
0.15–0.25		mild / low carbon steel									
0.25–0.55	medium carbon steel									respond well to hardening by quenching	
0.55–0.85	high carbon steel										
0.85					pearlite						
0.85–0.9											
0.9–1.6	tool steel				cementite + pearlite						
2.5–5	cast iron: white / grey		cast iron: white / grey		graphite + ferrite + pearlite		very brittle: cannot be worked				

Fig. 44. Table of the carbon content in iron with its nomenclature and properties.

Pure iron smelts at a temperature of 1534°C, a temperature that was normally not obtained in ancient furnaces.[112] Therefore iron did actually not smelt in the furnaces but was produced in a solid state, directly as a result of the reduction of the iron ore. This reduction is labelled iron smelting and the solid state reduction of iron-oxides to bloom is known as the bloomery process. The reactions involved depend on the type of ore. From about 400°C the following reactions occur in the furnace:

$2C + O_2 \quad \text{----->} \quad 2CO$
$3\ Fe_2O_3 + CO \quad \text{----->} \quad 2\ Fe_3O_4 + CO_2$
$Fe_3O_4 + CO \quad \text{----->} \quad 3\ FeO + CO_2$
$FeO + CO \quad \text{----->} \quad Fe + CO_2$

From about 800°C direct reduction can occur:

$FeO + C \quad \text{----->} \quad Fe + CO$
$Fe_3O_4 + 4\ C \quad \text{----->} \quad 3\ Fe + 4\ CO$

The carbon content which is important for hardening the wrought iron can be increased by two processes during

[112] Rehder as well as Burnett, Craddock and Meeks report extremely high temperatures which could be obtained in antiquity: Rehder 1986; Burnett *et alii* 1986. Moreover, they independently speculate that in theory cast iron could have been produced much earlier than historically attested. Blomgren and Tholander present explanations why cast iron was not produced in Antiquity even though the required temperatures were obtained: Blomgren and Tholander 1986. They indicate that this is mainly due to the early slag formation during smelting which prevented the necessary diffusion of carbon in the iron.

smelting:

1. Iron carbide is produced:

$3\,Fe + 2CO \longrightarrow Fe_3C + CO_2$
$3\,Fe + C \longrightarrow Fe_3C$

2. Simultaneously carbon dissolves in iron.
Less than 2% carbon by weight can be absorbed in the bloom at about 1,140°C.

Thus, ore, charcoal and possibly a flux coalesce in the furnace to a sponge-like mass, a bloom with a high percentage of iron, a variable carbon content and a fluctuating amount of slags (Fig. 45). The bloom can be produced at raised temperatures in various types of furnaces. The high temperatures required are mainly obtained by forced-draught with the aid of tuyères through which air is forced with one or a pair of bag bellows. Two types of furnaces are the bowl furnace and the shaft furnace which can be both slag tapping or non-slag tapping (Fig. 46).[113] Sperl mentions that the shaft furnace was employed by the Etruscans.[114] During smelting, the furnace is gradually filled with alternating layers of prepared ores, possibly sand or other fluxes and charcoal. The height of the shaft furnace is one of the variables which can direct the effectiveness of the smelting. Low furnaces will not utilise productively the gasses emitted in the furnace. Therefore a low furnace may require 400 to 500 kg charcoal in order to produce 100 kg bloom while a taller shaft may require about half the amount of charcoal. In general, the reduction of iron-oxides requires more energy as well as a larger zone of high temperature in the furnace than necessary for the smelting of copper oxides. This is provided by using a moderately higher ratio of charcoal to oxide. The usual smelting ratios by weight of charcoal to ore ranges from 0.5 to 2.0 measures charcoal to 1 measure ore (Table 2).[115]

Table 2. Resources that are required during the smelting of iron ores.

	Moesta[116]	idem	Moorey[117]	Crew[118]	Tylecote[119]	Cleere[120]
Ore	3800 kg	19,000 kg	180	7.6 kg	7 to 15	90 kg
Charcoal	4000 kg	20,000 kg	300	28 kg	7 to 15	120 kg
Iron bloom	360 kg	2,000 kg	18	1.7 kg	1	9 kg

[113] I refer to Cleere for a classification of early iron-smelting furnaces: Cleere 1972.

[114] Sperl 1985, 40.

[115] Rehder 1986. This article predominantly presents data for a possible early production of cast iron. Sperl reports the ratio in weight of ore to carbon as 1 to 2: Sperl 1985, 40.

[116] Moesta 1983, 160. He describes first the resources required by a random workshop with 18 furnaces and subsequently those necessary for a systematic workshop with 95 furnaces. These data refer to the workshops excavated at Weichselboden in Polen dated from 150 BC to AD 150.

[117] Moorey 1994, 282. Moorey presents a relevant description by Hamilton of iron smelting near Trebizond in Turkey. Hamilton made this account in 1842 and used the local measures which are not presented in this table.

[118] Crew 1991 b. The high amount of charcoal used during this smelting experiment might be due to the high blowing rate of the bellows.

[119] Tylecote *et alii* 1971, 345, 353, fig. 32, Table XIII.

[120] Cleere 1970, 17-9. The figures derive from his most succesful trial.

The accounts of the ratio ore to charcoal to bloom presented in Table 2, derive from diverse ores and different smelting procedures while employing dissimilar furnaces and operating conditions. These variations are reflected in the ratios. Variables that affect the ratios are, for instance, roasting and grinding of the ores because they enhance the smelting process. In general hydrated ores, such as limonite or bog-ores, are easier to smelt at lower temperatures than massive ores such as magnetite and hematite[121] while hematite is easier to reduce than magnetite.[122] On average, the ore appears to yield roughly 10% of metal and for the production of 1 kg iron bloom about 10 kg ore is required as well as 10 to 15 kg charcoal.

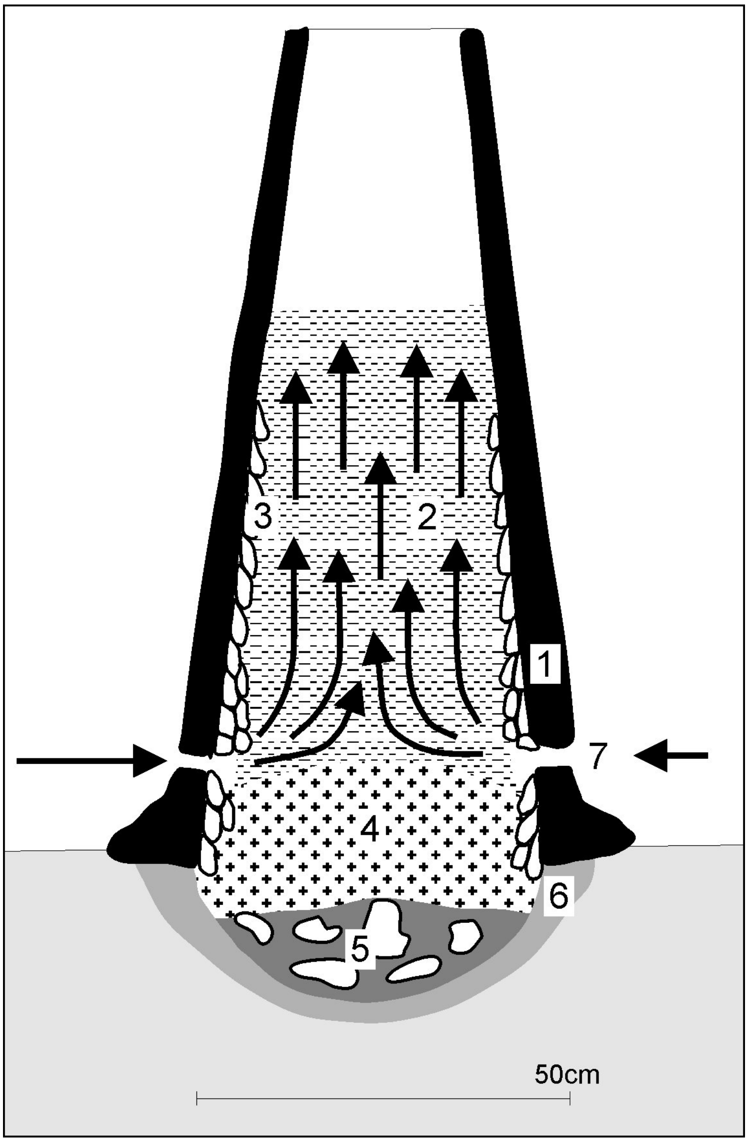

Fig. 45. Section of a shaft furnace while smelting iron ores.
1. furnace wall,
2. air flow through shaft furnace that is filled with carbon and ore,
3. slag formation along furnace wall,
4. smelting process; reduction of iron ore and formation of bloom,
5. slag formation,
6. base of furnace with no slag tapping facilities,
7. opening for tuyères.

[121] Avery 1982, 206.

[122] Blomgren and Tholander 1986, 158.

Ethnographic reports from Africa record that one smelting procedure may involve about four men who would have to be available for eight days before the bloom could be removed from the furnace.[123] This is an indication of the labour necessary for one smelting process. Experimental archaeology provides different estimates. According to Crew the whole cycle from ore to fully smithed bar iron could require about 25 man-days' work for the manufacture of 1 kg bar iron.[124]

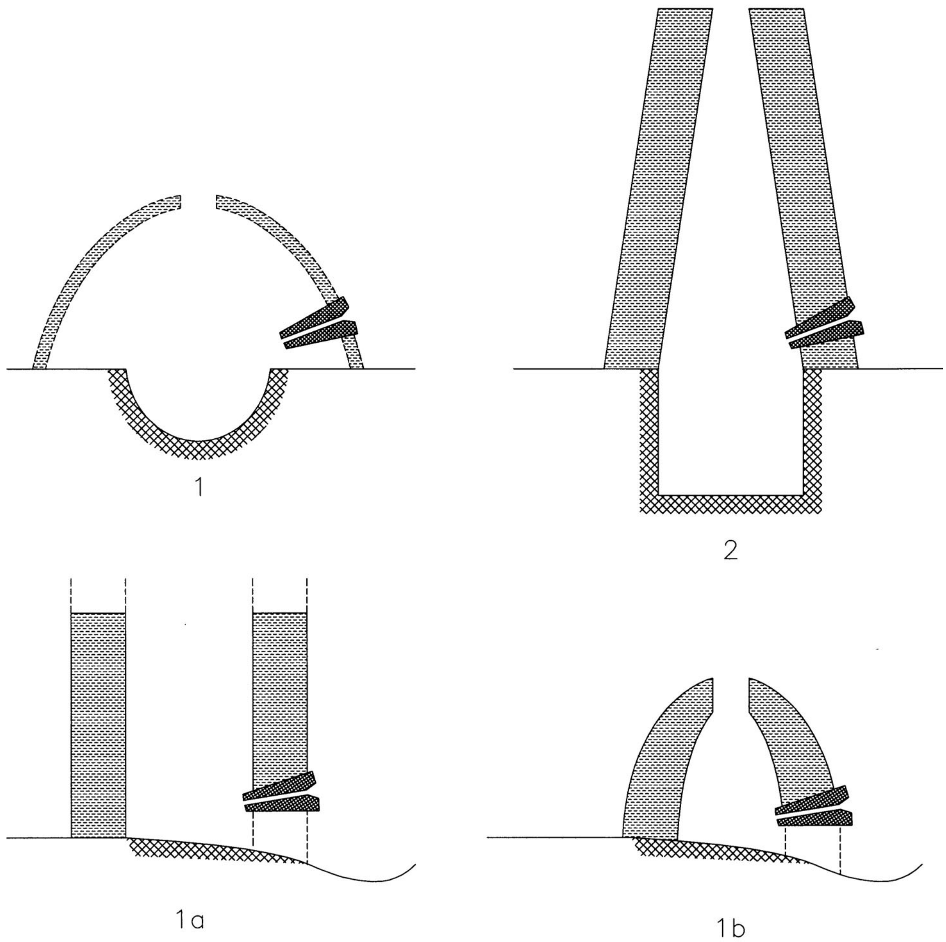

Fig. 46. Reconstruction of some smelting furnaces.
1. bowl furnace, non slag tapping,
2. shaft furnace, non slag tapping,
3. bowl furnace, slag tapping,
4. shaft furnace, slag tappin.

[123] Moesta 1983, 159. This figure includes the production of charcoal, the mining of ore and the building of a furnace which took about 2 days. See also van Nooten and Raymaekers and McNaughton: van Noten and Raymaekers 1988; McNaughton 1993, 18, 31-2.

[124] Crew 1991 b, 35. A comparison between the various figures is not possible because the conditions diverge. Different ores, furnaces and operating conditions are represented. For example, Crew employed a low shaft furnace while the ethnographic data indicate that tall shaft furnaces were used. In the experiment by Crew the manufacture of charcoal is estimated while it took the African team about 2 days to produce and transport the charcoal. Moreover, the 25 days that are reported by Crew constitute the whole cycle from ore to bar iron while the 32 mandays labour of the African team represents the process from ore to the recovery of the bloom from the smelting furnace. Voss reports that 40 kg bar iron from ore can be produced in 12 days employing a slag-pit furnace but his calculations are based on estimates: Voss 1995. Moreover, this type of furnace is not attested for central Italy during the period examined.

Approximately 1/3 or less of the iron-oxides originally present in the ore is reduced to iron. The smelting slag absorbs most of the iron-oxides and thus ancient technology appears to be inefficient to us. In fact, the result could not have been more productive considering the smelting conditions and the desired result. Under different conditions the carbon content in the bloom could rise and this was inconvenient. A carbon content of more than 1.5% would render the bloom unsuitable for subsequent smithing because it would be too brittle. Iron which can be forged easily contains up to 0.9% carbon. From 0.1% carbon, iron can be hardened to steel (Fig. 44). Therefore the seemingly unproductive process results in a bloom with a low carbon content which can be forged and hardened at a later stage of the production process.[125]

Waste materials such as bloom, smelting slags, cinder and furnace-lining with slag-residues, are formed at a smelting site of iron ores. The morphology of smelting slags is determined by the type of furnace and the process used. For central Italy tap-slags and furnace bottoms appear to be common.[126] Cinder can have a number of textures and is the result of fusion between charcoal, slag and furnace lining.[127]

Once the bloom is removed from the furnace, it has to be forged into bar iron or steel. Besides iron, the bloom contains various amounts of carbon and slag material. Tylecote mentions that raw bloom may contain as much as 20% slag which had to be removed by primary smithing.[128] During this process the carbon is more evenly distributed and the slag is removed as much as deemed necessary. Smithing will result in bar iron which eventually can be forged into an iron artefact. Moesta reports that for the manufacture of an iron sword, roughly 1.8 kg bloom is required.[129] Smelting and smithing may occur at different locations. During the primary smithing, the bloom is refined by re-heating and hammering which could be carried out at the smelting site. It has been demonstrated that the process of primary smithing is time consuming. Crew reports '*that this first stage of smithing took 2.5 hours needing 24 heats and consumed about 10 kg charcoal*'.[130] In his experiment the bloom was first forged into a billet, subsequently into a short, and eventually into a long, bar. This sequence required 33 kg charcoal and resulted in 1.6 kg smithing slags as waste materials. The original 1.7 kg of bloom was reworked to about 0.5 kg bar iron.[131] Voss indicates that during primary smithing, 60 kg bloom is reduced to 40 kg bar iron. These figures are open to debate because the reduction in weight by primary smithing depends primarily on the amount of slag present in the bloom, the grade of the bloom and the quality of the bar iron. For a good quality bloom the loss by forging may have been less than 50%. Nevertheless, primary smithing is labour intensive and could involve almost as much energy and resources as the smelting procedure of iron ores.

After refining the bloom into bar iron, it is forged into an artefact during a process that is known as secondary smithing. This could be done immediately after the primary smithing. Another option is that the bar iron was transported, exchanged and smithed elsewhere at a local smithy. Secondary smithing includes repairs and the reuse

[125] Cleere for example, reports that a bloom with a relatively high carbon content was discarded at a metalworking site in Roman Britain because it '*was obviously beyond the technical capacity of the smith*': Cleere 1970, 2.

[126] Cucini Tizzoni and Tizzoni 1992; Sperl 1981.

[127] Bachmann 1982; Sperl 1980.

[128] Tylecote 1987, 249-53.

[129] Moesta 1983, 160.

[130] Crew 1991 b, 29-30.

[131] Crew 1991 b, 35. His experiment is presented as an example of the effort and resources required for the manufacture of bar iron. The figures given, provide an indication of the time involved. Other types of furnaces or smelting conditions than those employed for his experiment, will give different results.

of scrap iron. Forging occurs at high temperatures and the hearths employed may be simple though more complicated structures are illustrated on Greek vases.[132] The simplest smithing hearth is the bowl hearth on ground-level. Forges could be built on a base of stone or bricks in order to improve working conditions for the smith. Tuyères and bellows are employed at the forge to control and increase the temperature range. Waste materials produced during smithing include smithing slags and ceramics such as hearth lining. The slags comprise hearth bottoms, smithing slag lumps, cinder, fuel-ash slags and hammer scale.[133] The hearth bottom with its typical plano-convex shape is an accumulation of slag formed at the bottom of the hearth. It is formed by fusion of iron-oxides with flux, mostly sand. Fluxes such as sand were used during smithing for the formation of fluid slag. In the process the unwanted components of the iron were removed. Moreover, sand prevents oxidation. A smithing slag lump is smithing slag which was discarded from the hearth and has, therefore, an irregular shape. Cinder, fuel-ash and hearth lining are characterised by their higher silica content. Finally, hammer scale is ejected from hot iron during working at the anvil either as globules or as flakes. They are usually highly magnetic and minute in size, not exceeding a couple of millimetres. Therefore hammer scale is likely to be preserved near a forge or anvil and can be easily discovered due to its magnetism. In addition to these waste products, a smithy can be identified by associated finds such as hammer stones, tools and building remains.[134]

The manufacture of steel requires a separate account because steeling is an intricate process. Steel is an iron with specific properties combining hardness with flexibility. An equilibrium is required to make steel not too brittle due to excessive hardness and not too soft due to deficient hardening properties. The essential quality of steel is the possibility to manipulate its hardness. This manipulation is made possible by a carbon content by weight of 0.5 to 1.5%. The empirical assessment of the properties of steel is one of the achievements of the ancient smith. Quenching, that is emersing a hot carburised iron artefact in a cold fluid, increases the hardness of steel considerably. Emersion of the hot blade in cold water for a short moment makes it possible to obtain a hard surface with a tough interior. This results in a blade which is resilient enough to absorb mechanical stress while the cutting properties are improved by a harder exterior. In ancient iron, the carbon content is often less than 0.2 % which makes the wrought iron less suitable for hardening.

After smelting the ore, the carbon content of the bloom is unequally distributed. Prolonged smoldering of the forged bloom diffuses the carbon content more evenly. Specific techniques may have been employed to increase the carbon content.[135] One method is to place an artefact made from a low carbon iron in a sealed vessel filled with

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[132] Oddy and Swaddling 1985; Tylecote 1987, 115-6, 154-7. Besides for forging iron, the same ancient illustrations have been interpreted as furnaces for smelting copper ores or for the heating of copper alloys: *cf*. Bol 1985, 129-30. Experiments that were reported in Formigli, indicate that this type of furnace was less effective for smithing copper alloys: Formigli 1993. The two furnaces that are illustrated on Greek vases, might have been employed for smithing iron. In both illustrations the shaft of the furnace is sealed by a type of cauldron. This vessel itself is also closed. A hypothesis is that the cauldron contained carbon and iron artefacts for the process of surface carburisation. The fact that in both illustrations the furnaces are sealed by a cauldron implies a functional meaning. Tylecote presents a different explanation without acknowledging that on both vases the design of the furnaces or forges is compatible. Other explanations for the cauldron include:

1. functional part of the furnace for controlling the air flow,
2. crucible for preheating tin and lead before alloying with copper from the furnace,
3. crucible for pretreating bronze,
4. for extinguishing the fire in the furnace,
5. for heating water in order to smelt wax and
6. a kind of timer: Formigli 1993, 112-4.

[133] *cf*. McDonnell 1986.

[134] Bachmann provides a cheque-list for documenting an archaeo-metallurgical site: Bachmann 1982, 6-7. Tylecote examines the various waste products in chapter 8: Tylecote 1987, 291-324. McDonnell discusses early iron smithing residues: McDonnell 1986.

[135] For methods of carburising iron, see for example: Tylecote 1987, 258-80.

charcoal powder.[136] The carbon will gradually diffuse into the surface of the artefact. Tylecote mentions that it requires 6 hours at a temperature of 900°C to get the carbon to penetrate 2 mm into the iron artefact.[137] The same technique that was used for surface hardening iron, has been proposed for the production of *bucchero.*[138] *Bucchero* was made from the late 8th, early 7th centuries BC onwards and its manufacture indicates that this specific production-method which could also produce surface carburisation of iron, was probably known to the communities in central Italy. A close relationship between metal artefacts and *bucchero* is implied by stylistic similarities but this correlation could extend to specific production techniques employed by both the potter and smith. Unfortunately, this technical interdependence of both materials remains hypothetical and requires further support from workshop excavations as well as from detailed metallographic analyses.[139]

A review of the impact of iron technology on the social-economic conditions in central Italy depends partly on whether it was produced locally prior to the 8th century BC or not. There are some indications that iron ores may have been processed in central Italy during the late Bronze Age - early Iron Age but the evidence is not conclusive.[140] The corpus of early iron artefacts dated before the 8th century BC is small and, therefore, implies that either the local production of iron was confined or that these artefacts could have been imported.[141] If they were imported, than the discussion arises as to who the intermediaries were and whether the contacts were such that transmission of technological knowledge could have occurred.[142] The issues relating to the dispersion of the technological knowledge for the processing of iron are not examined in this research since the discussion is based on opposing views while simultaneously too many findings are disputed. Transmission of technology during the 8th century BC is attested for techniques such as wheel-throwing pottery and granulation. Nevertheless, it cannot be excluded that the knowledge necessary for the processing of iron was available in central Italy prior to the 8th century BC.

Snodgrass described in general terms the development of iron technology as a process in three stages:
- the first stage constitutes the production of iron ornaments;
- the second stage is marked by the introduction of iron tools with sharp cutting edges though in a smaller quantity than similar copper alloy tools;
- the third and final stage is identified by the prevalence of iron tools over copper alloy tools.[143]

In the same article, Snodgrass reports in a review on the introduction of iron in various regions of the Mediterranean, that '*Etruria may have moved to the adoption of iron somewhat later (from onwards 800-760 BC) than parts of Southern Italy but in the end more comprehensively*'. Hartmann, who examined the early iron artefacts of southern Etruria noticed that during the first half of the 8th century BC, iron was almost exclusively used for ornaments at Veii. He underlines not only the importance of the 8th century BC iron ornaments from Veii but also

[136] Moesta 1983, 167.

[137] Tylecote 1987, 271.

[138] Section 2.1. Moreover, the production of granules for the granulation process is described as a similar technique: Nestler and Formigli 1993, 41-54.

[139] For a hypothesis explaining the ancient illustrations of forges or furnaces that are closed by a sealed vessel, I refer to the previous pages.

[140] Giardino 1995, 114, 116-9; Gualtieri 1977, 213-2. See however, also: Delpino 1988.

[141] Delpino 1988; Gualtieri 1977, 213-34; Hartmann 1985.

[142] *cf*. Giardino 1995, 281-5; Sperl 1985, 39; Bakhuizen 1976, 65-77.

[143] Snodgrass 1980, 336-7.

those from Tarquinia and Rome.[144] In his opinion, iron technology was introduced by the Greeks which was shown by the excavation of a metal-working quarter at *Pithekoussai* dated to the second half of the 8th and early 7th centuries BC.[145]

A recognition of the early phase of iron metallurgy in *Latium Vetus* is less clear than in southern Etruria due to the smaller numbers of iron objects published. According to Snodgrass, '*the adoption of iron in Latium seems to have ocurred detectably later: working iron is rare before the 7th century, and even then it only slowly displaces bronze as a practical metal*'.[146] This view can no longer be supported by the evidence from *Satricum*, nor from other sites in *Latium Vetus* such as Castel di Decima, Osteria dell'Osa and Caracupa. The quantity of iron artefacts steadily increased in *Latium Vetus* during the 8th century BC and did not start with stage I, that is the emergence of iron ornaments. From the 8th century BC, iron knives were available as well as iron ornaments. The combined use of iron for both tools and ornaments is also characteristic for the 7th century BC.[147] The range of iron artefacts found in tombs at Castel di Decima dated to the late 8th and 7th centuries BC, include swords, daggers, components of chariot wheels, lances, knives, spits, horse bits, cylinders and fibulae. Tomb 15 for example, which dates to the late 8th century BC, contained knives, a sword, spearheads, a spit and parts of a chariot, all made from iron.[148] The quantity of iron artefacts at Castel di Decima and other sites in *Latium Vetus* such as those found in the votive deposit at *Satricum*, imply local manufacture. Moreover, they demonstrate that copper alloys were replaced by iron during the late 8th and 7th centuries BC in *Latium Vetus*.[149] This statement is illustrated by the copper alloy to iron ratio in the tombs discovered at Caracupa. These tombs are dated from the 9th to the 7th centuries BC and the incidence of iron artefacts gradually increases during this period.[150] The iron axe found in tomb I is a socketed axe with an eyelet attached to it.[151] It copies in iron exactly specific copper alloy axes though the manufacture of an eyelet in iron is labour intensive and technically complicated. Therefore this type of iron axe reflects a specific moment in the transition from copper alloys to iron. It seems that within about 50 years the eyelet in iron was abandoned by the smith.[152] The distribution of iron artefacts in the extensive, Latial Iron Age necropolis at Osteria dell'Osa, is recorded in detail by the publications of Bietti-Sestieri.[153] At this site, the quantity and range of iron artefacts increased consistently during the 8th century BC and, therefore, supports the hypothesis that in *Latium Vetus* the transition from stage II to III occurred during the 8th and early 7th centuries BC.

Two aspects remain to be discussed in this section; the close relationship between copper and iron working and the devaluation of iron.

The early development of the iron industry in central Italy cannot be separated from the production of artefacts made from copper alloys. In the introduction, the close relationship between copper and iron manufacture from the

[144] Hartmann 1985, 285-9.

[145] *cf*. Klein 1972. See, however, section 3.6.1.

[146] Snodgrass 1980, 362.

[147] See illustrations in section 3.6.2.

[148] Zevi *et alii* 1975, 251.

[149] Zevi *et alii* 1975.

[150] Savignoni and Mengarelli 1903; Angle and Gianni 1985; Bietti Sestieri 1992 b, 60-1, 227-8.

[151] Savignoni and Mengarelli 1903, 301.

[152] *cf*. Bietti Sestieri 1992 a, 875-7; De Santis 1995.

[153] Bietti Sestieri 1992 a.

prevalent chalcopyrites or CuFe-sulphide ores in central Italy was reported.[154] In addition, it is generally accepted that a labour division between copper-smiths and iron workers had not yet been established during the Orientalising Period.[155] The combined use of copper and iron in the local metal workshop could explain the close parallels during this period of objects made from either a copper alloy or iron. Moreover, there are several sites in central Italy, such as Poggio Civitate and Acquarossa, where simultaneous working of both copper alloys and iron is attested.[156] On Elba and at Populonia, copper and iron slags were found side by side.[157] Thus, slags from smelting copper ores were discovered on Elba while ancient iron slags were found in significant quantities which shows the early working of both metals on the island.[158] The close relationship between copper and iron working during the 8th and 7th centuries BC is substantiated in section 3.6 when the archaeo-metallurgical sites of central Italy are presented.[159]

The notion of the value of iron and especially its devaluation during the period 800 to 400 BC has been mentioned before. The process of devaluation would have affected the economy of central Italy profoundly and may explain in fact the fall off in crafts. The argument is circumstantial because price lists dating to this period do not exist for central Italy. Value can, however, not be determined in a pre-monetary society by fixed prices but has to be deduced from the contexts in which artefacts are found, their desirability and an assessment of the resources and labour involved. The working conditions are pivotal for an examination of value since a reduction in labour costs by for example, employing assistants or slaves, could counterbalance the devaluation of iron. An assumption in this thesis is that slavery became gradually a component of workshop conditions. This is substantiated by some of the archaeo-metallurgical sites where living-conditions could be recorded.[160] Another option for counteracting devaluation is an increase in production which was established for various categories of artefacts such as *bucchero* vessels and copper alloy basins from about 650 BC onwards. A deterioration in working conditions and an increase in output per craftsmen probably occurred simultaneously. This process was encouraged by a lack of major technological innovations after the 7th century BC. It is a central theme of this research that from about 650/600 BC, a progressive devaluation of artefacts made in workshops by craftsmen affected the status and social position of workers employed in these crafts.[161]

The value of iron in central Italy has to be deduced from the archaeological contexts in which they are found. The vast necropoleis in this region present ample opportunities to relate iron artefacts to other status markers. It was

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[154] Table I; Sperl 1981, 32-4.

[155] *cf.* Pleiner 1988, 35-6; Hartmann 1982, 154-5; Ampolo 1980, 173-9.

[156] See sections 3.6.4 and 3.6.8.

[157] Crew 1991 a, 113-4; Fedeli 1983; Sperl 1985, 39.

[158] Sperl 1985; Giardino 1995, 119-22.

[159] For example, in the workshop of Phidias at Olympia iron was smithed as well: Zwicker 1984, 66.

[160] See for example, the conditions at Lago dell'Accesa, Acquarossa and at the industrial quarter at Populonia: sections 3.6.6, 3.6.5 and 3.6.7. I refer also to section 3.1.

[161] It is intrigueing and simultaneously cynical for the development of Mediterranean Archaeology as a discipline, that this devaluation is still reflected in the prices on the Antiques market. One could ponder on a subconscious, well tuned system of valuation that remained valid for various periods of the western history. Also excavations have often resulted in a selection of recorded finds that is correlated to the prevailing valuation system and not to quantity. For example, the pre-eminence of Greek pottery in publications on archaeological sites in central Italy is not related to their quantity but rather to their exquisiteness and rarity when compared to the quantity of *impasto* fabrics. In addition, prices on the Antiques market bring about clandestine excavations as witnessed during the present archaeological project of the University of Groningen at Francavilla Marittima in Calabria. Guided by this subconscious system of value, the *clandestini* select those artefacts which were probably valued in Antiquity as well, leaving us with partially mutilated areas and scattered piles of ordinary wares.

established that, during the 8th century BC, iron was considered a luxury material associated with warriors or women of high status.[162] During the first half of the 7th century BC, iron is a component of wealthy graves though the range and quantity of iron artefacts increases. The *Tomba Bernardini*, for example, contained in addition to many prestige goods, iron axes, lances, spearheads, spits, hilts, cylinders, blades, a bar, plate, components of a chariot and other iron artefacts.[163] This assemblage of iron objects indicates that iron was still valued since it otherwise would not have been deposited in this princely tomb but at the same time the assemblage shows that iron had become obligatory for tools and reinforcements. It, therefore, was considered a metal necessary for subsistence items and in this process was devalued as a luxury. During the subsequent period, the substantial accumulations of iron at, for example, the deposit at Brolio in the *Val di Chiana* or in the *Tomba <dei flabelli di bronzo>* at Populonia imply that iron as a material further decreased in value and in line with other categories of artefacts, had presumably become a semi-luxury and subsistence good.[164]

This transition in value is recorded in other regions of the Mediterranean. An account of these regions is relevant due to the significance of trade in iron during the Orientalising Period.[165] The analogous decrease in the value of iron in Greece and the Near East is likely to have had an effect on the economy in a wider context. Pleiner reports that in Greece certain types of iron artefacts, semi-products and iron bars became important for exchange during the 8th to 6th centuries BC.[166] He describes that from the 8th century BC, iron became a common metal but probably remained a valuable material. An increasing productivity is attested by the establishment of manufacturies during the 5th century BC. From at least the 5th century BC the existence of qualified slave craftsmen in the larger urban workshops is recorded for the iron industry.[167] In my opinion, the increase of iron production in combination with a deterioration of the working conditions marks decreasing value.[168] This process is illustrated by the employment of substantial quantities of structural iron for the construction of monumental buildings during the Classical period.

The most detailed evidence for the decline in value of iron in relation to other metals, derives from Mesopotamia and the Near East. Moorey reports for stage 1, which he dates during the second millennium to 1250 BC, ratios of iron to gold ranging from 1 : 8 to 1 : 10. The ratio for iron to silver would have been about 1 : 90. This indicates that iron was considered a precious metal in this region during stage 1.[169] During stage 2 which he dates from 1250 to 850 BC, iron was still considered relatively valuable since it is listed in royal inventories. To indicate its value, Moorey mentions that around 1000 BC, one '*iron dagger was worth two full-grown rams*' or 2 *shekels* of silver.[170] He reports for stage 3 which is dated from about 850 to 350 BC, ratios of iron to silver ranging from 240 :

[162] *cf*. Hartmann 1985, 291; Bietti Sestieri 1992 a, 398.

[163] Canciani and von Hase 1979, 60-4. They report 22 catalogue entries of iron artifacts from the *Tomba Bernardini*. Various catalogue entries consist of two or more artefacts which have not all been identified.

[164] Romualdi 1981; Minto 1943, 139-59, *Tav*. XXXIII.

[165] The considerable trade in iron is reflected by the lines in the *Politeia* of Aristotle, quoted as a theme at the beginning of this chapter. Aristotle notes that trade became dependent on exchange of materials which were intrinsically useful and mentions specifically iron and silver. I refer also to: Strøm 1992.

[166] Pleiner 1969, 15-7, 29.

[167] Pleiner 1969, 20-3, 29-32, 37.

[168] The working conditions were probably still humane because slaves in metal workshops were qualified as is documented in texts. They could represented considerable assets for their owner: *cf*. Pleiner 1969, 32; Garlan 1988, 35-6; 64-5; 148-55.

[169] Moorey 1994, 287-8. Moorey employs the phases of development in the use of iron as proposed by Snodgrass: Snodgrass 1980. These phases have been summarised in this section.

[170] Moorey 1994, 288-9. Brinkman 1988, 143. McDonald reports that 1 Sumerian *shekel* is about 8,165 gr silver: McDonald 1992, 41, 108.

1 to 840 : 1, probably depending on the quality of the iron.[171] These records which reflect the development in the value of iron from stage 1 to 3 show an enormous devaluation of the metal. They demonstrate the transition from precious to base metal and a comparable decline will have occurred in central Italy during the transition from stage 2 to 3. This transition is partly linked to the exploitation of the substantial iron ore deposits of central Italy. Once the technology of iron smelting and smithing was mastered at a local level, the devaluation of iron became unstoppable. Consequently, this modified the economic significance of the mineral resources of central Italy which mainly consist of copper and iron ores.

3.5 *Resources*

The mineral resources of central Italy were mentioned in the previous sections in relation to specific metals. Nevertheless, the extensive range of metal resources require a review for a general assessment.

The mining region of Etruria is part of a wider area with metal resources. This area extends from the *Monti della Tolfa* in southern Etruria to the *Alpi Apuane* in northern Italy. The resources are of diverse genetic types and include various minerals from which metals could be extracted.[172] Figure 47 illustrates the distribution of ore deposits in *Latium Vetus*, Etruria and northern Italy along the Tyrrhenean coast. This figure presents possible locations of mines but the exploitation of individual deposits in antiquity remains to be ascertained.[173] For example, the map includes deposits of magnetite bearing sands while it is doubtful if these deposits were exploited in antiquity.[174] It excludes, however, bog ores. Nevertheless metallurgical analyses of a billet/bloom, slags and of iron artefacts from *Satricum* indicate that these items may have originated from bog ores though the ore itself was not found.[175] The fact that bog ores are omitted in Figure 47 is based on their present economic insignificance as well as on the reclammation of marshes in central Italy which complicates the detection of ancient bog ore deposits.[176] Most of the bog ores occur in small, heterogeneous deposits and are nowadays of minor economic interest. The deposits may nonetheless, have been important to the communities in central Italy during the period 800 to 400 BC. The quantity of bog ores which could be processed, was limited since deposits rarely exceed half a metre in depth. It is, however, possible that these deposits occurred on various locations in central Italy. Many stream-valleys, lakes and marshes would have been bordered by bog ore deposits which after exploitation, could replenish themselves within 30 years.[177] The renewal of the deposits is based on the formation of ore horizons of insoluble iron compounds. These horizons appear along lakes and bogs due to precipitation. The bog ore is an impure limonite, often with varying amounts of manganese oxides. The deposits can range from bog iron to bog manganese deposits.[178] The presence of various iron-manganese compounds at *Satricum* and other settlements in central Italy indicates the

[171] Moorey 1994, 289-91.

[172] *cf.* Zitzmann 1977; 1978. He desribes various iron ore deposits in central Italy.

[173] *cf.* Warden 1984, 353.

[174] *cf.* Piaskowski 1982; 1988; Zifferero 1991, 204, 230.

[175] See section 3.6.2.

[176] *cf.* Zitzmann 1977, 24-5; Sabella 1954, 28.

[177] Van den Broeke 1991, 189.

[178] Zitzmann 1977, 24-5. At this stage I would like to mention that Arnoldus-Huyzendveld wonders whether bog ore deposits were abundant in Italy: personal communication. According to her limonite is formed in certain soils under specific conditions. She recalls limonite concretions, with or without associated manganese, in the area around *Cures Sabini* and *Satricum*. I have seen similar limonite concretions in the area around Lavinium.

favourable circumstances in this region for the formation of limonite deposits.[179] It is unfortunate that these deposits could not be included in Figure 47 since they are relatively easy to smelt and might, therefore, have been sought after.[180]

Fig 47. Ore deposits in Italy; the black circles with numbers indicate mining areas and mineral deposits. The grey circles with black outline and chemical elements represent mineral deposits without specification of the location. Sb: antimony; Hg Mercury; Pb: Lead; Zn: Zinc; Fe: Iron; Cu: Copper and Ag: Silver.

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[179] Kamermans 1980. See also Schweitzer and Rinuy who describe the use of manganese black as an Etruscan pigment: Schweitzer and Rinuy 1982.

[180] Avery 1982, 206.

The mineral resources of central Italy are important for the processing of the metals lead, iron, copper, tin and silver.[181] The major concentration of resources is located in the district around the *Colline Metallifere* while the distribution of the ores in Figure 47 demonstrates that *Latium Vetus* has a few iron ore deposits. In addition, the metal resources in *Latium Vetus* are not as diverse as in Tuscany which demonstrates that metals such as lead, tin and copper had to be imported to this region. The *Colline Metallifere* contain amongst other ores, sulphidic copper ores.[182] These ores require a pretreatment which includes roasting. This process was previously discussed in Table I, but it is important to note that the exploitation of sulphidic copper ores requires a high degree of technical skill. According to Sperl, the indigenous population had mastered this skill during the late Bronze Age.[183]

The exploitation of local silver and tin ores is ambiguous because metallurgical waste which is related to the smelting of these ores during the period 800 to 400 BC, is not reported. Consequently, the origin of tin and silver in central Italy is a subject of debate.[184] Tin in the form of cassiterite occurs in Campiglia. This cassiterite is unusually rich and contains up to 72% tin. Warden suggests that these resources were exploited in antiquity while Formigli questions the abundance of tin in Campiglia.[185] However there is circumstantial evidence which makes it probable that tin was processed in central Italy. The employment of threads of tin to decorate Villanovan pottery demonstrates that it was available locally during the early Iron Age. There is also evidence at Gran Carro that tin was employed in a workshop context while most of the analysed metals found at this site, indicate that they derive from local resources.[186] In addition, it is reported that copper alloy artefacts in central Italy contain on average, about 2 % more tin than copper alloy artefacts in Greece.[187] Therefore it is probable that in central Italy, tin was relatively common and possibly less valuable than in Greece.[188] In my opinion these findings indicate that tin ores were exploited either in central Italy or Sardinia.[189]

A problem while discussing resources in antiquity is that scarcely any ores or smelting residues have been discovered during excavations of settlements. Thus, the relationship between particular ore deposits and ancient metal artefacts is hardly ever established. Therefore Bartoloni could record that almost nothing is known of the exploitation of the metal resources in Etruria.[190] Recent publications by Zifferero and Giardino relate specific mineral deposits to settlement patterns while incorporating the available archaeo-metallurgical evidence.[191] Both authors subscribe to the opinion that actual evidence relating to mining and smelting is scarce but that the evidence

[181] Bietti Sestieri 1981, 227. Other mineral deposists are reported for this region such as Zinc and Mercury deposits, but it is unclear whether these deposits were processed during the period 800 to 400 BC.

[182] Formigli 1981, 182-4.

[183] Sperl 1981, 31-2.

[184] For the exploitation of silver ores, I refer to the section 3.2.

[185] Warden 1984, 353; Formigli 1981, 182, 191-3.

[186] Giardino and Gigante 1995.

[187] Craddock 1986.

[188] It is reported that per *talent* tin was valued at 233 *drachma* while copper costed 35 *drachma* per *talent* in Greece around the middle of the 5th century BC: Zimmer 1990, 162.

[189] I refer to Giardino for a presentation of the mineral resources on Sardinia: Giardino 1995.

[190] Bartoloni 1989, 188.

[191] Zifferero 1991; 1992; Giardino 1995.

that is at hand, indicates local exploitation during the Bronze Age and later.[192] When one compares the spatial relationship between settlements and ore deposits there are distinct concentrations during certain periods. The exploitation of the mineral resources around the *Valle del Fiora* for example, appears to be earlier than those in the Tolfa region. In the Tolfa area, the late Bronze Age is characterised by an increase in the number of settlements around the mineral resources. This implies an intensification of mining activities during this period.[193] The evidence, moreover, suggests primary smelting at the mines. During the Etruscan period the settlement pattern in this region appears not to be so closely linked to the mineral deposits. Mining may have continued in this region but the local economy did not basicly depend on metallurgical activities.[194] It appears that mineral deposits in central Italy were exploited during specific periods after which they might have been abandonned. This may reflect preferences for specific ore deposits during particular periods but this hypothesis remains to be investigated. The periodic exploitation of resources might have affected a general shift of industrial activities during the 6th and 5th centuries BC to northern Etruria and north Italy. It is suggested that the industrial export of Elban hematite does not predate the middle of the 6th century BC.[195] Elban ores are reported in Genoa in a context which is dated around 450 BC.[196] These ores were, therefore, transported by ship to coastal areas around Populonia, northern Italy and Corsica.[197] This shows a regional trading network for their distribution. Moreover it implies that the size of mining activities on Elba was substantial. The Elban ores are characterised by a high percentage of iron and their transport overseas demonstrates that this asset could be marketted by the 6th century BC.

The presentation of the archaeo-metallurgical information in the next section, will support the close relationship between the metal deposits and individual sites. Nevertheless, this relation varies from site to site. The impression that emerges is that for central Italy the metallurgical development can be explained in general, macro-economic terms but that the actual situation at individual settlements is extremely diversified.

3.6 *Archaeological evidence*

In this section I will present sites with archaeo-metallurgical features. A number of these sites were previously introduced in chapter II on pottery production. I will refer to these introductions where appropriate. As in the foregoing chapter, the sites are presented according to their geographical location. Thus, the most southern site is examined first and the most northern site last.[198]

3.6.1 *Pithekoussai*

Several settlements in Italy such as Sorgenti della Nova and Cran Carro, show evidence for metalworking prior to the establishment of *Pithekoussai*. These settlements are dated to the late Bronze - early Iron Age, thus before the

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[192] There are indications that cinnabar was exploited from the Eneolithicum. Prehistoric mining tools were recovered in the mine of Cornacchino; Zifferero 1991, 207-9.

[193] Zifferero 1991, 212-5.

[194] Zifferero 1992, 88-9.

[195] Zifferero 1991, 218. See also Giardino 1995, 119-22.

[196] Milanese 1996, 70-1.

[197] Jehasse and Jehasse 1985; Cucini Tizzoni and Tizzoni 1992, 47-51.

[198] This arrangement is directed by the location of *Satricum*, the site I could examine in most detail.

arrival of foreign communities. The metallurgical evidence from *Pithekoussai* is dated to a later period and the location of this port of trade is south of the region examined in this study. Nevertheless, a discussion of the remains of the metal workshops at *Pithekoussai* is essential for it is, at the moment, the oldest building in Italy which can be related to metallurgical activities. Moreover, the excavations at *Pithekoussai* have guided the debate on the diffusion of technologies and, therefore, an examination of the evidence is necessary.[199]

Fig. 48. Pithekoussai, suburban industrial complex with an illustration of a copper alloy fibula that was discarded during mabnufacture and a rim sherd of a local late Geometric krater, with painted retrograde inscription ... inos m'epoiese[e], (a potter whose name ends in) – inos made me.

Zimmer classified house IV at *Pithekoussai* as a Greek metal workshop even though it is reported that Italic type fibulae were manufactured here.[200] The discovery of the early workshop at *Pithekoussai* is exceptional not only for Italian but also for Greek archaeology. In comparison to other workshop remains from Greece, the evidence for metalworking at *Pithekoussai* is extensive as well as advanced.

The workshop in building IV on the Mazzola site had originally, during the second half of the 8th century BC, a double apse and measured 8 by 4 m (Fig. 48). The south-east side of the building may not have been covered and could have functioned as an open area for industrial activities. Around 700 BC this house was reconstructed as a rectangular building which could have incorporated an open courtyard in which the furnace was located. This furnace was constructed of mud bricks which had been exposed to extremely high temperatures. Large flat pieces of hard, bleuish stones, *phonolithes*, must have functioned as anvils. Along the north-east wall of this building, debris was found which included iron slags, copper alloy snippets of sheet and wire, lead and a fragment of a copper alloy ingot. In addition, the debris contained a weight which will be discussed in chapter IV and a fibula which was discarded during production (Fig. 48). The bow of the fibula would have been decorated with elements of bone and amber. Some pieces of bone from which these elements had been sawn were discovered as well. Therefore it is probable that not only metals were processed in this workshop but also other materials such as bone and amber. The

[199] *cf*. Hartmann 1985, 285-92; Zifferero 1992, 86; Bakhuizen 1976, 65-9.

[200] Zimmer 1990, 16-9; Buchner 1983, 271.

fibula represents a type which is known in Campania but which is also reported from Greece. Buchner considers it to be an Italic type.[201] In addition to the copper alloys, iron was worked in this workshop as is shown by the iron slags. The debris is dated to the first quarter of the 7th century BC.

Another workshop with metallurgical debris is building III. It is a rectangular building and measures 7.5 by 6 m. It incorporated an open area with a floor that was scorched. The open courtyard contained a fireplace which was probably the forge. This interpretation is supported by the charcoal found nearby. Fragments of iron, slag and hammer scale demonstrate that building III was a blacksmiths' workshop.

Other remains of metalworking at *Pithekoussai* were discovered in the *Scarico Gosetti*. Several slags were found which indicate smithing but not smelting. The bases of two large ceramic vessels were covered with a substance that was analysed as hammer scale combined with chalk and smelt. Hammer scale and slag is ejected from the hot iron when it is emersed in cold water. Zimmer, therefore, interprets these vessels as containers in which the smith quenched the iron.[202]

The workshop remains at *Pithekoussai* are frequently presented as the confirmation for the hypothesis that the Greek trading communities came to Italy in search for metals. One piece of Elban ore especially has confused the argument.[203] Hartmann notes that the lack of early iron and imported Greek artefacts in the area around Populonia does not support the hypothesis that the Greek colonists at *Pithekoussai* were primarily interested in the Elban iron ores.[204] Moreover, the *emporion* at *Pithekoussai* is used as a convenient illustration for the profound influence of Greek society on the indigenous population of Italy.[205] However with respect to metals, especially the copper alloys, it is questionable as to who influenced who.[206] In this context, a remark by Buchner is revealing. He reports that the dress ornaments, the copper alloy fibulae excavated at *Pithekoussai*, correspond with fibulae types known from Etruria, *Latium* and Campania.[207] This has prompted him and Coldstream to argue in favour of widespread

[201] Buchner 1983, 271.

[202] Zimmer 1990, 16-9; Klein 1972; Ridgway 1992 a, 83-96; 99-100. *Pithekoussai* is mentioned in various sections throughout this study.

[203] See section 1.7.

[204] Hartmann 1982; 1985.

[205] *cf.* Cornell 1995, 86-7. It is not my intention to belittle the Greek influence on Italian society but a merely Hellenocentric bias is insufficient for the complex transformations that occured in central Italy. This bias perseveres by the habit to single out in excavation reports the Greek imported pottery. The transitions in this region reflect, however, an amalgam of cultural traits, local as well as Levantine and Greek while the direction and control over the organisation of the social-economic conditions were definitely regulated by the indigenous communities. The methodology of my research that is the analysis of primary evidence, generates predominantly data on these local arrangements and less on the role of the Greeks or any other ethnic immigrant group in central Italy since their presence is hardly documented by inscriptions or by other data in the industrial complexes that are recorded in this study.

[206] I make a distinction between the metals involved, to allow for one of the hypotheses that was formulated by Bakhuizen: Bakhuizen 1976, 65-9. This hypothesis concerns the early phase of iron smithing in Italy. He argues that '*The nucleus of the first group of Chalcidian emigrants to settle near the Bay of Naples consisted of traders in iron products and of iron smiths. They came to the West because they expected to find a market for their products in Italy. They based their expectations on the knowledge that they were able to offer a superior product*'. One could find arguments in favour of this hypothesis. However, iron was introduced to a society which had achieved a high level in the manufacture of copper alloy artefacts. Moreover, Giardino as well as Zifferero present evidence for the processing of iron prior to the arrival of Greek communities: Giardino 1995, 183-4; Zifferero 1991, 228-9. See also Delpino 1988 and Bietti Sestieri forthcoming.

[207] Buchner 1979, 133-5; 1983, 271. See for example, Toms for similar fibulae at Veii: Toms 1986, 81. The important notion on the origin of the metals at *Pithekoussai* demands a detailed examination which can not be included in this study. An examination would have to incorporate the typology and distribution of the metal artefacts, the workshop activities as well as wider implications such as the exchange mechanisms and the mixed descent of inhabitants at *Pithekoussai*. The extensive presence in the *Pithekoussan* tombs of pottery that was produced according to Greek models, might have resulted in an inflated notion on the role of the Greek trading communities. In this context, I recall that this region of Campania which included settlements like *Pithekoussai*, *Kyme* but also communities in the interior such as Capua and Suessula, was characterised by an amalgam of Italic and Greek features. Frederiksen for example, concludes that '*the social and cultural diversity of the region*

intermarriage between the first Euboean colonists and women from the Italic populations.[208] Intermarriage may have occurred but is not sufficient as a model for the substantial interactions between the various communities in this region. Intermarriage, for example, does not account for aspects such as internal political organisation, external exchange mechanisms, the actual control over land and the exploitation of the rich mineral resources in central Italy. Moreover, it was reported that at *Pithekoussai* males wore fibulae of Italic type as well.[209] Following the argument by Buchner and Coldstream would imply that these males were also Italian. In my opinion, the adoption of ornaments of Italic type at *Pithekoussai* merely suggests that at least part of the exchange with the indigenous communities involved metals and metal artefacts. The location of the *emporion* on the offshore island of Ischia and the character of the settlement at *Pithekoussai* combining local manufacture with trading activities implies that the settlers were originally restricted in their pursuits by regulations that were laid down by the Italic communities.[210] Furthermore, the production of artefacts at *Pithekoussai* indicate that the indigenous demand controlled the manufacturing and trading activities at this port of trade.

The confined report of the metallurgical evidence from *Pithekoussai* illustrates the confusion of the implications of the data. In this study *Pithekoussai* is basically a *port of trade* where various communities lived together and manufactured goods for their own consumption as well as for the Italic population on the mainland. The presence of foreign residents in Italy accelerated the internal development and could partly account for the acculturation process. Acculturation is, however, not the equivalent for colonisation or domination since it is primarily a cultural phenomenon and does on the whole not involve the internal social-economic conditions. Moreover, *Pithekoussai* emerged during a period in which the Villanovan polities of central Italy had already established important communications routes towards the north as well as towards the south.[211]

3.6.2 *Satricum*

The proto-historic settlement at Borgo Le Ferriere which is referred to by its ancient name *Satricum*, was introduced in the previous chapter. Besides evidence for local pottery manufacture, the excavations have revealed information for the processing of iron artefacts from the middle of the 7th century BC. This metallurgical activity at the settlement cannot be related directly to products or to a range of iron objects since the number of iron artefacts from the settlement excavations is confined. However the excavations of the necropolis and votive deposit I give an impression of the range of iron artefacts that were available at *Satricum*. In this section, I intend to relate the evidence for iron working at the site to the iron artefacts that are actually known. This will illustrate the metallurgical development at the site.

During excavations at *Satricum* a century ago, many iron objects were excavated from both the Iron Age necropolis and votive deposit I dated from he 8th to the 6th century BC. The necropolis was recently published by Waarsenburg.[212] Unfortunately he did not record the iron artefacts comprehensively due to their state of

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was very great': Frederiksen 1984, 136. Conflicts over the control of this territory are reflected by the battle of *Cumae* in 524 BC and the battles with the Samnites who captured Capua in 423 and *Cumae* in 421-420 BC: Frederiksen 1984, 95-9, 136-9, 163-9. This exemplifies that the Italic population and their interests had always been pivotal for the historical development of this region. See also: Cristofani 1984.

[208] Buchner 1979, 135; Coldstream 1994.

[209] Buchner 1983, 271.

[210] See section 1.7. I introduce in this section characteristics of *emporia*.

[211] Bietti Sestieri forthcoming.

[212] Waarsenburg 1994.

preservation. Waarsenburg writes that '*although the Northwest Necropolis has produced a fair amount of iron weaponry and utensils, most pieces have decayed beyond recognition*'.[213] The complete content of votive deposit I was never published but is catalogued at the moment and will be printed in the near future.[214]

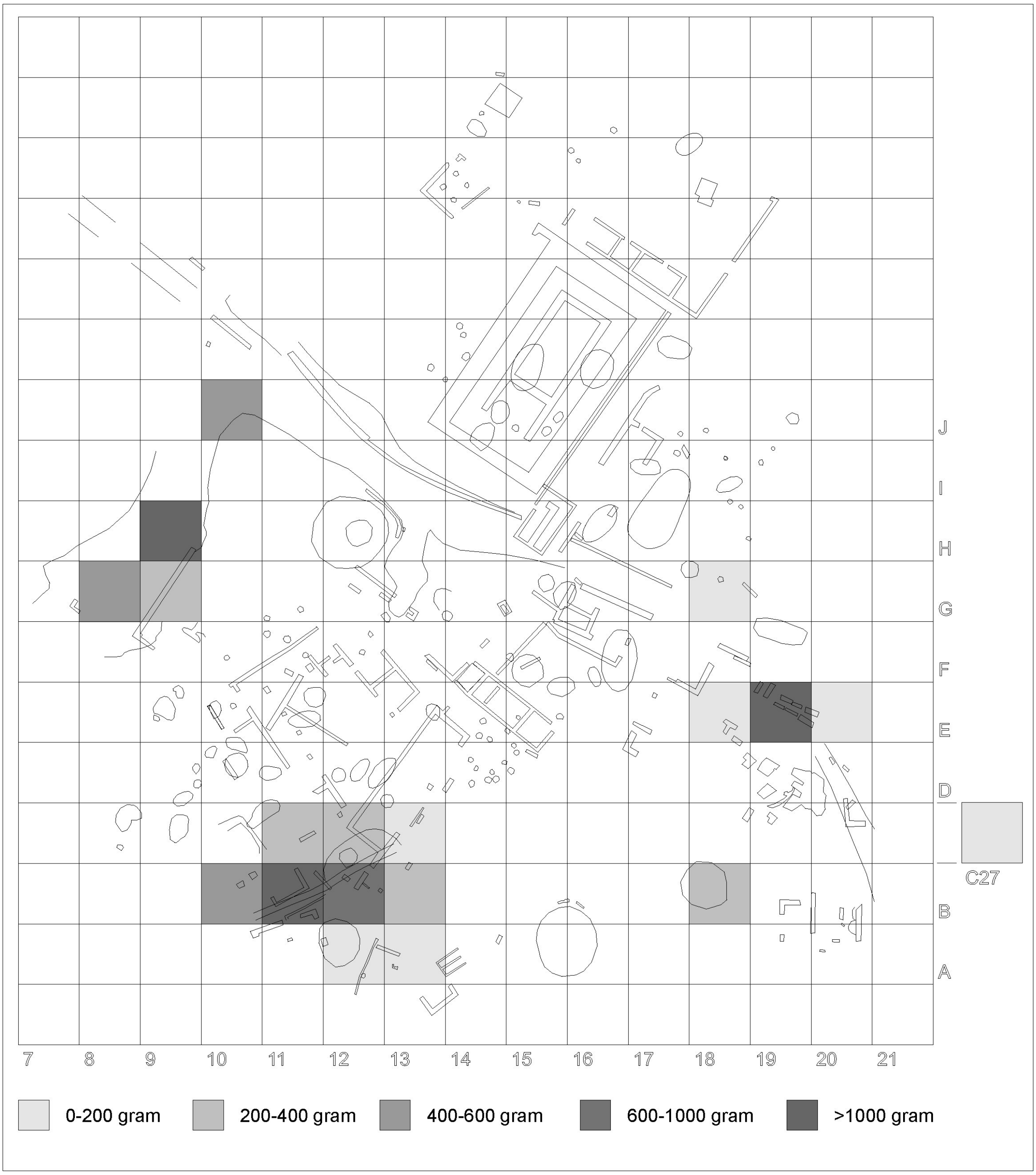

Fig. 49. Satricum, excavation plan and distribution map of iron slags that were excavated on the acropolis.

[213] Waarsenburg 1994, 432.

[214] Waarsenburg forthcoming. In this publication I will present the catalogue of the iron artefacts ascribed to votive deposit I. The iron artefacts are illustrated in Figures 50 to 56 of this section.

The distribution of the iron objects in the various contexts, that is votive deposit, necropolis and settlement in a period when iron was still considered valuable, is significant.[215] Hardly any metal artefacts are found in the settlement, while in the Iron Age necropolis copper alloy artefacts are found side by side with iron objects though from 725 BC, iron weaponry was fairly common at *Satricum*.[216] The majority of iron artefacts are found in votive deposit I (Figs. 50 to 56). Among the objects in this deposit are iron daggers, swords, knives, axes, sickles, spears, arrowheads, shafts, pins, bars, nails, rings, fibulae, pendants, bracelets and other items. The amount of iron tools is indicative since scarcely any copper alloy tools were found in this deposit. Iron tools are by far in the majority. This means that by at least the middle of the 7th century BC, iron tools had replaced copper alloy implements.

The introduction of iron knives is considered to reflect a transitional stage towards a fullfledged Iron Age when iron tools supersede copper alloy tools. This intermediate stage is recorded at excavations of the necropolis at Osteria dell'Osa. Bietti Sestieri noticed that from 770 BC all knives were of iron. In the previous period from about 900 to 770 BC, iron knives are rare and appear to have been part of exceptional tomb inventories. During the following periods iron knives dominate.[217] This indicates that the transition to a fullfledged Iron Age in *Latium Vetus* roughly corresponds to the 8th century BC. The fullfledged Iron Age, a term which marks the dominance of iron implements, is for *Latium Vetus* represented by the evidence from *Satricum*.

The metallurgical evidence at *Satricum* consists of slags discovered during excavations on the acropolis. These slags can be classified as:[218]

a. plano-convex smithing hearth bottoms that are magnetic;

b. smaller, relatively light and porous, non-magnetic slags. Cinder or metallurgical waste products of slag, ash and sand/vitrified fuel ash;

c. smithing slag lumps;

d. molten slag with traces of furnace or hearth lining.

The distribution of these slags on the acropolis at *Satricum* is illustrated in Figure 49. Two aspects should be mentioned. First, the map presents the concentrations of iron slags and shows three major concentrations. The oldest concentration of slags was recovered from a context dating to the second half of the 7th century BC. Secondly, I would like to emphasise the continuity of metallurgical activities at the site which is demonstrated by the various stratigraphical layers from which the slags originate. These could be dated from the 7th to the 4th centuries BC. Most of the slags are found in concentrations located in squares B11 and E19 and are dated to the late 7th and early 6th centuries BC. In B11 the slags are associated with hut VII and the wooden building AA. The building is a direct continuation of the previous activity area. This 7th - early 6th centuries BC context is associated with *bucchero*, fine *impasto* wares, some fine drinking vessels of depurated clays and a small terracotta head. The pottery suggests a relatively affluent family though the interpretation of this area awaits final publication.[219] An assessment of the relationship between hut VII and building AA with the metallurgical debris has to include the evidence of the recent

[215] The iron artefacts from these contexts are each listed in the Appendix.

[216] Waarsenburg 1994, 79, 89, 433.

[217] Bietti Sestieri 1992 a, 398.

[218] Sperl 1980, 14-9; Bachmann 1982, 1-6, 30-4; Tylecote 1987, 310-21.

[219] Nijboer, 1993/1994; Beijer 1991 a; Maaskant-Kleibrink 1992, 92-7; 99-100; The catologue numbers 2239 to 2541a in Maaskant-Kleibrink 1992, present an illustration of the pottery with which the iron slags can be associated. In addition, slags are recovered from this area during recent excavations which await final publication. Beijer reports that one of the important families at Satricum occupied this area: Beijer 1991 a, 24. On account of the metallurgical waste material that was found in the 7th century BC strata of hut VII and the timber building, it is suggested that at least one of the activities in which this family was involved, was metalworking. I would like to thank my colleague Arnold Beijer for discussing this context with me.

excavations. At the moment area B 11 represents the only context on the acropolis with both structural remains and metallurgical debris. The other two concentrations of slags are found either as refuse used probably for a foundation layer of a road or appear to have been deposited in votive deposit II.

In addition to slags, the excavation of an area south of the temple in square B18 yielded a metal and pottery deposition that included copper alloy vessels and jewellery as well as iron axes, knives and a piece of raw, unworked iron (Figs. 68 and 69). The piece of unworked iron is a bloom or billet. The associated pottery is *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 dated to the second half of the 7th century BC (Fig. 70). These objects were deposited in the settlement area, though the exact context is not known. The assemblage implies, however, trade and production of metal artefacts.[220]

Several of the iron objects from the settlement excavations were examined metallographically. Two knives and two axes were analysed as well as the raw iron nodule. Except for one knife, these items were part of the metal concentration in square B18 mentioned above and are, therefore, dated to the second half of the 7th century BC.[221] The iron knife which does not belong to this concentration is dated to approximately 650 BC.[222] The results of the metallographic examination are presented per artefact:

- Knife S4607 has a core which consists of a medium to high carbon steel with a hardness of 280 Hv, Vickers micro hardness test.[223] 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 consisted either of ferrite or phosphoric iron and had a hardness that was considerably lower.
- Axe S5099 had a low carbon steel and ferrite cutting edge and was relatively soft, 135 to 187 Hv.

It can be deduced from the metallographic examination that during the 7th century BC not all the constraints of smelting and smithing were under full control though the smiths were working with considerable skill. Various types of iron or steel were used for different parts of the object. This differential use of grades of iron can be observed in knife S4607, where the core, tang and probably the cutting edge consisted of a medium carbon steel as these parts have to be hard, while the back of the blade was 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, Axe S 5030, did indicate relatively rapid cooling.

The hardness of the artefacts was regarded as sufficient for their function. Various parts of the iron artefacts had a hardness of around 280-290 Hv, which is harder than most copper alloy artefacts.[224] Moorey mentions that a copper alloy which contains 6 to 10 % tin, can be work-hardened to 275-300 Hv but these figures are usually not achieved.[225] Therefore the hardness figures of the iron tools from *Satricum* indicate that the smith manipulated iron to produce a harder working tool than was normally obtained for copper alloy items. Simultaneously, it can be

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[220] Nijboer 1994, 6. See sections 4.2 and 4.3.

[221] Iron artefacts from this context are represented by the numbers S 5030 and S 5099.

[222] This is knife S4607.

[223] S 4607 is published in: Maaskant-Kleibrink 1992, 106, 206. For the hardness test see: Coghlan 1975, 75-6, 131; Scott 1991, 77, 82-3.

[224] Scott 1991, 82-3; Coghlan 1975, 75-83.

[225] Moorey 1994, 283; Scott 1991, 82-3, Appendix C; Coghlan 1975, 122-39.

deduced that full control over the constraints which affect the hardness of iron, was absent. Quenched steel can obtain hardness figures up to 800-900 Hv but this cannot be shown for the early iron from *Satricum*.

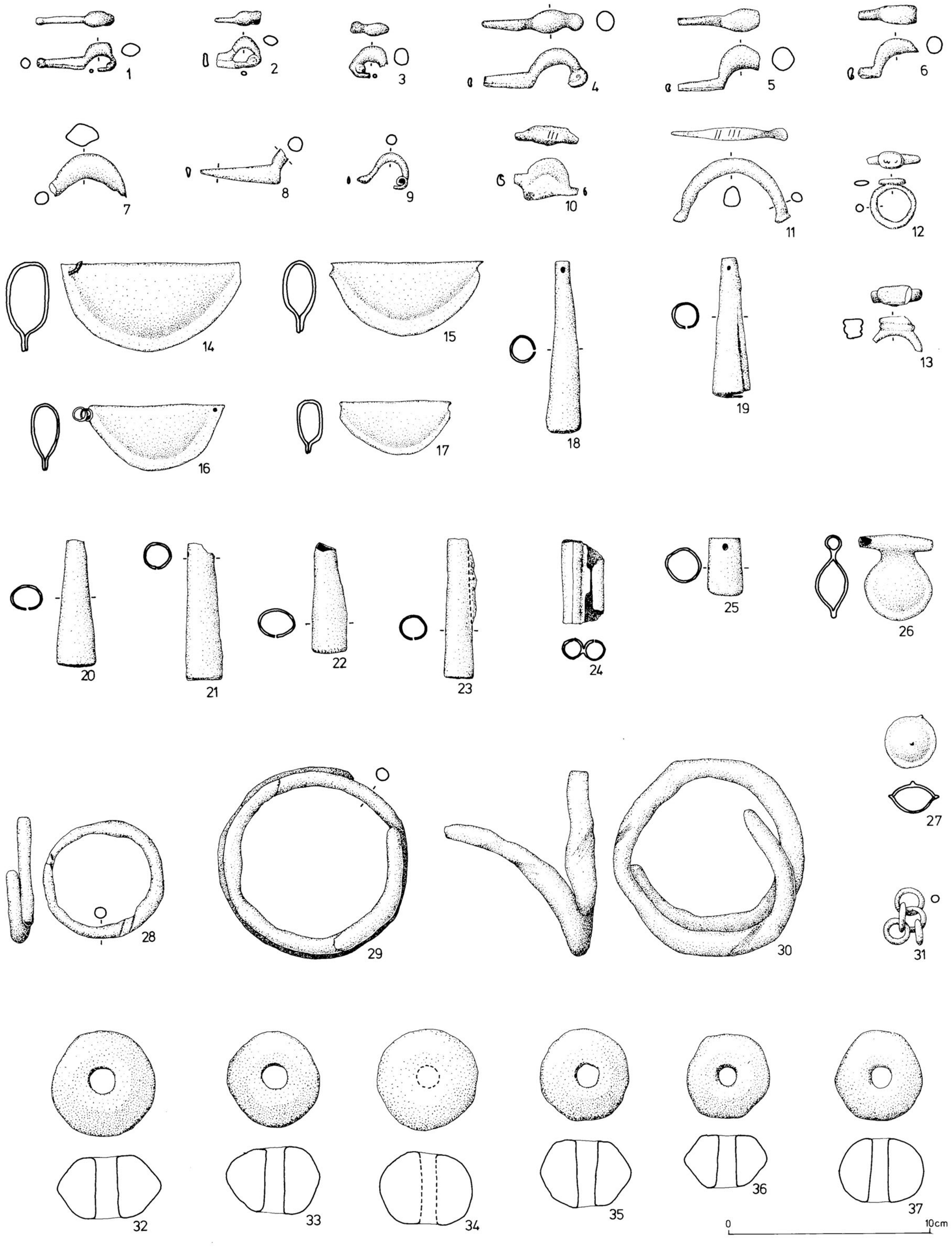

Fig. 50. Satricum, votive deposit I, iron ornaments.

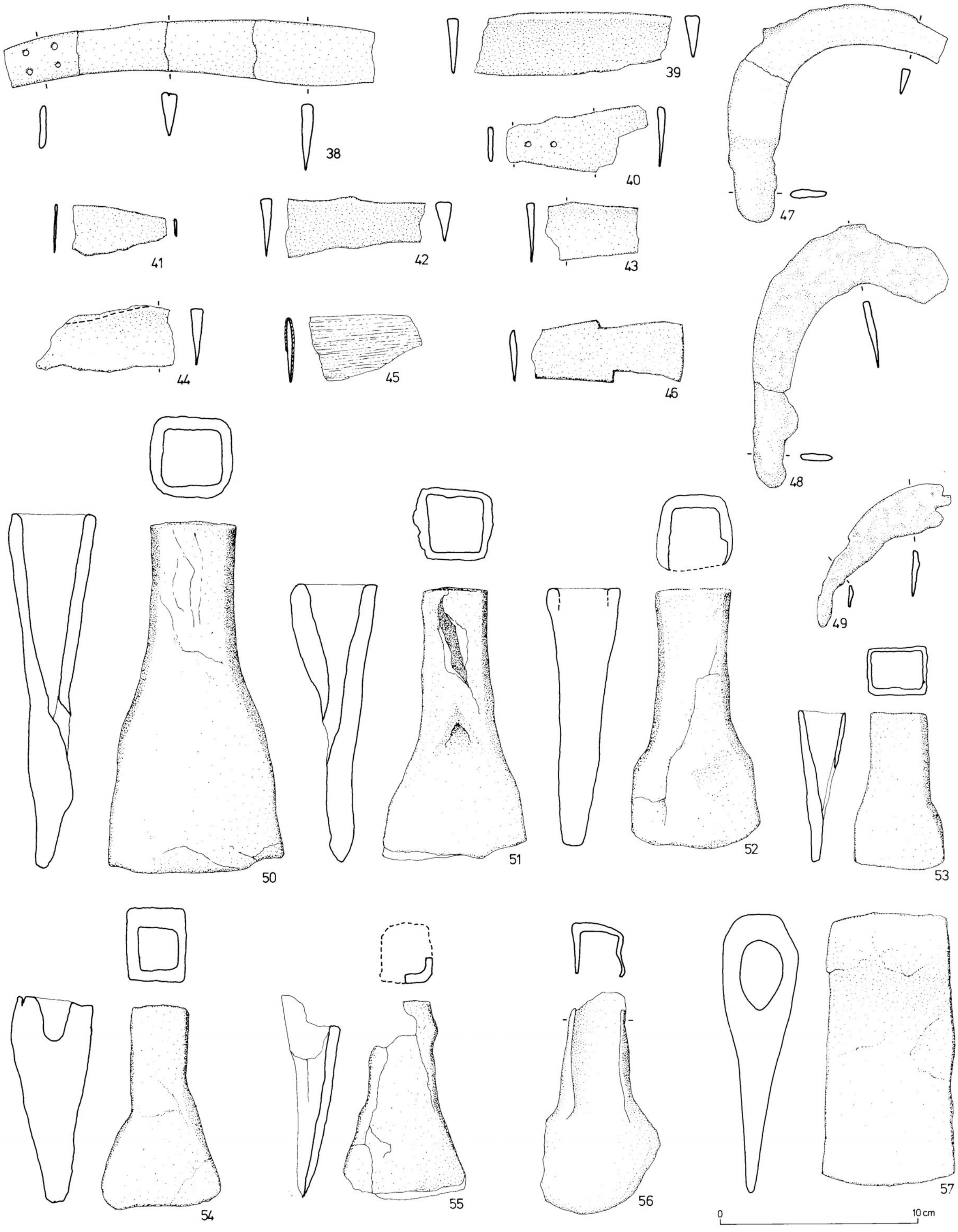

Fig. 51. Satricum, votive deposit I, iron tools.

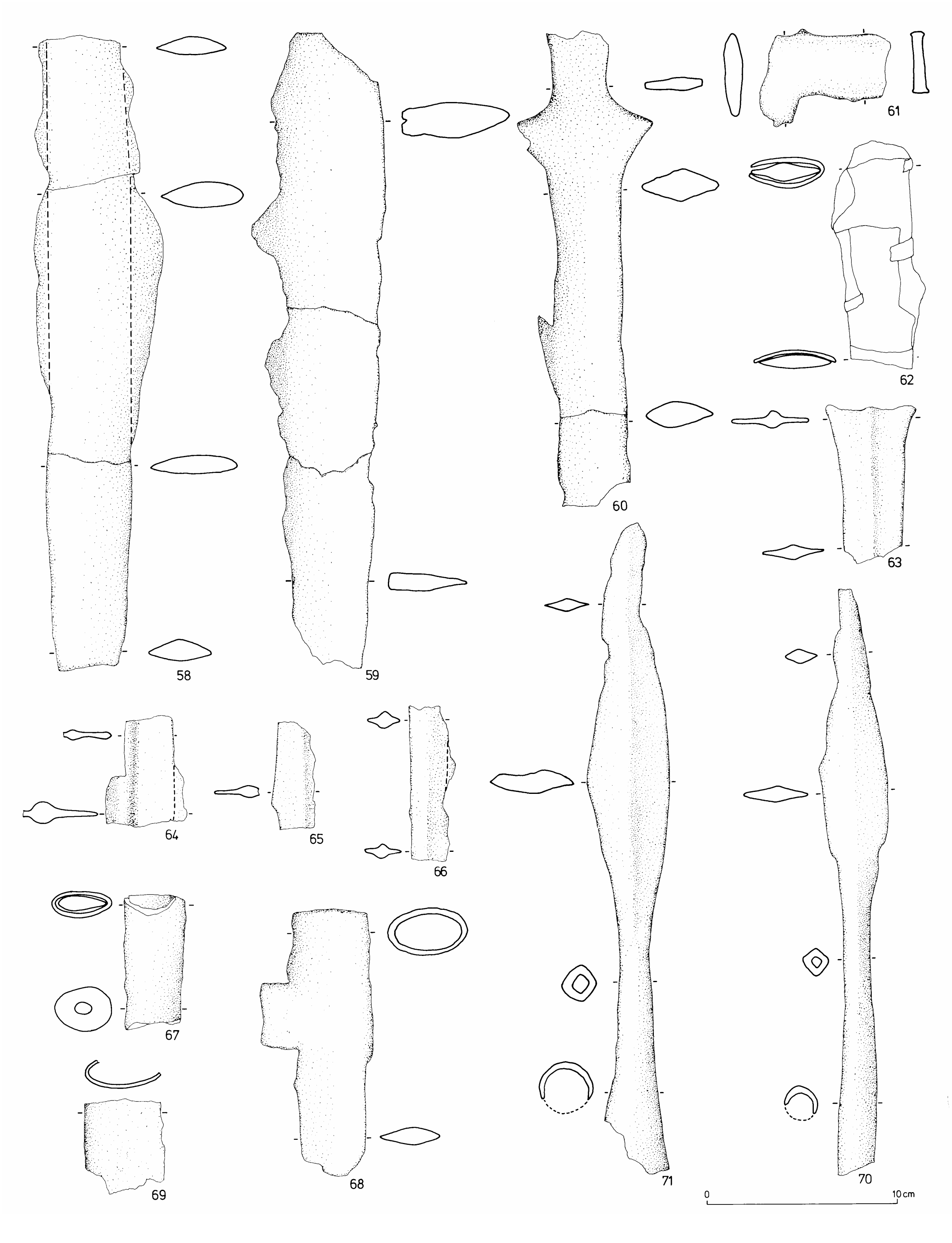

Fig. 52. Satricum, votive deposit I, iron weapons.

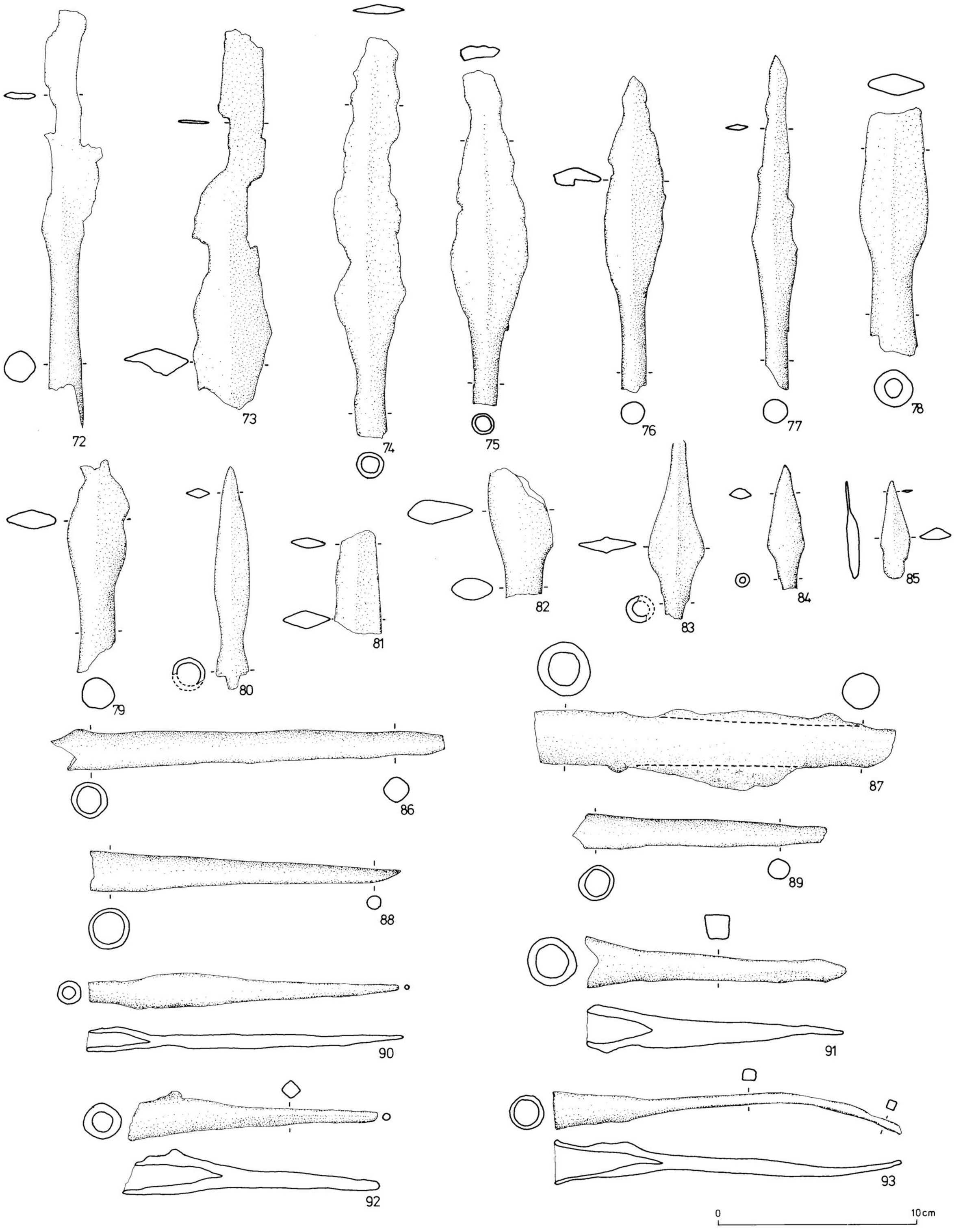

Fig. 53. Satricum, votive deposit I, iron weapons

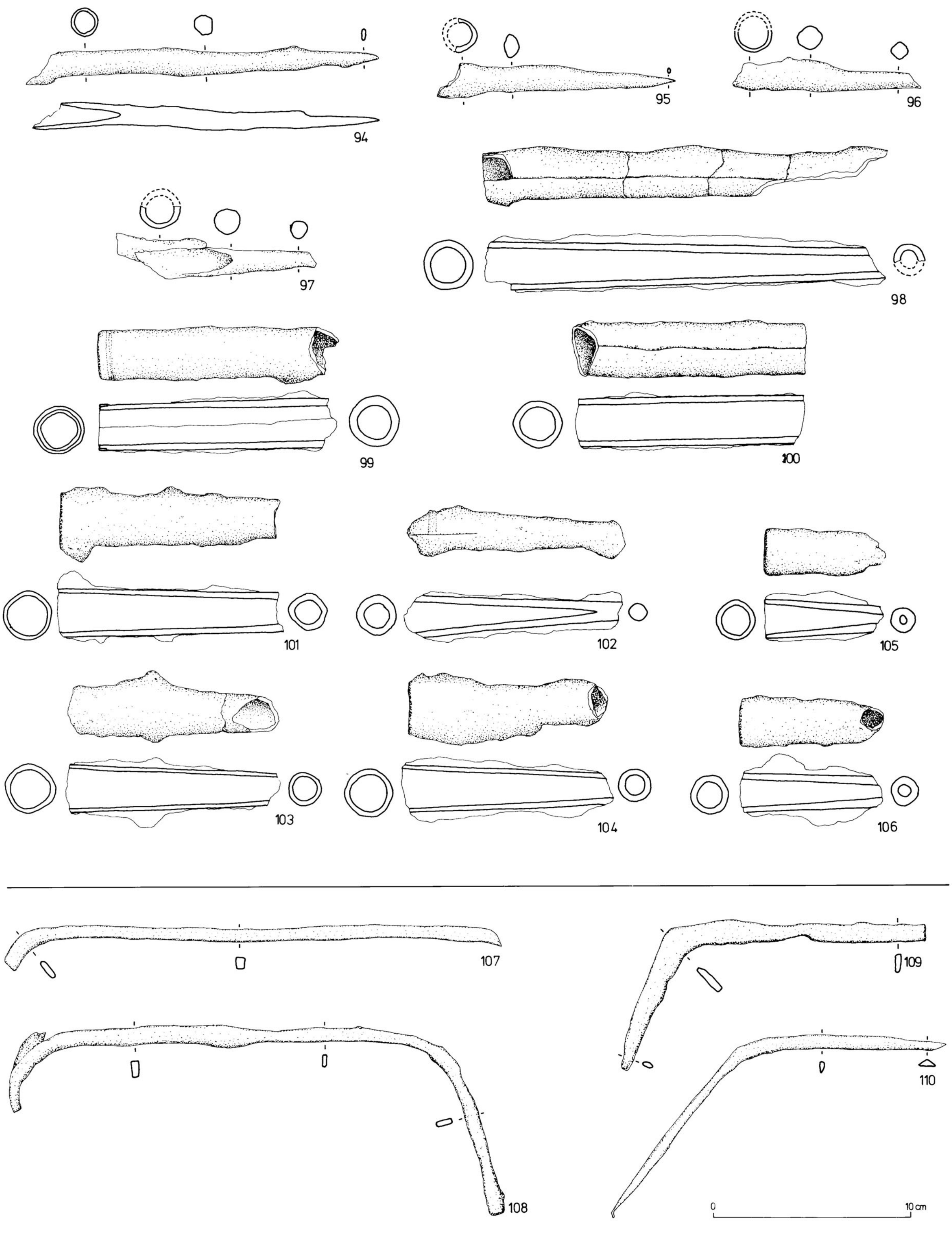

Fig. 54. Satricum, votive deposit I, iron weapons, shafts and rods.

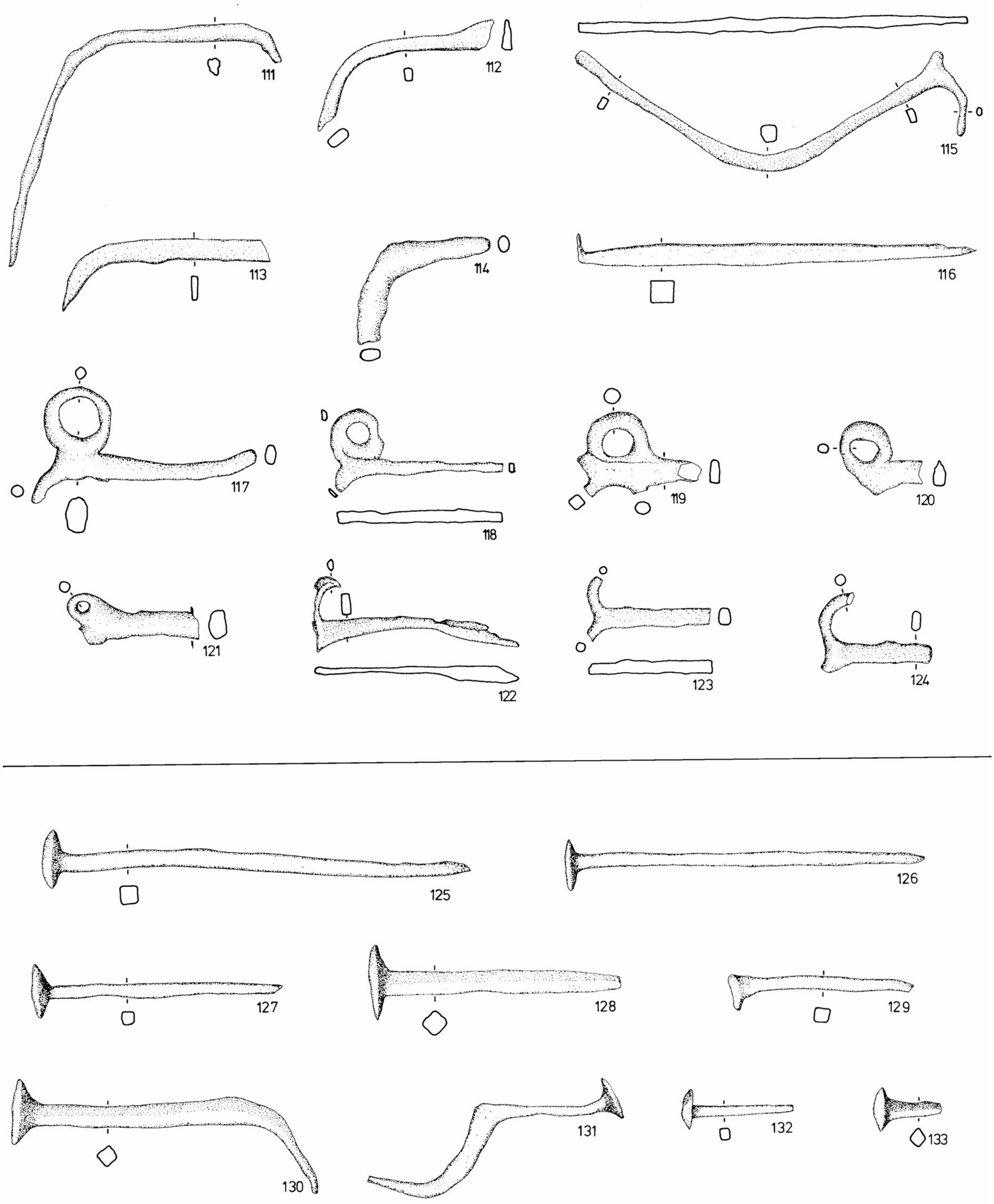

Fig. 55. Satricum, votive deposit I, iron rods, spits and nails

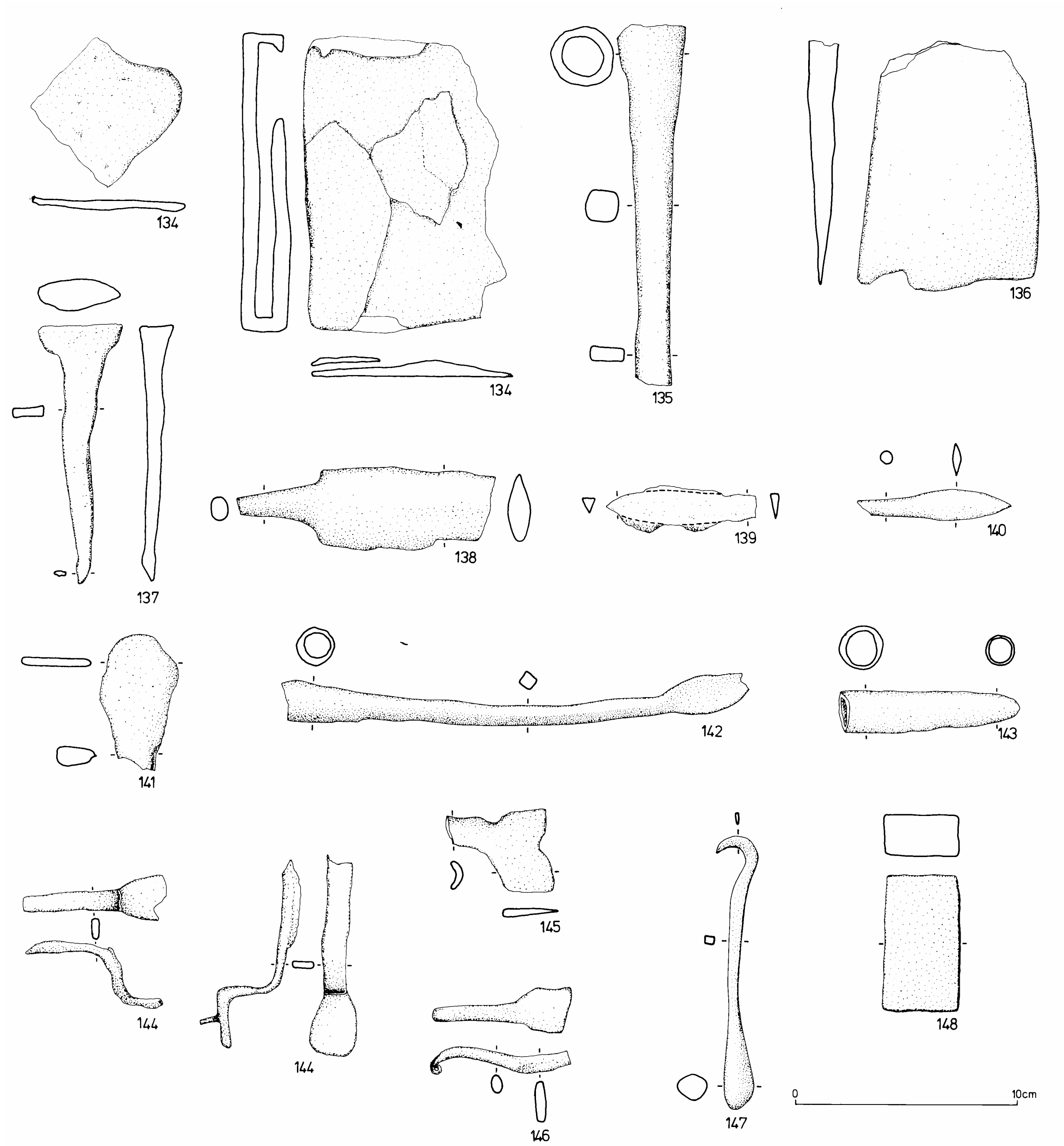

Fig. 56. Satricum, votive deposit I, iron, varia.

The metallurgical evidence from *Satricum* corresponds with the results from similar studies elsewhere in Europe. During the early period of iron technology, different grades of iron were employed to forge iron.[226] Some ancient Italian iron objects were examined for their metallographic characteristics by Follo *et alii* and by Panseri and Leoni.[227] The results of these studies can be compared with the analyses of the iron tools from *Satricum*. Among the iron implements analysed are a the blade of a dagger, a sword and an axe from Vetulonia. These objects are dated to

[226] Pleiner 1980.

[227] Follo *et alii* 1988; Panseri and Leoni 1960; 1961.

the 7th and 6th centuries BC and were forged from different grades of iron. Only the axe from Vetulonia was quenched with an hardness ranging from 560 Hv to 125 Hv, depending on the quality of the iron and its relative position within the axe.[228]

The analyses of the bloom or billet S5030-3, demonstrated that parts were of a hyper-eutectoid steel with more than 0.8% carbon. SEM-EDX analyses of two slag-inclusions in the bloom established that phosphorus, as well as manganese, oxides were present up to 2%. These quantities indicate that the bloom/billet was produced from smelting iron ores which contained phosphorus and manganese.[229] XRF and SEM-EDX analyses of the smithing slags excavated on the acropolis at *Satricum*, revealed that almost every slag contained manganese. The phosphorus and manganese content of the smithing slags resembles the content in the bloom/billet. Tylecote reports that the composition of the smithing hearth bottoms is not very different from the smelting slags and that these contain information about the ores smelted. Especially '*manganese and phosphorus are useful from this point of view although some of the latter element can come from the fuel ash*'.[230] Thus, the smithing hearth bottoms from *Satricum* as well as the slag inclusions in the bloom/billet indicate at least the use of manganese bearing ores. Relating slags to the provenance of iron ores is complicated on account of the variables involved such as the use of fluxes during smelting or post-depositional changes. For central Italy the ores from Elba have obtained an almost mythical status. However the Elban iron ores constitute only a fraction of the iron ores available in central Italy.[231] Moreover, there are various iron ore deposits on Elba which have diverse compositions.[232] Without specifications and a relevant archaeological context, an attribution of the provenance of iron ores to Elba is of little significance. In relation to the metallurgical residues from *Satricum*, Elban iron ores appear not to be a likely source since they contain no phosphorus and manganese or merely traces of these elements.[233] The relatively high proportion of manganese in the metallurgical residues from *Satricum* could indicate the smelting of bog iron ores or other manganese bearing iron ores.[234]

The account of the slags and the bloom/billet from *Satricum* establishes that iron was forged at the site while the metallurgical examination demonstrates the technological level of smithing around 650 to 600 BC. An indication of the range of iron artefacts that may have been produced at the settlement is provided by votive deposit I. This deposit has always been considered exceptional when compared to other early votive deposits in *Latium Vetus*. The assessment is based on the enormous quantity of artefacts that were found, their high technical quality and the variety of objects. Therefore the oldest votive deposit from *Satricum* is considered to be the richest deposit of *Latium Vetus*.[235] Unfortunately this deposit has not been published completely although it was excavated about a century ago.

Votive deposit I is dated from the 8th to 6th centuries BC.[236] Thus, the dating of the iron artefacts from this

[228] Panseri and Leoni 1960.

[229] Tylecote 1987, 313. For a complete account on the metallographic examinations of *Satricum* see Abbingh *et alii*, forthcoming. Avery reports the production of a bloom of medium carbon level ranging from 0 to hypereutectoid (> 0.8%) but on the average between 0.2 and 0.6 % carbon: Avery 1982, 212.

[230] Tylecote 1987, 313.

[231] *cf*. Giardino 1995.

[232] Bodechtel 1965; Zitzmann 1978.

[233] Cucini Tizzoni and Tizzoni 1992, 30; Zitzmann 1977 Vol. I, 211-2; 1978 Vol. II, 111-2, 317.

[234] Zitzmann 1977, 24-5; Tylecote 1987, 169, 52.

[235] *cf*. *Satricum* 1985, 97; Bouma 1996 chapter II and IV; Waarsenburg forthcoming.

[236] Maaskant-Kleibrink 1995; Kleibrink 1997.

deposit fall within these centuries (Figs. 50 to 56). In general, dating iron objects is difficult due to various reasons such as the longevity of tool and weapon forms and their ill-defined typology which is primarily caused by the poor state of preservation of iron. Nevertheless the initial phase of the deposit is recorded by some of the jewellery, lance heads, axes, swords and daggers while the final stage is represented by the iron rings. For example, the iron rings number 12 and 13 in Figure 50 are similar to silver and copper alloy signet rings found in votive deposit I which shows that they were manufactured in various metals. Similar rings are dated elsewhere to the second half of the 6th century BC and thus they relate to the final stages of this deposit at *Satricum*.[237] Most of the other iron objects in votive deposit I probably date to the second half of the 7th and the early 6th centuries BC. The dating of the various artefacts will be discussed in more detail below.

All iron artefacts attributed to votive deposit I are illustrated in Figs. 50 to 56. At present, most of these objects 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.[238] The iron artefacts from votive deposit I appear to confirm the exceptional character of the deposit. In central Italy, I do not know of any comparable deposit though the Archaic deposit excavated at Anagni and dated from the 7th to the early 5th centuries BC, contained some similar iron artefacts such as a fibula, bracelet, lances and rods.[239] Another deposit in central Italy with some related iron items is the deposit of Brolio in the Val di Chiana.[240] This deposit dates from the late 7th to the early 5th centuries BC. The majority of the artefacts in the deposit of Brolio date to the late 7th - early 6th centuries BC. It contains some lances and axes similar to those found at *Satricum* in votive deposit I.[241] Though both the deposits at Anagni and Brolio contain comparable iron artefacts, they do not exhibit the quantity nor the variety of iron objects found at *Satricum*.

The iron artefacts from votive deposit I at *Satricum* may be correlated with the evidence for smithing near the sanctuary presented above. There are several other deposits in central Italy with evidence for smithing. For example, a votive deposit at Grotta Bella (Terni) included slags and tools for iron working such as hammers and a pair of tongs. It was suggested that artefacts were produced in the sanctuary for the use of pilgrims.[242] Also in Rome various slags are recorded 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 to the late 3rd centuries BC.[243] Neither the deposits at Grotta Bella nor at the Vesta temple disclosed a comparable range of iron artefacts to that found at *Satricum*. To my knowledge, the closest parallel both in quantity and context is a deposit at Philia in Thessaly, Greece. At this site, offerings of iron artefacts as well as evidence for iron working, are recorded.[244] The difference between the deposits

[237] *Satricum* 1985, 112.

[238] These objects are attributed to votive deposit I and are therefore presented as such in this section. However, it is necessary to report that about 10% of the illustrated artefacts, many of which minor fragments, are registered as NN numbers. This means that they cannot be correlated directly to the field records. These NN numbers were at one stage in the past, assigned to votive deposit I. The majority of the illustrated iron artefacts are securely attributed to votive deposit I as is documented in the Appendix that presents their inventory at the moment of excavation about a century ago. A detailed report of the actual excavations around 1900 AD and of the complicated post-excavation history is published by Waarsenburg in his thesis: Waarsenburg 1994, chapter 2.

[239] Gatti 1993 a, 61-97.

[240] The deposit at Brolio was recovered in 1863 and was originally considered to be a hoard of a metal workshop on account of the associated semi-manufactured products. This interpretation is expressed in a letter by Scipione Corradini which was published by Romualdi: Romualdi 1981, 64. Nowadays it is considered to be a deposit: Romualdi 1981, 35.

[241] Romualdi 1981, cat. no. 58 - 67.

[242] Monacchi 1988.

[243] Boni 1900, 172-83; Gjerstadt 1960.

[244] Kilian 1983. Strøm kindly informed me of a metal workshop right in front of a Geometric cult building at Tegea: Østby *et alii* 1994, 98-107.

is that during the late 8th and first half of the 7th centuries BC, the deposit at *Satricum* contained a fair amount of imports from foreign communities while the deposit at Philia is considered to be a local or regional sanctuary. At Philia, the majority of iron offerings such as tools, *obeloi*, knives, arrows, lances, butt-spikes, swords, semi-manufactured products, waste products and a bar were excavated in the vicinity of the sanctuary.[245] In addition, waste-products demonstrating the processing of copper alloys were found at Philia together with debris of a smithy. Some metalworking tools were excavated near the sanctuary and testify to the existence of a metal workshop. Kilian reports that in Greece dedications of iron artefacts are fairly common in many Geometric and Archaic sanctuaries though not often published. He associates these offerings with local production on account of accompanying evidence such as semi-manufactured artefacts and waste products. Similar correlations are likely to have existed in Italy. For example, the archaic votive deposits of Anagni and *Satricum* revealed a large amount of iron offerings which at *Satricum* can be related to waste products of smithing. This pattern may well have lasted into the Republican period as is suggested by the deposit at Grotta Bella.

The dating of individual iron artefacts from votive deposit I is based on iron objects found in other contexts at *Satricum*. To a certain extent, the iron artefacts from the deposit resemble those found in the necropolis and the settlement. Several tombs at the site contained iron objects which can be compared with the iron artefacts from the votive deposit.[246]

- Tomb XIV for example, is dated to approximately 675-650 BC and contained an iron sword similar to the fragments 64 to 66 on Figure 52.
- Some of the pendants from tomb XXV, dated to 640-620 BC, resemble the pendants 18 to 22 and 27 in Figure 50. This corresponds with the date of the iron pendants excavated at Osteria dell'Osa in tomb 401.[247] Several of the pendants found in this tomb are related to the pendants from *Satricum*, numbers 14 to 27 illustrated in Figure 50.
- Tomb II is dated to between 700/685 and 620 BC and contained many lance heads with corresponding shafts and butt-spikes similar to the lance heads, butt-spikes and shafts from votive deposit I illustrated in the Figures 52 and 53. The blades of two swords from tomb II can be related to the blade of sword number 58 in Figure 52. Similar blades of swords were excavated at Osteria dell'Osa in the tombs 54, 76 and 227 dated from 660 to 580 BC.[248]
- Tomb XVIII, dated from 750/725 to 620/610 BC, contained several fragments of blades from swords and daggers which are comparable to the blade-fragments numbers 63 to 66 in Figure 52.[249]

A few iron objects were found in the settlement. These objects can be dated to the middle of the 7th century BC.[250] Both the knives and the axes from the settlement area are comparable to the knife fragments and axes from votive deposit I illustrated in Figure 51.[251]

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[245] The iron bar that was recovered at Philia, is similar to the bar excavated at *Satricum* (Fig. 56, no. 148).

[246] For a desription of these tombs see: Waarsenburg 1994.

[247] Bietti Sestieri dates this tomb to period IV A2: 660/650 - 630/620 BC: Bietti Sestieri 1992 a.

[248] Bietti Sestieri 1992 a.

[249] Undoubtedly more iron artefacts from the necropolis resemble iron objects from votive deposit I. However Waarsenburg did not fully document the iron from the necropolis and consequently it is not possible to relate every iron item from the necropolis to iron artefacts from votive deposit I: Waarsenburg 1994. Compare also the iron that is illustrated in Figures 50 to 56 with iron objects from *Satricum* that are published by: Ginge 1996.

[250] See Appendix.

[251] The catalogue of the *Satricum* 1985 exhibition contains two entries of lances that are reported to have been found in huts (no. 11800 and 11850): *Satricum* 1985.

The range of iron objects found in votive deposit I contribute to the difficulties in examining some of them. The diversity is unsurpassed in *Latium Vetus* and Etruria. Thus, several artefacts in votive deposit I are without parallels. Therefore they can only be dated by the general date given to the deposit. For example, the iron artefacts that look like spindle-whorls illustrated in Figure 50, numbers 32 to 37, cannot be compared to similar iron objects from other sites nor can the bracelets with copper alloy inlay, numbers 28 and 30 in Figure 50.[252] The iron sickles, Figure 51, numbers 47 to 49 are, as far as I know, difficult to relate to excavation reports from central Italy but are known in Southern Italy.[253] At Francavilla Marittima several iron sickles were found which all belong to a type with socket shaft dated to the 8th century BC.[254] However the iron sickles from *Satricum* do not resemble the sickles from Francavilla Marittima. Copper alloy sickles of similar form to the iron sickles from *Satricum* are known from the late Bronze Age.[255] The 412 copper alloy sickles found in the San Francesco hoard at Bologna provide an analogy in form and possibly date.[256]

Besides the complications due to the range of iron artefacts from votive deposit I, another obstacle in dating these artefacts is the wide date of the deposit itself. Many iron tools cannot be dated precisely when they do not derive from accurately dated contexts. This problem is illustrated by the group of axes in Figure 51 numbers 50 to 57. These axes are relatively rare in *Latium Vetus* during the 7th century BC. They appear to be more common in Etruria during the 7th and 6th centuries BC.[257] The prevalence of iron axes is demonstrated by the deposit of Brolio in the *Val di Chiana* and the *tomba <dei flabelli di bronzo>* at Populonia.[258] Iron axes similar to those from *Satricum* were found in several necropoleis in central Italy with dates ranging from 760 to the early 6th centuries BC. Hartmann catalogued early iron artefacts from Etruria and records:

- two iron axes from Veii dated from 760 to 720 BC,
- one axe from Tarquinia dated to approximately 725-700 and
- five from Vulci mostly dated between 720 and 690 BC.[259]

For example, an axe from Veii in tomb II JJ 19 resembles the axe from *Satricum* illustrated in Figure 51, number 52.[260]

The closest parallel in *Latium Vetus* for the axes from *Satricum* is the *tomba Bernardini* at Palestrina where two square socketed axes similar to Figure 51, numbers 50 and 52, as well as one shaft hole axe resembling Figure 51, number 57, are reported.[261] The *tomba Bernardini* is dated to the beginning of the 7th century BC. A square socketed axe from tomb 43 at Caracupa dated to approximately 650 BC, also resembles the axes from votive

[252] Bietti Sestieri reports lead spindle whirls in tomb 322 which were stolen from the excavation storeroom: Bietti Sestieri 1992 a, 709, fig. 315. Falchi documents an early copper alloy bracelet twined with an iron inlay that was recovered in Tomb III on the *Cima del Poggio alla Guardia* at Vetulonia: Falchi 1891, 78-80.

[253] Hartmann for example, does not present any sickles from Etruria: Hartmann 1982. In *Gli Etruschi in Maremma* it is reported that copper alloy and iron sickles dated to the 6th and 5th centuries BC, are known from Populonia: Cristofani 1981, 181. Pleiner mentions that iron sickles are frequently dedicated at sanctuaries in Greece; Pleiner 1969, 15-7.

[254] Gualtieri 1982, 163.

[255] *cf*. Bartoloni 1989, 72, fig. 3.9.

[256] Zannoni 1888; see for example, page 31, *Tav*. XXXI.

[257] Stary 1981, 181.

[258] Romualdi 1981; Minto 1943, 139-59, *Tav*. XXXIII.

[259] Hartmann 1982.

[260] Ward-Perkins *et alii* 1963, 210-2.

[261] Canciani and von Hase 1979, 62-3.

deposit I.[262]

This detailed account on iron axes from central Italy demonstrates that these axes can only be dated precisely by their contexts. The dates of these axes vary from the 8th to the 6th centuries BC, more or less the period ascribed to votive deposit I. Nevertheless, I suggest dating the iron axes from this deposit to the 7th century BC. This is based on the examples from Palestrina and Caracupa and on the iron axes found in the settlement at *Satricum*. The axes from the settlement derive from a context dated to the second half of the 7th century BC. Unfortunately, both an earlier as well as a later date for these axes cannot be excluded considering the features of votive deposit I.

The evidence for iron manufacture at *Satricum* in combination with the information on the production of pottery at the site which was presented in chapter II, establishes that at least from around the middle of the 7th century BC industrial production accelerated at the site. Evidence for production activities, such as slags and kiln remains, continues into the 4th century BC.[263] This means that workshop production was maintained at the site although the settlement did not develop into a primary urban centre. Nucleation of workshops is not demonstrated and it is probable that the main sanctuary directed the economic development of the site.[264] In addition to the local manufacture of iron and pottery, it is suggested that other materials were also processed. The evidence for local copper working and amber carving is circumstantial.

There is indirect evidence for the repair of copper alloy vessels[265] and the casting of fibulae, since several of the fibulae types which were found in votive deposit I, are identical and cast from the same mould. Thus, 7 boat fibulae are exactly equal in size and decoration.[266] Sets of the same type of fibula, each set decreasing in size, occur in this deposit as well. This suggests a local production from the 7th century BC. Other indications for copper smithing at the site, are the metal scraps and the enormous amount of *aes rude* from votive deposit I.[267]

Around the middle of the 7th century BC the activities at the settlement may have included the carving of amber. Tomb VI which is dated to 650/640 BC, is known as the 'amber burial tomb' and contained over 500 pieces of amber artefacts. On the basis of quantitative and stylistic analysis Waarsenburg suggested that a carver and his apprentice worked at *Satricum* around 650 BC.[268] A combination of activities such as carving and metalworking is common for workshops during this period. Carving hard substances was the craft of the *faber* which has meant throughout antiquity, the processing of materials such as wood, horn, bone, ivory, amber and even metals.[269] The processing of metals and bone was attested at *Pithekoussai* in the metal workshop and similar activities are recorded at Poggio Civitate.[270] It is, therefore, probable that at least during the Orientalising Period various materials were processed at *Satricum* in a single workshop.

The workshop activities at *Satricum* reflect the changes examined in this thesis. The workshop conditions around

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[262] Savignoni and Mengarelli 1903, 325; Angle and Gianni 1985, 200.

[263] Nijboer *et alii* 1995.

[264] *cf*. Bouma *et alii* 1995; Nijboer 1993/1994, 102; Nijboer *et alii* 1995.

[265] Waarsenburg 1995, 213-4, 253; Waarsenburg forthcoming.

[266] No. 10658, *Museo Villa Giulia*.

[267] I refer to Waarsenburg for the copper alloy artefacts in votive deposit I: Waarsenburg forthcoming. Haeberlin mentions the relation between *aes rude* and workshop activities: Haeberlin 1910, 3.

[268] Waarsenburg 1994, 339-419; Nijboer 1995 b, 41.

[269] Blümner 1879, 164-86.

[270] On *Pithekoussai* see section 3.6.1. For Poggio Civitate I refer to: Nielsen 1995; sections 2.6.6 and 3.6.8.

the middle of the 7th century BC as reported in the activity area of hut VII and building AA, appear to be relatively affluent. At *Satricum* the early workshop activities are located in a settlement that consisted chiefly of huts. Workshop production was directed towards the manufacture of luxury goods and included the processing of various materials. During the 6th century BC, the second kiln at the site implies that workshop activities are related to substantial buildings but that production became increasingly associated with subsistence goods. The workshop conditions at the site during the 5th and 4th centuries BC, indicates moderate circumstances. The religuous gatherings at *Satricum* became essential for the continuance of industrial activities, albeit on a reduced scale. The output of these late workshops is reflected by the artefacts excavated in the necropoleis and votive deposits. To judge from this output, I propose that the pottery was made by a few craftsmen, possibly one or two family workshops. The potting activities were probably combined with agriculture which would account for the low degree of specialisation that is revealed in the ceramics.[271] The pottery reflects the progressing marginalisation of the local crafts at *Satricum*. During this same period, metalworking was probably managed by a single person in what might be described as a small, local workshop.[272]

3.6.3 *Caere*

The evidence for metalworking at *Caere* is scarce when compared with the information on pottery production presented in chapter II. The recent publication of the excavations on the settlement plateau which were directed by Cristofani, has presented proof for metallurgical activities within an urban context. It is reported that 76 fragments of refractory material were discovered in a huge basin which contained pottery from the 7th to the early 5th centuries BC.[273] Some of these fragments derive from crucibles and others from moulds for casting copper alloys. The surface of the crucibles is occasionally vitrified and covered with slag-like material. One of the fragments of a mould is decorated on the inside with an impression of four petals. The refractory materials are waste products of casting copper alloys and demonstrate that a metallurgical workshop existed nearby within the urban centre.[274] The workshop itself was not found.

Other evidence for metalworking at the site is circumstantial. For example, it is suggested on account of stylistic details and distribution that a jewellers workshop existed at *Caere* from the early 7th century BC.[275] Albanese Procelli implied that *Caere* was a production centre for hammered copper alloy bowls and basins during the 7th century BC on account of the refined execution and the ancient repairs of metal vessels found at the site. It is suggested that this production increased and that goods may have been exported to Sicily and southern Italy.[276] Wiman considers that the town incorporated a workshop for the manufacture of copper alloy mirrors.[277] I personally would not hesitate to assign some of the *Caeretan* copper alloy artefacts which are kept at the archaeological museum in Florence, to a local workshop.[278] The production of metal artefacts in the urban workshops of *Caere*

[271] I refer to Bouma for an impression of the output of the pottery workshops during the 5th and 4th centuries BC: Bouma 1996.

[272] Nijboer *et alii* 1995.

[273] See section 2.6.4.

[274] Cristofani 1993, 503-4, fig. 737.

[275] *cf.* Cristofani and Martelli 1983, 37-70; Bordenache Battaglia 1980, 322-48; *Grande Roma* 1990, 262-3.

[276] Albanese Procelli 1985, 186-91.

[277] Wiman 1990, 227-9, 243-5.

[278] For a catalogue of these artefacts see: Cianferoni 1991, 108-31. This publication signifies the relatively limited preservation of copper alloy artefacts from antiquity.

must have been considerable but this is not directly reflected in the archaeological record. The output must have incorporated a wider range of artefacts than basins and mirrors. For instance, an indication of the iron production at the site depends entirely on the few assemblages with iron discovered in the early tombs. This makes it impossible to elaborate on this aspect of the craft of metal working during the period 800 to 400 BC.[279]

The excavations by Cristofani and his team have established that a portion of the central plateau was assigned to workshop activities at least to about 500 BC. In addition to metalworking, the production of ceramics is recorded. A large pottery workshop was discovered nearby which might have existed on the same site for several centuries.[280] The activities in this section of the town included bone, antler and horn working since off-cuts were reported.[281] Therefore the refuse material records the same range of activities as in smaller centres such as Poggio Civitate and *Satricum* though at *Caere* these activities were organised on a larger, more intense scale.[282]

3.6.4 *Acquarossa*

Acquarossa is located near some ore deposits (Fig. 57). Within about 3 km of the site there are two mining districts and the exploitation of these mineral assets contributed to the development of the settlement during the 7th and 6th centuries BC. The sulphide-iron ore deposits nearby were probably worked and reduced at the site. In addition, local limonite deposits may have been exploited.[283] Metals were processed at Acquarossa prior to the urban development from the middle of the 7th century BC. Metal waste products were found in a context dated to the late 8th and 7th centuries BC. Iron slags and metal artefacts were discovered at the floors of huts A and B. These huts belong to a compound of structures which are located in zone K of the excavation plan. Moreover, semi-manufactured copper alloy artefacts indicate that copper was locally worked.[284] Zifferero reports that slags, semi-manufactured iron, iron artefacts, fragments of crucibles and deformed or semi-manufactured pieces of copper alloy were found in these huts which establishes that metals were processed here. The findings imply that more than one family was involved in metallurgical activities which indicates that this might have been a communal pursuit. Similar evidence is recorded from the nearby settlement at M. Piombone.[285] As at *Satricum*, the early evidence from Acquarossa on craft specialisation and the processing of metals is associated with a settlement which consists of huts. An intensification of these activities undoubtedly assisted the early urbanisation of the site. The extensive excavations that revealed the urban buildings at Acquarossa, have unfortunately not produced primary evidence for workshop activities. The buildings demonstrate the considerable impact of construction works on the ceramic craft.[286] The lack of workshop remains and industrial debris from the late Orientalising and Archaic period has prompted the excavators to suggest

[279] *cf.* Hartmann 1982.

[280] See section 2.6.4.

[281] Clark 1993, 481-7.

[282] See for example: Haynes 1985, 66-71; Maffei and Nastasi 1990.

[283] Zifferero 1991, 219-21.

[284] Östenberg 1983; Zifferero 1991, 219-20.

[285] Nardi 1972, 106; Zifferero 1991, 219-20. In the nearby vicinity of Acquarossa there were other settlements of which at least one was associated with the manufacture of iron. The settlement traces around Acquarossa are dispersed which probably implies the existence of various communities in this mining area. Wikander estimated that about 4,000 to 7,000 people inhabited Acquarossa during the first half of the 6th century BC without including the existence of nearby settlements. This circumstance should caution those who are trying to minimise the size of the habitation around these mineral resources: *cf.* Wikander 1993 a, 137-9; Person 1994, 293-4.

[286] See section 2.6.5 where data on the ceramic industry at Acquarossa are presented.

that manufacturing activities were located outside the urban centre even though less than 4% of the urban area was excavated.[287] One detail of the ware analyses of the architectural terracottas, indicates that metallurgical activities continued at or near the site during the 6th century BC. Ore and slags are recorded as temper in a specific ware group for tiles that are dated from about 640/20 to 550/525 BC.[288] On account of the presence of ores and slag in local ceramics, it is likely that the processing of ores continued at the site well into the 6th century BC.

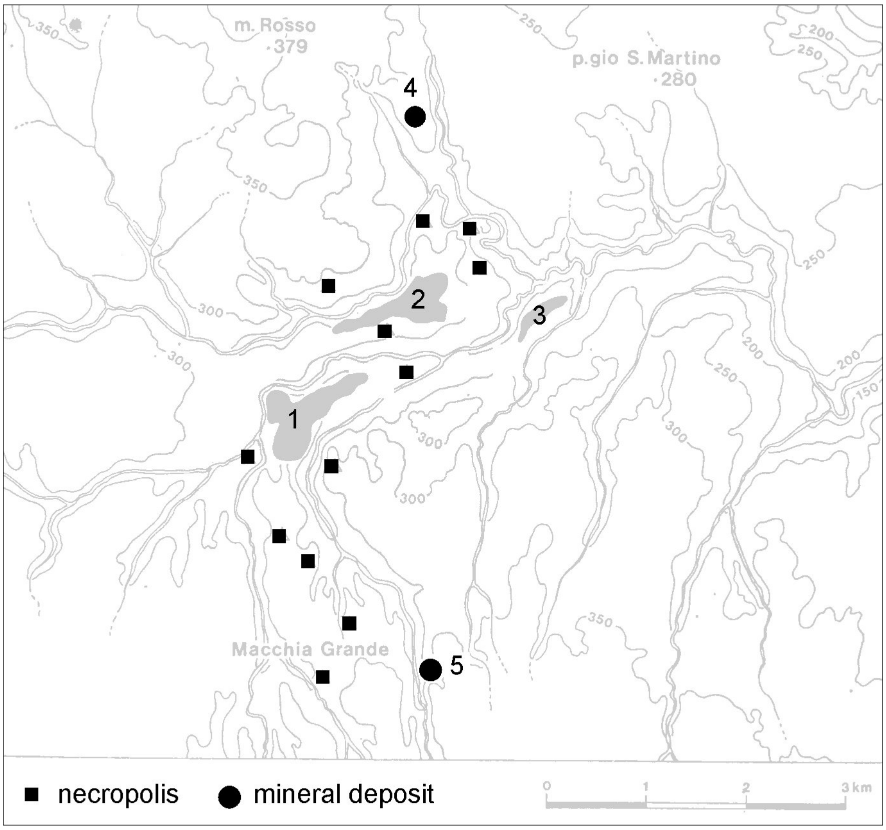

Fig. 57. Aquarossa, mineral resources and settlement traces around the site. 1. Aquarossa; 2. Ferento; 3. M. Piombone; 4. ore deposit of Solfatara; 5. ore deposit of Macchia Grande.

The prosperity of the site, its location within walking distance of mining areas, the early metallurgical debris and its fast economic growth during a period when increasing quantities of iron became indispensible, demonstrates, in my opinion, that the economy at Acquarossa was in part based on the exploitation of the nearby mineral resources. The evidence from the buildings at Acquarossa, which have a mean size of about 60 square metres, can be related to buildings at other sites where metals were processed, such as the settlement at Lago dell'Accesa and the workshops in the industrial quarter of Populonia. In comparison with the 5th century BC metal workshops of Marzabotto, the structures at Acquarossa are even relatively small. However the buildings at Acquarossa are living quarters and cannot be classified as workshops. They may be associated with families who were involved in mining and smelting ores. This could have been combined with other activities as will be recorded for the settlement at Lago dell'Accesa. It is likely that the construction of the buildings at the site is related to an intensification of the metallurgical industry at or near the site. This will have increased the income of the community that lived at Acquarossa.

[287] Wikander, C., 1988, 73-4; Wikander, Ö., 1993 a, 137-9. See section 2.6.5.

[288] Ware group *a* consists of pan tile type I and II: Wikander, Ö., 1993 a, 36-40, 164-70.

3.6.5 *Gran Carro*

Gran Carro is an early Iron Age site and located along the borders of the *Lago di Bolsena*, approximately 40 km north-east of Vulci. The lake settlement is included in this study because it illustrates the position of metallurgy prior to the arrival of overseas communities.

Three settlement phases can be distinguished during the 9th and early 8th centuries BC. The last settlement phase consists of rectangular buildings constructed on platforms, pile dwellings, probably to counteract the effects of a rising water level which eventually caused the abandonment of the settlement during the first half of the 8th century BC.[289]

The metallurgical evidence from Gran Carro was analysed by Giardino and Gigante.[290] A small but significant amount of metal artefacts, casting debris, ingots and unfinished products were discovered at the site. Among these are threads of tin found in a workshop context and a two-piece stone mould for making small objects. The findings establish the existence of a local foundry. Various scientific methods were applied to samples of the metal artefacts including some ingots and residues of casting. On the basis of the archaeometric results, the metalworking activities at Cran Carro can be related to the exploitation of the mineral resources in central Italy.

Analysis of decorative ringlets from Gran Carro showed them to be of tin. A metal thread originally considered to be a silver alloy, appeared also to be tin. Similar threads were used to decorate villanovan pottery. This and the ringlets demonstrate that tin was available locally and employed for purposes other than the necessary alloying with copper. It implies that tin was probably obtained by exploiting the the mineral resources in central Italy.[291]

The presence of a small amount of silver in the alloys of some of the metal artefacts is associated by the authors to the exploitation of galena deposits from which lead was obtained.[292] One ingot was analysed as lead with small amounts of silver, copper, antimony and tin. Considering the associated elements, the lead ingot could have derived from smelting local ores. The lead ores in central Italy contain varying amounts of silver and in my opinion, the metallurgical evidence from Gran Carro indicates that at least the raw material for extracting silver was known to the local communities. It does not, however, mean that silver was extracted nor that the cupellation technique was controlled.

Various ingots were analysed as copper alloys, a few of which contained tin. The presence of antimony in some of these ingots indicates that the ores contained this element as well. Antimony is also attested in other copper alloy artefacts from central Italy. Sulphidic copper ores which contain small quantities of antimony are reported from the mining district at Manciano which is located near the *Lago di Bolsena*. The elemental analyses of the copper alloys from Gran Carro, therefore, does not contradict the possibilty of the exploitation of local resources. Giardino and Gigante suggest that the ingots from the mining region could have been transported to Gran Carro in order to be used in the local metal workshop for the production of copper alloy artefacts.[293]

Moreover, the analyses of the ingots demonstrates that varying amounts of iron were present in the copper. One ingot and the casting residue contained a significant quantity of iron which indicates the smelting of sulphidic copper ores which are associated with iron. The exploitation of these ores in later centuries has been established by the analyses of the *ramo secco* bars.[294] However the metallurgical examination of samples from Gran Carro suggest

[289] Tamburini 1995, 209-21, 354-62; Bartoloni 1989, 110-1.

[290] Giardino and Gigante 1995.

[291] See also section 3.5.

[292] Giardino and Gigante 1995, 321.

[293] Giardino and Gigante 1995.

[294] Burnett *et alii* 1986.

that the elaborate technology for smelting these ores had been mastered at least by the early Iron Age.

Archaeometric investigation of the metals from Gran Carro imply that various ore deposits in central Italy were mined for the processing of a range of metals. The composition of the lead and copper goods are related to the composition of ore deposits in central Italy. This indicates that local resources were exploited which is also supported by the local economic characteristics of this lake settlement.[295] The evidence from Gran Carro and from other early metalworking sites in central Italy such as Scarceta, Luni sul Mignone and Sorgenti della Nova, establishes that the local mineral resources were exploited prior to the arrival of foreign communities in Italy.[296] During the 8th century BC, central Italy became incorporated in a trading network which encompassed nearly the whole Mediterranean and an intensification of the metalworking activities provided opportunities for economic growth. The Levantine and Greek intermediaries opened new markets, favouring increased exploitation of the local resources and stimulating the conditions for a cultural integration which is known as the Orientalising *koinè.*

3.6.6 *Lago dell'Accesa*

Lago dell'Accesa is located about 30 km to the east of Populonia on the border of an ore region with lead, silver, copper and iron-containing minerals. An early Iron Age settlement is recorded in the necropoleis.[297] The evidence that establishes mining activities, is dated to the Archaic period and is found in the settlement of *Macchia del Monte* near the Lago dell'Accesa. It is a rural settlement which is situated adjacent to the Massa Marittima mining region (Fig. 58). The mines of *Serrabottini* and *Fenice Capanne* which were exploited in antiquity are located some hundred metres from the buildings. The settlement is considered to be one of the minor economic centres in the countryside around Vetulonia. It is dated to the 6th century BC and exhibits three phases. The pottery found inside and near the houses includes some *bucchero* but comprises mainly domestic wares similar to the wares excavated at Poggio Civitate. Within the wall structures some smelting slags were found while pieces of minerals were discovered in the central open area and within complex IV. According to Camporeale and others the economy of the settlement was based on mining the local ores in combination with subsistence activities. For instance, hunting, fishing and agriculture is illustrated by the implements that were found at the site. It is suggested that women were involved in domestic activities such as weaving and the production of ceramics. This is deduced from the number of ceramic weaving tools, such as spindle whorls and loom-weights, and the low degree of specialisation that was reflected in the pottery. The reconstruction that is presented by these authors, is one of part-time specialisation.[298]

The settlement illustrates the living conditions of people who were involved in mining on a part-time basis. In ancient literary texts and in modern textbooks mining is primarily associated with slavery but nothing at the settlement of *Maccia del Monte* indicates that the inhabitants were servile.[299] The buildings as well as the associated finds represent relatively comfortable conditions for some families who combined mining with a range of other activities for subsistence. Mining was probably a communal pursuit and the resources might actually not have been

[295] The imports at Gran Carro are predominantly metals and these reflect local or regional trade. Tamburini emphasises the total absence of imported pottery such as the Geometric pottery from Bisenzio: Tamburini 1995, 357. The economy at the site was based on the exploitation and processing of nearby resources with little direct communication with other communities though culturally it appears to be related to the Latial *koinè*: Tamburini 1995, 353-62. This implies that exchange was organised internally and the economy was primarily self-supporting.

[296] See section 3.1 for the metallurgical data at Scarceta, Luni sul Mignone and Sorgenti della Nova.

[297] Giardino 1995, 61-2, 129.

[298] Camporeale 1985, 126-78; van Dommelen forthcoming.

[299] *cf*. Finley 1981, 101, 103-4; Garlan 1988, 65-6; Healy 1978, 133-8. Starr notes, however, that industrial slavery was of restricted importance in Greece down to 500 BC: Starr 1977, 91.

possessed by one or two families. In my opinion, circumstances at the settlement displays features of communal ownership of resources rather than of private propriety rights. This does not indicate that I deny the existence of social hierarchy but actual appropriation of resources is a slow process and probably developed differently at individual sites depending on the social-economic context. It is possible that the community at *Macchia del Monte* had to compensate individuals with tribute for the use of the mines and land but this remains hypothetical.[300] The desertion of the settlement at Lago dell'Accesa and other sites in central Italy by the late 6th century BC implies increasing social-economic tensions in which the confiscation of resources played a role.

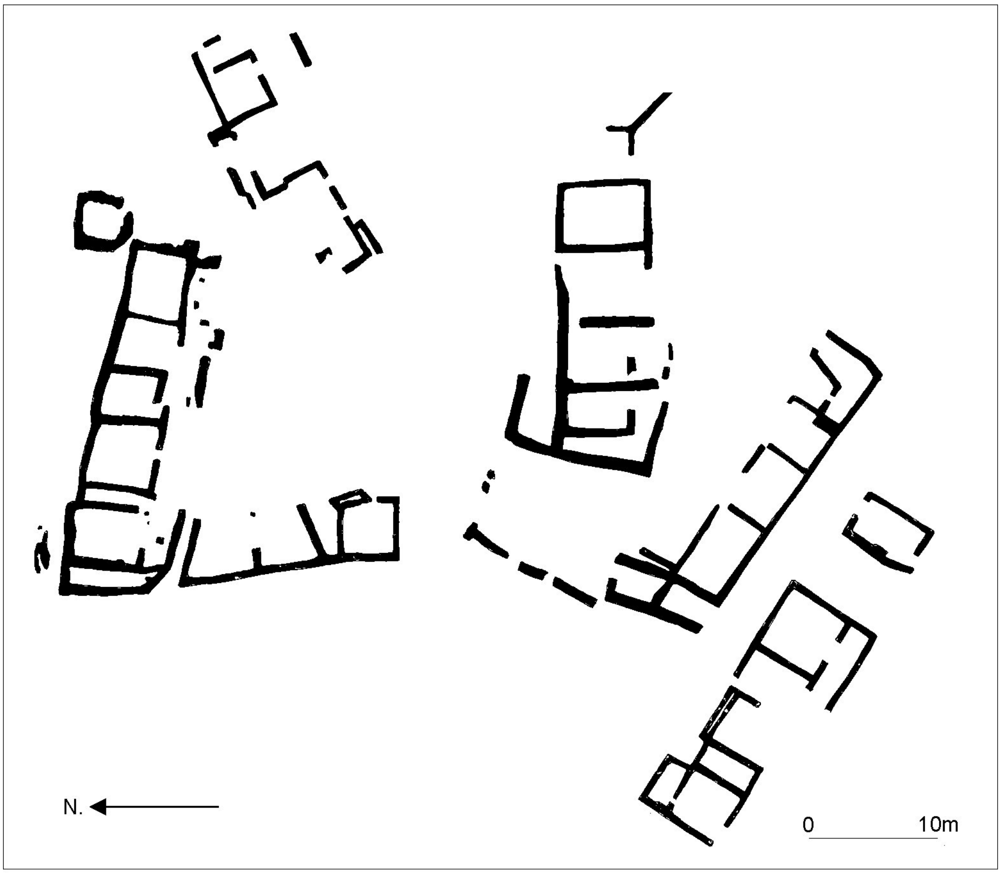

Fig. 58. Lago dell'Accesa, building remains.

3.6.7 *Populonia*

Populonia is located along the Tyrrhenean coast, less than 20 km to the north-east of the island Elba. The necropoleis from various periods and the settlement features that were excavated at Populonia are illustrated in Figure 59.

The site is positioned in between the rich mineral deposits of the Campiglia area, the Colline Metallifere and the

[300] I refer to section 1.8 and the Epilogue for the slow evolution of appropriation of resources by individual families during state formation processes. Due to this gradual development various degrees of control over resources will have existed in central Italy during the period 800 to 500 BC.

deposits on Elba.[301] Therefore, it had in theory access to a range of metal ores which could derive from various locations. In the ancient literature, Populonia is only associated with the smelting of ores from Elba.[302] The settlement has long been accepted as one of the most important, early iron production centres in antiquity. Nonetheless, it should be noted that other metals were processed as well. The area immediately around Populonia is characterised by metal processing in general and not just by iron working. It is recorded that copper slags and several tons of litharge were found in the vicinity of the settlement.[303] However the dating of the various metallurgical activities at Populonia is complicated since the enormous slag deposits around the site contain scarcely any stratigraphic information.[304]

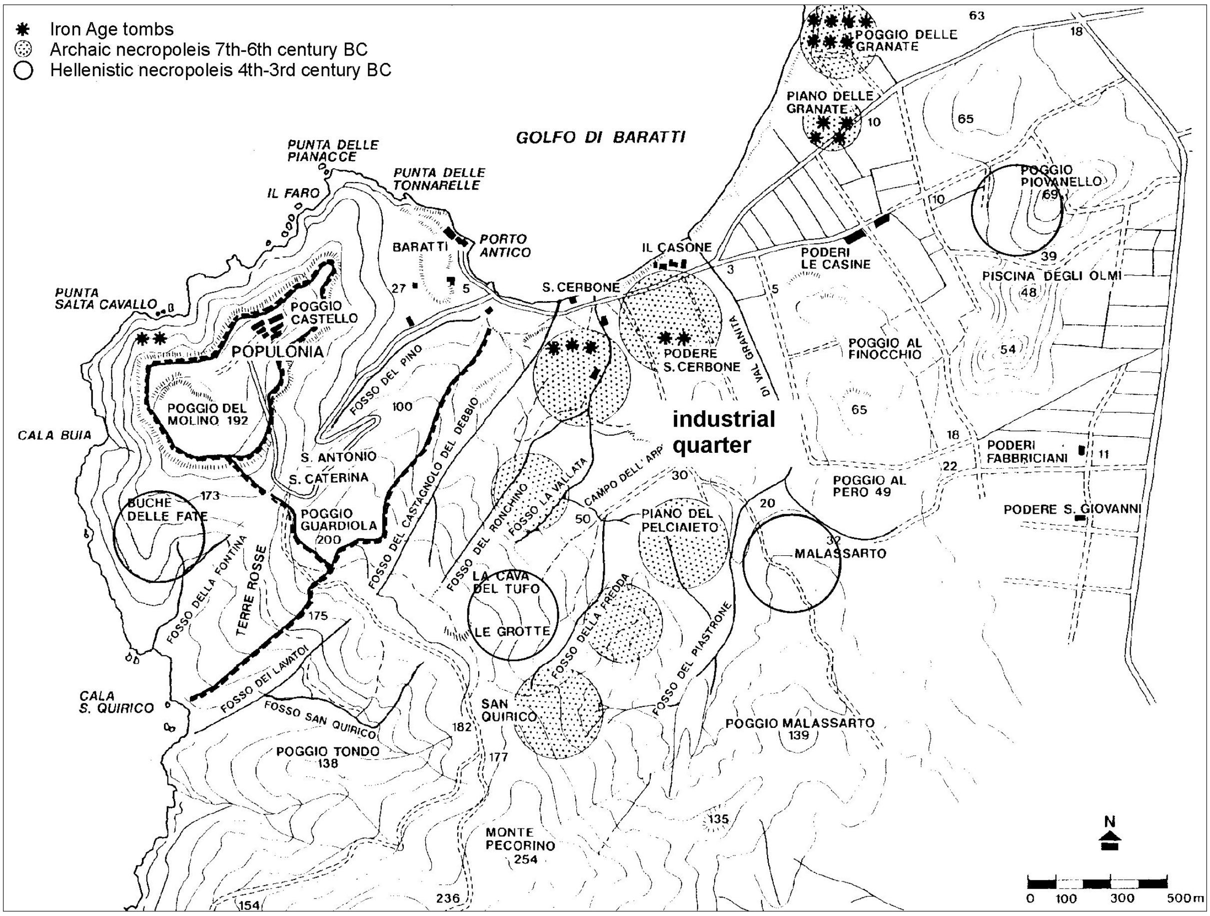

Fig. 59. Populonia, archaeological features in the immediate vicinity of the settlement.

The most detailed account of an archaeo-metallurgical context at Populonia is provided by Martelli who

[301] Giardino 1995, 119-33.

[302] Rasenna 1986, 122. Archaeo-metallurgical evidence demonstrates that ores from Elba were smelted in pre-Roman times on various locations on the mainland of Italy opposite the island Elba: Cucini Tizzoni and Tizzoni 1992, 47-51. These authors demonstrate that Elban ores were employed on the mainland throughout history.

[303] d'Achiardi 1929, 399-402.

[304] *cf.* Crew 1991 a.

excavated a building complex associated with the processing of metals (Fig. 60).[305] This complex is interpreted as the remains of an industrial quarter and exhibits four phases. The first phase is dated to the late 6th century BC. Some tuyères and much iron slag together with *bucchero grigio*, were found in a pit which is interpreted as a smelting furnace for iron ores. The upper part of the furnace was missing but a cavity for tapping the smelting slags was preserved. The architectural remains of the second phase of the complex are presented as several connected rooms and resemble the layout of other Archaic houses in central Italy.[306] This building complex establishes that iron was processed at Populonia from at least the 6th century BC. Considering the reports on comparable complexes nearby and the scale of the iron production at Populonia during the 6th and 5th centuries BC, it is likely that several of these buildings were located in this section of the town.[307] This indicates nucleation of workshops.

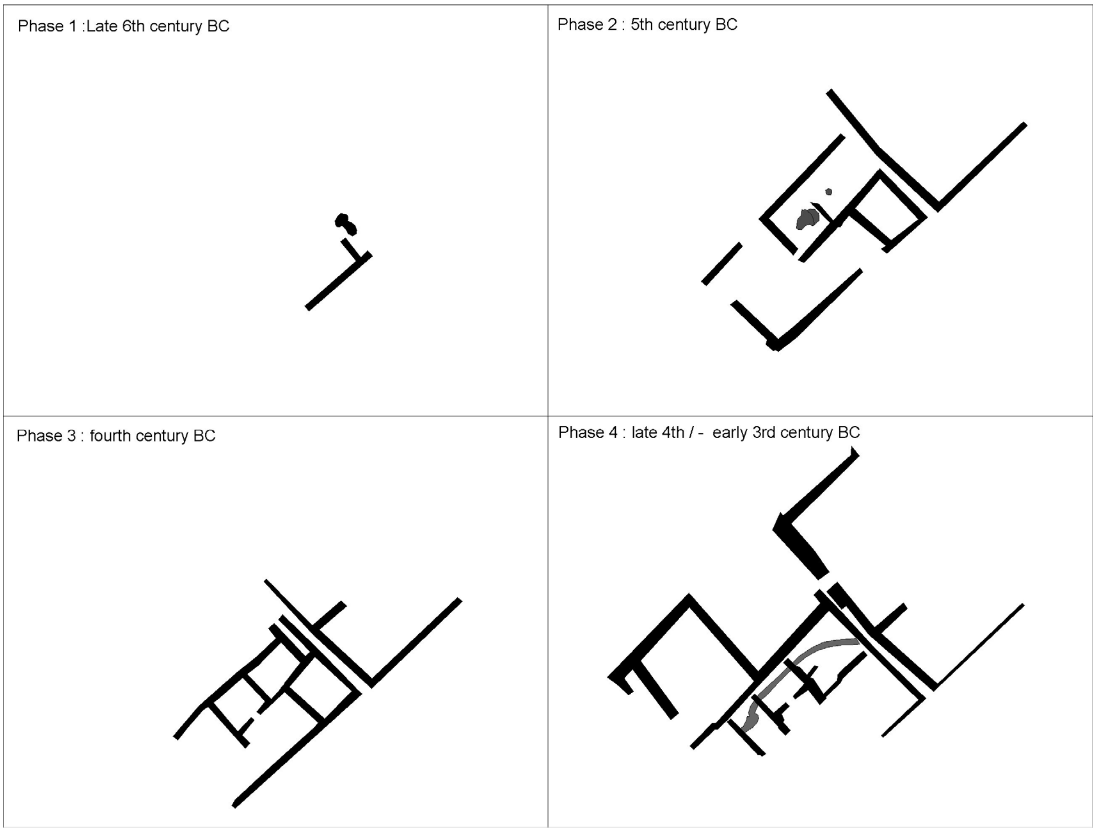

Fig. 60. Populonia, building remains in industrial quarter.

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[305] Martelli 1981 a. See also Sperl 1981, 45-9; Cuccini Tizzoni and Tizzoni 1992, 47, 50. Figure 60 is based on the illustration on page 182 of *Etruria Mineraria*: Camporeale, 1985. This illustration presents the excavated building complex in colour according to each building phase represented. Thus all the phases are positioned on top of each other, each in a different colour. However, the reading of this illustration is almost impossible because the printing process has interfered with the individual colours. The orange walls, for example, turn into brown. For clarity Huib Waterbolk and I tried to disentangle the individual building phases of this complex. This exercise was complicated since a full publication of the excavations is missing. Therefore Figure 60 is a reconstruction based on the publications available. These publications are not always consistent especially not for the features dated to the 6th century BC: Martelli 1981 a and Cristofani and Martelli 1985. Consequently I would like to emphasise that Figure 60, particularly the reconstruction of the situation during the 6th century BC, is hypothetical and probably requires readjustments once the final publication has been printed. Also the dating of the furnaces is not definite though Cristofani and Martelli mention that these should be dated to the 6th and 5th century BC: Cristofani and Martelli 1985, 84.

[306] Martelli 1981 a; Camporeale 1985, 84-8.

[307] Sperl 1981, 49; Martelli 1981 a, 172.

Metalworking remained an important economic activity in this region during the 5th century BC and later. In general, the advanced economic development of Populonia and the northern region of the Tyrrhenean coast during this period has been related to iron working. At Aleria on Corsica for instance, economic progress was recorded from the 5th to the 3rd centuries BC while the excavators indicate that iron working contributed to this development.[308] Furthermore, it is reported that Elban iron ores were processed at Genoa and along the Gulf of Follonica during the pre-Roman period.[309] Therefore it appears that these ores had become a commodity for external trade by at least the 5th century BC.

The period prior to the 6th and 5th centuries BC is less clear. Bartoloni records that Populonia had an open character during the early Iron Age. This is recorded by the imports from Sardinia and Phoenicia.[310] Some Phoenician pottery is recognised in the necropoleis.[311] Overseas contacts were stimulated by the available, rich mineral resources.[312] Originally, iron production does not appear to have been important for the development of this district. Minto indicates that the processing of iron is scarcely documented in the 8th century BC but that it intensified significantly during the 7th century BC.[313] The copper alloy to iron ratio was completely reversed during the Orientalising Period.[314] Therefore it is possible that during the 8th century BC metals other than iron were processed at Populonia. According to Hartmann, the lack of early iron and Greek imports in the area around Populonia indicates that the Greek intermediaries were only interested in the ores.[315] This deduction is primarily based on the hypothesis that *Pithekoussai* directed the iron industry in central Italy. However this hypothesis cannot be substantiated. I think that the scarcity of Greek imports implies rather that Greek intermediaries rarely visited this region during the 8th century BC. This brief account of the early development of Populonia shows that the evidence for metalworking in this region before the 6th century BC is circumstantial.[316] However the immense quantity of slags found at the site establish that it had been an industrial site. These enormous amounts of slags were quantified and this figure was subsequently used by scholars to estimate the metallurgical output. The assessments indicate the significant scale of the iron production at Populonia. However the exercise is almost futile since the slags represent various periods or could be associated with different smelting processes. I will illustrate the speculative nature of these calculations by presenting two estimates which give a high and low figure. However even the low figure still represents the substantial extent of metalworking at the site and supports the view that various metal workshops existed simultaneously.

Wertime reports that copper and iron were worked at the site and that these activities produced 2 to 4 million tons of slags which are mainly dated from the 5th to 1 st centuries BC. The smelting would have involved 4 million tons of ore and 1.5 to 3 million tons of charcoal. The production of this quantity of charcoal would have consumed 1.5 to 3 million acres of trees. It is mentioned that these raw materials generated 500,000 tons of iron.[317] The

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[308] Jehasse and Jehasse 1985, 99-101.

[309] Cucini Tizzoni and Tizzoni 1992, 47-51; Millanese 1996, 70-1.

[310] Giardino 1995, 40-62; Bartoloni 1989, 188.

[311] Markoe 1992, 76; Martelli 1981 b, 404-5, 418-9; MacIntosh 1975.

[312] Acquaro 1988.

[313] Minto 1943, 70.

[314] Gualtieri 1982, 222.

[315] Hartmann 1985, 292.

[316] The development of Populonia and its territory is for example, presented by: Fedeli 1983; Fedeli *et alii* 1993.

[317] Wertime 1983, 450-2. Wertime and Wertime report for Populonia a slag heap of 2.2 km^2 which was produced during five centuries. This

hypothetical figures by Wertime imply that on average, about 1,000 tons of iron was produced per year.

Crew reports a fraction of this figure without underrating the importance of Populonia as a metallurgical centre.[318] He readjusts the estimations because the high figure of Wertime and others does not quantify variables such as:

- the type of iron produced;
- the total amount of slag involved;
- the uncertainty of the period assessed, and
- the quantity of slags which derive from smelting copper ores.

He indicates, more-or-less, that the data on which the calculations are based are inadequate. According to Crew, a mean yearly production of 1 ton iron and 1 ton copper during the period 600 to 100 BC is more acceptable than the high estimate by Wertime. He reports that a mean yearly production of 2 tons of metal would still be significant for any early metalworking site. It still indicates the industrial scale of the metalworking activities at the site.[319]

Both assessments are based on immense heaps of metallurgical slags. Whatever the exact yearly production, nucleation of workshops is probable from at least the 6th century BC. It is likely that the industrial quarter at Populonia whose remains were excavated, consisted of various metal workshops because small scale production would not have resulted in these quantities of metalworking debris.

3.6.8 *Poggio Civitate*

The buildings at Poggio Civitate and their context were introduced in the previous chapter.[320] In addition to evidence for ceramic production, the site produced some archaeo-metallurgical information. Metalworking debris is scattered over the excavated areas though two concentrations are reported.[321] At the north-western end of the plateau, an accumulation of slags was found associated with technical ceramics such as fragments of crucibles. A second concentration is located along the southern flank of the plateau. Excavations in and around the stoa-workshop (Figs. 36 and 37) have revealed bellows and crucible fragments together with large quantities of bone and antler in various stages of preparation. Thus, the primary evidence records a range of activities in and near this building. The western section of the stoa-workshop appears to have been employed for the manufacture of terracottas while the eastern half may have been used for the production of smaller objects in copper alloy and in bone, antler and ivory. Copper alloy smelting in this area is indicated by the various bellows and crucible fragments.

The technical ceramics at Poggio Civitate include tuyères for portable bellows which were used to generate the high temperatures necessary for metalworking. The tuyères had a flat bottom and are slightly vitrified.[322] It is suggested that small portable braziers or furnaces were employed by the craftsmen for small-scale operations.[323] The

amount of slag would represent 4 million tons of ore, 2 million tons of slag and possibly 500,000 tons of smelted iron. The smelting of this quantity of ores would have consumed 1 million acres of consumed forest: Wertime and Wertime 1982, 135. See also: d'Achiardi 1929.

[318] Crew 1991 a.

[319] Crew 1991 a.

[320] See section 2.6.6.

[321] Nielsen 1993.

[322] See on tuyères: Tylecote 1987, 115-24.

[323] Nielsen 1993, 31. Similar furnaces were experimentally used by Formigli and others to melt copper alloys in small crucibles but this did not have a satisfactory result: Formigli (*a cura di*) 1993, 109-22 (*Resoconto dei gruppi di lavoro*). In a previous publication on the *impasto* from Poggio Civitate, Bouloumié suggested that the objects which are now interpreted by Nielsen as small furnaces, were cooking wares: Bouloumié 1972; 1978.

technical ceramics furthermore comprise a thick terracotta pipe, the end of which was heavily vitrified. This pipe was identified as a bellow pipe.[324] Moreover, Nielsen mentions the existence of furnaces at Poggio Civitate. These furnaces are provisionally interpreted as furnaces for roasting ore.[325] They are located about 300 m to the west of the *Piano del Tesore* on one of the natural terraces along the northern face of the hill. The remains are not well preserved since they were discovered close to the surface. The furnaces consist of a ring of stones with a diameter of approximately 1.5 m. The interior is plastered with a lining. A concentration of fine carbon may suggest the position of the opening of the furnace. Several slags were found in this area but no ores or technical ceramics.[326]

An experimental reconstruction of an ancient metal workshop for casting small copper alloy artefacts was based on the technical ceramics from Poggio Civitate and on iconographic representations on Greek vases.[327] The technical ceramics were made from a clay that was dug in the vicinity of Poggio Civitate. Crucibles, tuyères and small portable ovens were made according to the models that were excavated at the site. The size of the ancient crucibles for example indicates that they could not contain more than 200 g copper. This experiment was elaborated with the reconstruction of a vertical furnace as depicted on Greek vases. The furnaces on these vases are interpreted as being for smelting copper. The reconstructed furnace had a diameter of 55 cm and a height of 140 cm. During the experiment it was employed both as a forge for heating iron during smithing as well as a furnace for placing crucibles to alloy and smelt copper. It was established that it was inconvenient to smelt copper in this furnace because the conditions inside the kiln were difficult to control. The reconstructed furnace was, however, satisfactory as a forge. Neither were the experiments with the small portible furnaces successful since it was difficult to position both the crucible and the tuyères.[328] This could suggest that the ceramic vessels interpreted as small furnaces or ovens for working copper alloys are not related to the processing of metals but may have had another function. Similar ceramic ovens are, for instance, recorded and used for the granulation technique.[329]

Some of the metallurgical debris from Poggio Civitate was examined in detail.[330] Several slags enclosed green and blue specks which indicate that copper was smelted at the site. Moreover, the slags contained a high amount of iron which could have resulted from smelting iron-rich, copper-sulphide ores. A prill of copper was entrapped in a slag adhering to a crucible.[331] This prill did not contain any tin which means that copper was smelted in the crucible but not a copper-tin alloy. The slags found near the furnace include smithing slags while one slag may indicate the casting or smelting of copper.[332] It is reported that one of the copper smelting slags contained pieces of metallic iron, some of which were previously smithed and partially carburised. The metallic iron in the slag is difficult to explain in metallurgical terms. Warden suggests that it may be an experiment to recycle iron. He implies that at

[324] Formigli reconstructed a bellow: Formigli 1993, 103-8.

[325] Nielsen 1993, 34.

[326] The furnaces are published in an interim report and still require metallurgical examination and interpretation. Warden reports that the slags which are associated with the furnaces, have a high iron content: Warden 1993, 42.

[327] Formigli (*a cura di*) 1993, 109-22 (*Resoconto dei gruppi di lavoro*).

[328] Formigli (*a cura di*) 1993, 109-22 (*Resoconto dei gruppi di lavoro*).

[329] Nestler and Formigli 1993, 75-87; Formigli 1995, 68-72.

[330] Warden 1993; Warden *et alii* 1991.

[331] Scott describes a prill as follows: '*In the extraction of copper from primitive smelts, the metal is produced as small droplets or particles in a slaggy matrix. These small metallic particles are called prills and were often extracted by breaking up the smelted product and sorting the metal. In crucible processes, prills are small droplets of metal adhering to the crucible lining*': Scott 1991, 143.

[332] Warden 1993, 43.

Poggio Civitate an attempt was made to process iron locally by trying to extract it from iron-rich, copper slags or by trying to recycle iron scrap.[333] However iron was normally recycled by resmithing and the addition of iron scrap in a copper smelt does not make sense to a contempory metalworker unless it was introduced to increase the carbon content of the iron. After smelting the copper, the carburised iron might have been retrieved from the slag. All these possible explanations for the presence of metallic iron in a copper smelting slag remain highly hypothetical.

The charcoal at Poggio Civitate was derived from a red-oak, probably a *Quercus cerris* which is the most common type of oak in Italy. It is, therefore, likely that the charcoal necessary for the metalworking came from local sources.[334]

The copper ores that may have been processed at or near Poggio Civitate, could derive from local sources. The site is situated on the eastern edge of the Colline Metallifere, not far from rich deposits of copper, silver and lead. Copper ores, for instance, are found in its vicinity and may have been mined at the Crevole lode at Vescovado di Murlo which is about 1 km from Poggio Civitate.[335] Iron was probably imported as bar iron since the nearest iron ore deposits are located about 30 km from the site.[336] Another possibility is that it was extracted from the iron-rich slags that were produced during the smelting of copper ores. The report on the metallurgical debris from Poggio Civitate establishes that metals were worked adjacent to the main building. However the preliminary character of the publications hampers a full account of the metalworking activities at the site and it remains unclear whether the ore deposits located in its vicinity were actually processed at or near the settlement.

I have presented the evidence for the manufacture of ceramics at Poggio Civitate in the previous chapter while the processing of metals is discussed in this section. In addition, an early school of carvers of materials such as bone, antler and ivory, is recorded at the site from approximately 650 BC on the basis of raw materials, unfinished products and finished artefacts.[337] Over 50 pieces worked on one or more sides, were found along the southern flank of the *Piano del Tesoro* at Poggio Civitate. Within the trenches at the site, more than 400 fragments of ivory, bone and antler were discovered from 1978 to 1980. One ivory block had rasp marks on all four sides and can be considered to be an unfinished product. Nielsen argues that the artisan who worked at Poggio Civitate was not an itinerant craftsman because otherwise the large number of unworked pieces cannot be explained since a travelling artisan might be expected to take his materials with him.[338] Nielsen furthermore suggests that there was a strong correlation between the manufacture of small, copper alloy artefacts and the documented carving of materials such as bone, antler and ivory.[339] A similar relationship between metalworking and carving hard substances was noticed at other sites such as *Pithekoussai*, *Satricum* and *Caere*. This sustains the opinion that at several settlements various materials were processed near to each other, possibly on one location during the 7th century BC. Thus, the industrial debris from Poggio Civitate supports the claim that from about 650 BC various materials were worked at the site. As such, it can be described as an early centre for craft specialisation. A concentration of refuse is located in and near the monumental stoa-workshop. Other primary evidence for industrial activities is scattered about the site and implies that workshop activities were not restricted to the *Piano del Tesoro*. However a full assessment of these

[333] Warden *et alii* 1991, 152-4; Warden 1993, 44-5.

[334] Warden *et alii* 1991, 154; Warden 1993, 45.

[335] Warden *et alii* 1991, 151-2; Warden 1993, 45-6.

[336] Warden *et alii* 1991, 154.

[337] Phillips 1993, 75-6; Nielsen 1983/1984; 1993. At the moment Nielsen is preparing an entire corpus of bone and ivory objects that were recovered at Poggio Civitate.

[338] Nielsen 1983/1984, 344.

[339] Nielsen 1993, 33.

activities remains problematical. So far one can deduce that the artisans who worked on the *Piano del Tesoro* were primarily involved in the manufacture of status markers though the local pottery production included cooking wares and other ordinary wares. The processing of ores at the site requires further verification but would change the meaning of the site significantly. The excavators have until recently focussed their attention on the monumental structures of the *Piano del Tesoro* but if the processing of local ores at the site can be substantiated than it would be interesting to examine the settlement features around this plateau as well as potential traces prior to 650 BC.

3.6.9 *Marzabotto*

The metallurgical evidence from Marzabotto is as important as the evidence for the pottery workshops presented in the previous chapter. There were several metal workshops which probably functioned simultaneously. This means nucleation of workshops for metalworking within the urban centre from the late 6th century BC. A similar account was given for the pottery workshops in section 2.6.7. Figure 38 shows five locations which are associated with metalworking debris. I will present the primary industrial evidence discovered at these locations individually, in order to support the argument for metalworking activity at the site.

The first workshop to be introduced is located in *Regio* V, *Insula* 5 (Fig. 61).[340] The earliest traces of this workshop are dated to the second half of the 6th century BC. Therefore the metallurgical activities at this location predate the rectangular layout of the town. The 5th century BC workshop is incompletely preserved. It can be entered from the main street A. Immediately to the right there are two rooms with irregular pits. Room 3 to the east, contained a circular furnace with a combustion and firing chamber. Both chambers were separated by a raised oven floor with ventilation holes.[341]

The remains of this metal workshop consist of various rooms, a casting room on account of the debris that is presented next, and basins and canals for water supply and drainage. The pottery associated with the 5th century BC workshop, incorporates local wares and some imported vessels. One local *bucchero* bowl is inscribed in Etruscan with *I am of Venel*, a name which is common in Etruria and the Padana.[342] The workshop finds include copper alloys droplets, sawn bones, tap slags with copper alloy flecks, moulds, tools and copper alloy artefacts. The debris demonstrates that copper alloys were processed and cast in this workshop. The artefacts include statuettes, large nails and fibulae of which one still required finishing. The sawn bones affirm once more the close relation between metallurgy and bone-working. One of the tools is a small black serpentine slab with a series of holes with different diameters ranging from 6 to 16 mm. It is probably an instrument for making metal wires. This tool is marked and inscribed in Etruscan with various lines, one of which is interpreted as *I am of Sualu*.[343]

The most interesting feature are the moulds which demonstrate the range of artefacts manufactured in this

[340] The account on this workshop is based on: Sassatelli 1994, 179-88; Zimmer 1990, 71-3, 201; Brizzolara 1980, 111-2; Sassatelli 1989, 62-4; 1990, 69-74; Gentili 1968, 116-7. The workshop is excavated in 1967 and was incompletely documented: Sassatelli 1994, 179. I refer to Malnati for a preliminary report on recent excavations in this section of the town: Malnati 1991.

[341] The interpretation of this furnace varies since it mirrors the design of a pottery kiln while the industrial debris is related to metalworking: Sassatelli 1990, 69-74; Zimmer 1990, 72. The exact function of this furnace within a metalworking context remains unclear. Sassatelli suggests that the furnace might have been employed for roasting ores or for refining the copper bars by extracting the possible excess of iron in the bars: Sassatelli 1990, 70; 1994, 179. Roasting ores implies that copper ores were smelted in the town which would be remarkable because ores are preferably processed nearby mines.

[342] Sassatelli 1994, 179-80.

[343] Sassatelli 1994, 180-5.

workshop.[344] These moulds were employed for casting small tools, fibulae, decorative copper alloy artefacts such as attachments for vessels and possibly components of helmets. Some mould fragments establish that in addition to small artefacts, monumental statues were also cast in this workshop. The fragments are from a mould of a head and possibly a limb. Around 500 BC they were used to cast a statue of approximately 90 to 100 cm height. This is important since it establishes that monumental copper alloy statues were made in central Italy by 500 BC. Moreover, it provides evidence of casting of large statues which could be achieved in a local workshop primarily involved in the manufacture of smaller copper alloy artefacts.

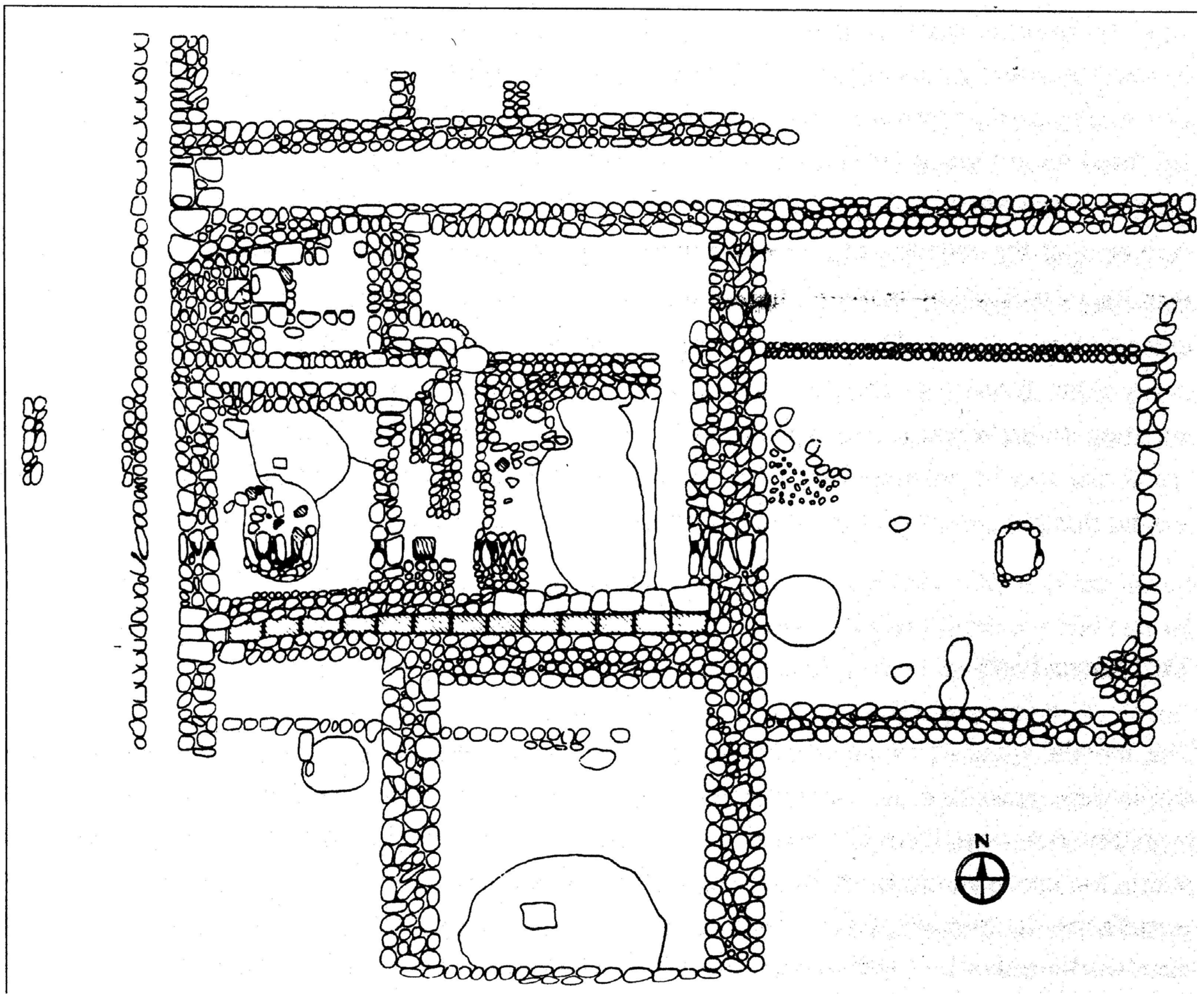

Fig. 61. Marzabotto, Regio V, Insula 5, remains of metalworkshop.

Another mould fragment that is associated with this workshop is interpreted as a negative from a *ramo secco* bar which was employed for casting and marking copper alloy bars.[345] These bars are identified as currency bars, are well known in the Padana region and represent a pre-monetary exchange system in a rudimentary market

[344] The moulds were made from a refractory clay. At least one was described as composed of two fabrics. The outer layer consisted of a red fabric while the interior of the mould was made from a fine grey clay. It could preserve surface detail of the wax model though the grey colour is typical for the *cire perdue* method: Zimmer 1990, 72, 201.

[345] Sassatelli 1990, 72-4; 1994, 179.

economy.[346] The presence at Marzabotto of a mould for casting currency bars is remarkable for various reasons. First it marks the prominent role of this site within the regional economy. Metals were essential for exchange activities and the casting of the pre-monetary bars points to the market function of Marzabotto. Therefore it supports the notion that the site functioned as a centre where transfer trade in commodities was organised. Moreover, the presence of this mould within a workshop context verifies the primary role of workshops within an elementary market system.

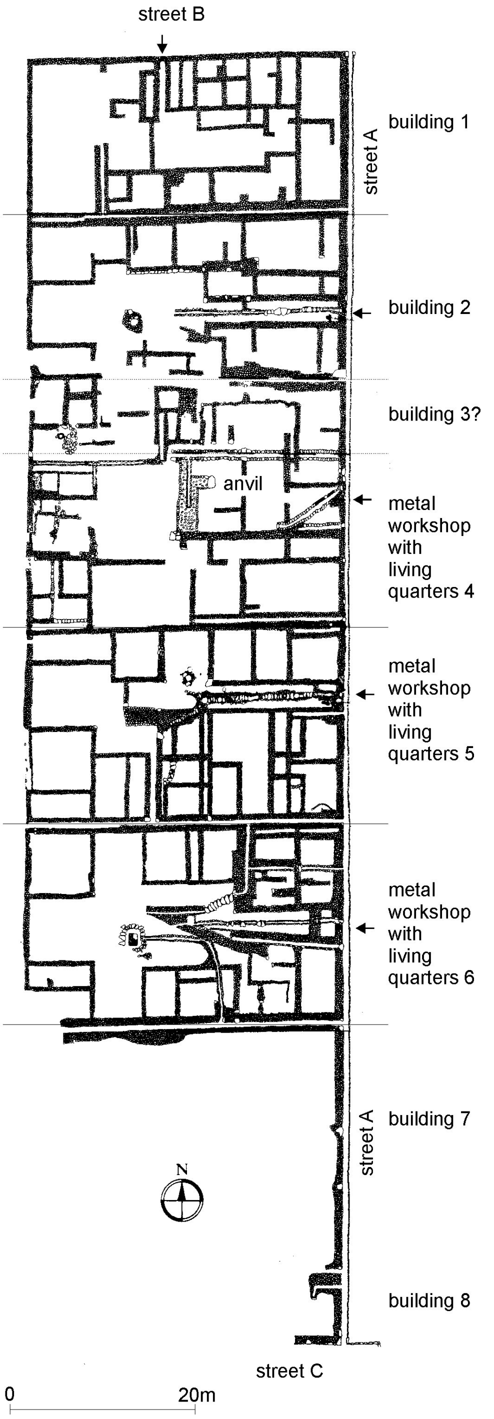

Fig. 62. Marzabotto, Regio IV, Insula 1, living quarters and metalworkshops.

[346] *cf.* Burnett *et alii* 1986; Rasenna 1986, 141-3. See also chapter IV.

The excavated finds from the workshops in *Regio* V, *Insula* 5 are exceptional. For example, Zimmer who studied the remains of foundries in Greece, includes this workshop because it is the only example where casting monumental statues could be associated with a permanent workshop. In Greece, the casting of these statues is related to temporary arrangements.[347] The range of artefacts produced in this workshop at Marzabotto is significant. It was involved in the manufacture of ordinary metal artefacts such as tools and in high quality production. This could reflect a division in tasks between a master and his assistants.

The second location at Marzabotto where metalworking has been reported is situated in *Regio* III, *Insula* 4.[348] The architectural remains are slight but metallurgical debris records industrial activities during the 6th century BC. De Maria describes some walls, canals, and a pit which was filled with carbon and numerous slags. He implies that there was a metal workshop in this section of the town prior to the rectangular layout of Marzabotto. Some metres to the west of the pit, traces were excavated which were interpreted as a hut of 3.5 by 2.8 m. The account does not give details of the slags and, therefore, it is uncertain if iron, copper alloys or both metals were processed here.

The third metalworking site is located in *Regio* IV, *Insula* 1 and is dated to the 5th century BC (Fig. 62).[349] The excavated area of *Insula* 1 is about 145 m long and 35 m wide and revealed 7 or 8 houses some of which contained metallurgical debris. The buildings are spacious but of various dimensions and at least four have an open courtyard that is generally cruciform. The courtyard is entered by a corridor that opens to the street. The workshop activities were located along the street and are identified with buildings 4, 5 and 6. This is established by the significant amounts of slags, copper alloy ingots, carbon and other residues that were discovered in these complexes.[350] In building 4, a large stone with a width of 1.2 m had been shaped into a rectangular block and was interpreted as an anvil. Many iron slags were found during the excavation of this house and it is probable that the front part of this building was used as a smithy. Building 6 produced a pair of iron tongs which is a typical tool for smithing as well as copper alloy scrap metal probably intended for resmelting. Furthermore, traces of intense heat in specific parts on the floor of building 6 demonstrate pyrotechnological activities. Clay vessels described as thick, shallow and with a nozzle may have been employed for smelting copper alloys.[351]

The findings demonstrate that iron and copper alloys were worked in this section of the town. This means that by the 5th century BC both metals could still be processed in one workshop. An interesting feature of buildings 4, 5 and 6 is that they combine metalworking activities with living quarters.[352] An internal division between these functions is convenient because the manufactured goods were exchanged along the street while the nuisance caused by fire and smoke could be limited to some extent. An interpretation of this arrangement could be that there was a formal division between those who owned this complex and lived in it and their dependants who had to work and live in the front side. Such a separation is known from later centuries[353] and the individual buildings are large

347 Zimmer 1990, 71, 156-72.

348 De Maria *et alii* 1978, 72-5.

349 Sassatelli 1994, 71-89; 1989, 62; Mansuelli 1963; Bouloumié 1976. Figure 62 is based on: Sassatelli 1994, 72, Fig. 7 and Mansuelli 1963. Building 3 is not well defined and could belong to either building 4 or 2. The entrances of building 1 and 4 are uncertain as well as the identification of an anvil in building 4.

350 Bouloumié who examined the pottery from building 3, *Regio* IV, *Insula* 1, reports numerous slags and ceramic fragments that could derive from furnaces or ovens. The slags accompanied the pottery that derived from this context: Bouloumié 1976, 137-40. Building 3 might actually be part of complex 4.

351 Mansuelli 1963, 62; Bouloumié 1976, 97, n. 4.

352 Sassatelli 1989, 62.

353 *cf*. Boëthius 1978, 107-8.

enough to house more than one family. However when I consider the evidence from the various workshops at Marzabotto in general, it seems to me more likely that within each complex a family lived and worked while some assistants may have helped out. The layout of these buildings could reflect conditions that combine characteristics of both a family concern and a master-assistant workshop.[354]

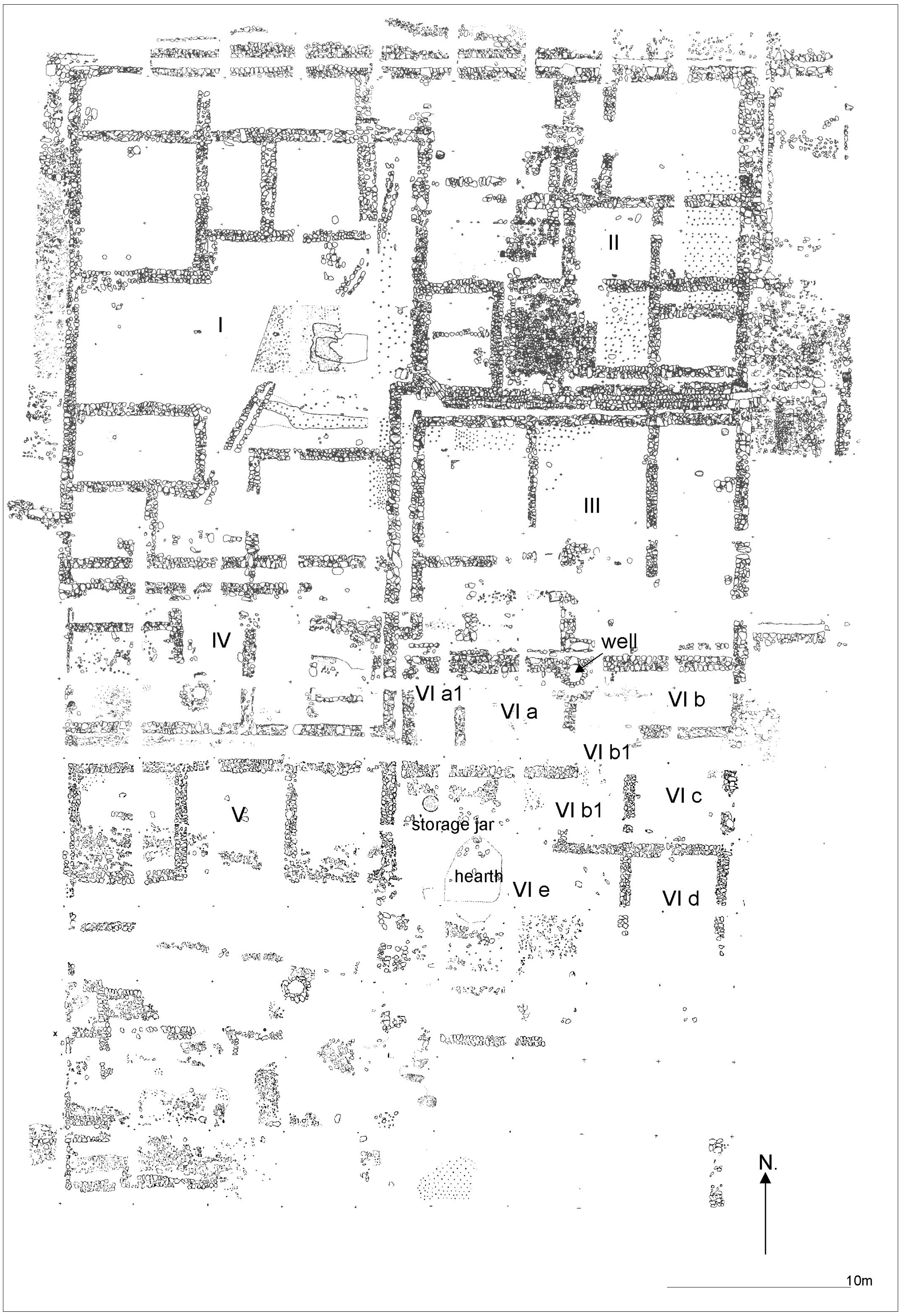

Fig. 63. Marzabotto, Regio V, Insula 3, living quarters and metalworkshop.

[354] The distinctions between types of workshops are discussed in section 2.1. A general assessment of the workshops at Marzabotto is presented further down.

The fourth site with a concentration of metalworking debris at Marzabotto is located in *Regio* V, *Insula* 3 (Fig. 63).[355] Copper alloys were worked in building complex VI where moulds, carbon, slags and casting refuse were found in the courtyard, in area VI E. A hearth was identified in the middle of this yard by an accumulation of ash, carbon and industrial debris. Some of the moulds were probably used to cast decorative artefacts. Furthermore, rooms VI A and A[1] contained metalworking refuse such as slags and copper alloy droplets. These rooms were also used for household activities such as weaving and carving bone.[356] The pottery found in this complex dates from the first quarter of the 5th century BC.

The metal workshop in *Regio* V, *Insula* 3 measures 20.6 by 16.8 m and is not well preserved at the south end. It is not located along a major road as are most of the other metal workshops and, therefore, its position is less convenient for the direct exchange of manufactured goods. The activities in complex VI involve metalworking, weaving and carving bone and may indicate a family workshop. On the other hand Pairault Massa implies a master workshop because she mentions a bronze caster and his assistants.[357] It is also significant that the artisans who worked in this building could probably read and write.[358] Furthermore, the workshop contained quite a lot of imported Attic vessels and the conditions in which these craftsmen lived and worked can be described as comfortable.

Pairault Massa compares the buildings shown in Figure 63 with those in *Regio* IV (Fig. 62) and suggests that a functional division between living quarters and workshop activities can be detected in *Regio* IV, *Insula* 1 as well as in *Regio* V, *Insula* 3. The difference is that in *Regio* V the functions appear to be formally separated by a dividing wall in the middle of the *insula*.[359] This hypothesis is interesting but hard to substantiate. A detailed account of the associated finds per room and complex is required in order to distinguish use and function of sections of buildings and these accounts are scarcely available for Marzabotto. In addition, it is not certain whether or not there were passages between the various buildings that were excavated in this *insula*. Moreover, the workshop in complex VI is not accompanied by other workshops as were the workshops in *Regio* IV, *Insula* I. In my opinion, the excavations at Marzabotto show that in the majority of the building complexes, working and living quarters were combined. The industial debris is in most cases accompanied by household ceramics. A strict separation of functions seems to me too rigid until more details on context and associated finds prove otherwise.

The fifth metalworking site is located in *Regio* V, *Insula* 4 (Fig. 38). So far I have been unable to find detailed information for this workshop except that the earliest traces of metalworking are dated to the middle of the 6th century BC. During this period the settlement consisted mainly of huts. The casting of copper alloys continued into the 5th century BC and a metal workshop was incorporated into the rectangular layout of Marzabotto.[360]

The primary evidence on metallurgical activities at Marzabotto confirms the relationship between the processing of iron and copper alloys as well as the association of metal-working and carving hard substances such as bone and

[355] Sassatelli 1994, 137-54; Pairault Massa and Vallet 1978. Figure 62 is based on both publications.

[356] Pairault Massa suggests that zone II was also used for industrial activities: Pairault Massa and Vallet 1978, 139. The presented data are, however, not convincing.

[357] Pairault Massa 1994, 139.

[358] Pairault Massa 1994, 140.

[359] Pairault Massa 1994, 137.

[360] Brizio 1889; Sassatelli 1994, 155-67. Mansuelli denotes that *Regio* V, *Insula* 4 was marked by Brizio as *Insulae* VII and VIII: Mansuelli 1963, 45-6, n.2.

horn. These relations were encountered at other sites in previous centuries but the evidence from Marzabotto demonstrates that various materials could still be manipulated in one complex during the 5th century BC.

The findings also imply that the various workshops at Marzabotto were directly involved in trade. This suggestion is supported by the mould for casting *Ramo Secco* bars in the metal workshop of *Regio* V, *Insula* 5 which shows the role of workshops in the marketting of commodities. Coins of small denominations were not available at the site, nor anywhere else in central Italy during this period. I think that this implies that a mature market mechanism did not yet exist.[361] Moreover, a public area or *forum* has, so far, mot been definitely identified for Marzabotto.[362] I, therefore, suggest that market exchange at Marzabotto was rudimentary though the existence of various metal workshops in the urban centre implies that market conditions were known. The mechanisms of market exchange seem to be accepted but the transfer of commodities by coins was not established. This indicates that within the sequence of commoditisation introduced in section 1.7, goods were transfered by quantitative evaluation. In the next chapter I will try to establish how quantitative exchange proceeded at Marzabotto.

The evidence for the metal industry at Marzabotto demonstrates that there were several locations where metals were worked during the second half of the 6th century BC. This establishes that prior to the rectangular layout of the town, some families were involved in industrial activities. These activities persisted on the same site when huts were replaced by buildings and this feature affirms continuity in family activities. Thus the original functions of various quarters were incorporated in the new design of the town. During the urban reorganisation of the late 6th, early 5th centuries BC, the workshop facilities increased in size and this could mark a transition from family to master workshops but the distinction may not have been as rigid. The metal workshop in *Regio* V, *Insula* 3 for example, contained evidence for additional pursuits such as weaving and carving bone. This implies communal activities of a family within specific areas of building VI. On the other hand, the metal workshop in *Regio* V, *Insula* 5 produced a range of metal artefacts including common items as well as monumental statues which could indicate a master-assistant arrangement. Furthermore, the association of industrial debris with household ceramics makes it hard to separate habitation from industrial areas. However the distribution of finds as well as the layout of buildings 4, 5 and 6 in *Regio* IV, *Insula* 1 suggests that the main habitation area is located at the rear of these buildings. This division could be interpreted in terms of social differentiation but this aspect remains difficult to assess for Marzabotto.[363] The artisan families may have belonged to a middle class but the status of their assistants as unfree or free dependants is open for debate.

3.7 *Conclusion*

The most basic mechanism for dividing labour is assigning specific tasks to either males or females. Examination of ethnographic information established that mining, smelting and metalworking were activities chiefly assigned to men.[364] These pursuits were difficult to combine with household tasks as is hunting. As such metalworking can be compared to pottery production that is characterised by a reallocation to males with increasing craft specialisation. Metallurgical activities are from the start, primarily male tasks. Smelting and smithing were in all circumstances acknowledged as technologically complex. Open air mining and the pretreatment of ores may be a communal pursuit involving both men and women but smelting and smithing were male activities. For example, Clark records

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[361] See chapter IV.

[362] Brizzolara 1980, 108, 115.

[363] Brizzolara 1980, 108. It is reported that the social structure of the town does not reflect an oligarchy. See also section 2.6.7.

[364] Murdock and Provost conclude that in about 98% of the societies that were recorded, the activities mining (for 93.7% of the societies), smelting (for 100%) and metalworking (for 99.8%), were allocated to men: Murdock and Provost 1973, 207.

that mining and the pretreatment of ores was a family task in Central Africa during the early stages of mining copper ores. The last process in which women were involved was the roasting of ores. Subsequent stages, smelting and smithing, were male tasks.[365] Nevertheless, in most cases the mining and processing of minerals would have been a male enterprise especially when the exploitation of the ore deposits intensified. For central Italy I think that this intensification was a slow process that varied from site to site. This opinion deviates slightly from a hypothesis that was formulated by Warden. He suggests a division in stages for the increase in mining activities. According to his hypothesis, mining was characterised by incipient, possibly seasonal exploitation prior to 750 BC. Specialised mineral production increased from 750 to 550 BC while after 550 BC it became an intensive, industrial activity.[366] I consider his hypothesis in essence valid particularly for the most important mining regions. Nevertheless, the primary evidence on metalworking in central Italy present a more miscellaneous development. The industrial debris from the huts at Acquarossa shows that various families were involved in part time metallurgical activities during the late 8th and early 7th centuries BC. This is also observed at the 6th century BC settlement at Lago dell'Accesa. For Acquarossa one can deduce from the building activities from about 640 BC, that exploitation of the nearby resources increased and thus supported the economic prosperity of the site. It remains, however, impossible to assess the nature of this progress because workshops or industrial quarters were not excavated. To me, it seems likely that the former part-time occupation was intensified though full-time involvement is doubtful. The establishment of an industrial quarter for the processing of ores outside the original urban centre of Populonia during the 6th century BC, demonstrates how metalworking advanced to a full-time occupation in the most important mining region of central Italy. The above assessment of the economic activities at Acquarossa, the settlement at Lago dell'Áccesa and the industrial quarter at Populonia, presents variations in social-economic conditions that prevailed in central Italy during the 7th and 6th centuries BC. There were urban centres with developed modes of production as well as settlements with an antiquated production system. This difference is mirrored by varied and distinct social structures. The social-economic conditions in central Italy were more diverse during the Archaic period than is implied by a mere classification in rulers and those who were ruled. The variety may be related to the degree to which individual appropriation of resources was feasible. In section 1.8, I presented information indicating that the transfer of control of resources from community to individual is a slow process during early state formation.[367] I believe that especially at those sites where mineral resources were exploited by a community prior to the social stratification process of the 7th century BC, private ownership may have developed less than at those sites where social differentiation advanced as is recorded by the necropoleis of the primary sites in central Italy. The communal mining of local minerals at Acquarossa is probable from the late 8th century BC. The exploitation continued to increase during the following century but this economic intensification seems to be accompanied by a slow development of distinct social classes. It appears that the economic growth was substantial and could accomodate the material needs of most of the inhabitants. This probably affected the political significance of Acquarossa. In my opinion it is revealing that mining sites as Acquarossa and the settlement at Lago dell'Accesa did not last into the 5th century BC suggesting that the social-economic conditions that emerged at these sites could no longer be maintained. The disappearance may be the result of a relocation of mining activities. An alternative cause could be that the social-economic arrangements at these sites could no longer be tolerated by the primary centres of central Italy.

The account of the development of mining activities in central Italy is reflected in the evolution of the craft of metalworking. Metallurgical debris from Late Bronze Age - early Iron Age sites such Gran Carro, Scarceta, Elceto, Sorgenti della Nova and Luni sul Mignone, indicates that metalworking was a part-time activity of resident smiths.

[365] Clark 1991. See also: Giardino 1995.

[366] Warden 1984, 360.

[367] Claessen and Skalník 1978, 640-9. See sections 1.8 and 3.6.6.

These smiths operated within a regional or interregional network for the exchange of raw metals which were locally exploited.[368] During the 8th century BC the production at local metal workshops was transformed significantly. An increase in output is recorded by the metallurgical examination of 8th century BC fibulae which began to be produced in series. However the major change in the craft of metalworking is recorded by a general shift from copper alloy to iron tools and weapons. An intermediate stage in this transition is reflected by an increase in the number of iron knives. Snodgrass reports that it was in knife blades that iron may have found its earliest acceptance for functional use in the Aegean.[369] This could also apply to central Italy during the late 9th - early 8th centuries BC. Gualtieri notes that iron knives are the first objects to be made and that they appear to be numerous at the major sites during the early Iron Age.[370] In central Italy this stage is illustrated by Osteria dell'Osa where from 770 BC all knives were made of iron while during the preceding period, iron knives had been rare and appear to have been part of exceptional tombs.[371] This means that the transitional period towards a fully fledged Iron Age in *Latium Vetus* corresponds to the 8th century BC. Early production sites in central Italy where iron was worked are rarely recorded and this leads to speculation about the transmission of the necessary technology.[372] It is possible that the processing of iron took place at certain sites in central Italy prior to the 8th century BC but it did not become widely adopted during this period. Local manufacture of iron in central Italy is indicated by its rapid adoption during the 8th and 7th centuries BC. The development of iron technology in central Italy can be compared with similar events elsewhere in the Mediterranean. Pleiner, for example, distinguishes two periods in Greece: the proto-'Iron Age' from the 12th to 8th centuries BC and the early 'Iron Age' from the 8th to the beginning of the 5th centuries BC.[373] The proto-'Iron Age' is characterised by a gradual increase in the number of iron objects. Individual tombs steadily became equipped more extensively with iron swords, knives and tools. The 8th century BC represents a critical period which brought many improvements. Iron working intensified and local blacksmiths produced increasing numbers of iron artefacts. Smithies were equipped with specialist tools while metal smiths mastered quenching techniques and the use of steel for manufacturing implements. This is reflected in a well known passage in the Odysse when Homer comments on the blinding of Polyphemos:

'*Even so, we took the fiery-pointed stake and whirled it around in his eye, and the blood flowed around the heated thing. And his eyelids wholly and his brows round about did the flames singe as the eyeball burned, and its root crackled in the fire. And as when the smith dips a great axe or an adze in cold water amid loud hissing to temper it - for therefrom comes the strength of iron - even so did his eye hiss round the stake of olive wood*'.[374]

According to Pleiner, crafts without iron tools, agriculture without iron harvesting implements and woodwork without iron axes were no longer imaginable in Greece from the 8th and 7th centuries BC. The stage of specialised blacksmith work starts in the 5th century BC. There were several branches that produced different metal artefacts,

[368] *cf.* Bietti Sestieri 1981, 239. See section 3.1 and 3.6.5. Zifferero indicates that the exploitation of mineral resources around the Valle del Fiora appears to be older than those of the Tolfa region: Zifferero 1991, 231.

[369] Snodgrass 1971, 229.

[370] Gualtieri 1982, 221.

[371] Bietti Sestieri 1992 a, 398.

[372] Giardino 1995, 114-9; Hartmann 1985, 285-9; Gualtieri 1977, 213-29; Delpino 1988. See section 3.4.

[373] Pleiner 1969, 30-1. Pleiner presents a vivid description of the events in Greece and therefore I wish to incorporate this account even though the three-stage division of the iron industry by Snodgrass, is now generally accepted: *cf.* Snodgrass 1982; Maddin 1982.

[374] Odyssee, IX. 387-396: translation by Murray, Volume 1, 1976, 331. See for details on this process the data from *Pithekoussai*: section 3.6.1; Zimmer 1990, 16-9.

such as armourers, swordsmiths, cutlers and hoe-makers.[375]

When this account of the development of iron production in Greece is compared with the situation in Italy, than it is remarkable that in both areas the 8th century BC is crucial in quantitative terms. Moreover, the evidence from *Satricum* corresponds favourably with Pleiners' description of the 8th to 6th centuries BC because at *Satricum* a large variety of iron objects is recorded for this period (Figs. 50 to 56). As such, these artefacts represent a range of iron objects which were available in central Italy during these centuries. The initial stages in the use of iron in central Italy can be examined by the archaeological evidence of the Quattro Fontanili cemetery at Veii. The iron artefacts excavated in this necropolis indicates that there was a gradual increase in iron artefacts from 800 BC with a marked development from 760 to 720 BC. The number of iron objects as well as the variety of types increased sharply.[376] Hartmann reports that at Vulci this intensification occurred slightly later, between 720 and 690 BC.[377] In *Latium Vetus*, the use of iron increased gradually during the 8th century BC while the 7th century BC displays a marked upsurge in its adoption. I, therefore, conclude that in Etruria as well as in *Latium Vetus*, iron had become the most important metal for tools and weapons by the 7th century BC. This stage may have occurred somewhat earlier in Etruria but the evidence from Osteria dell'Osa indicates that in this respect the difference between both regions is minimal.

The metallographic analyses presented in this chapter, record the control of characteristic physical properties of iron by the smith. These examinations correspond with results from similar studies executed elsewhere in Europe. During the early stages of iron technology, different types of iron were used as was reported for the 7th century BC iron tools from *Satricum*.[378] The metallographic studies from other sites in central Italy confirm this differentiated use of iron while evidence for quenching is still scarce.[379] Sofar only an axe from Vetulonia was quenched and thus intentionally hardened.[380]

The late 8th and early 7th centuries BC record the growth of other metalworking techniques besides ironworking, such as the repoussé and granulation technique. These decorative techniques are associated with the manufacture of status markers. Immigrant craftsmen from the Levant were probably responsible for the transfer of technological knowledge.[381] The local adoption of these metalworking techniques helped in the spread of craft specialisation and was encouraged by the demands of aspiring members of the local communities. This corresponds with the account of the specialisation process of the ceramic craft which was reinforced by a growing demand for highly crafted artefacts. Nevertheless, the metal craft was basically transformed by iron which was originally a precious metal but in time, gradually became a base metal. The almost complete replacement of copper alloy tools and weapons by iron items within about 100 to 150 years signifies a major industrial event. During this period, the resmithing of scrap iron could not fulfil the increased demand because there was no stock in the form of iron hoards. Therefore the smelting of iron ores had to be intensified. In section 3.4, I have specified that smelting was a labour intensive enterprise and thus, the transition from copper alloy to iron will have stimulated the economic evolution of this region that possessed so many ore deposits. The increase in mining and smelting activities was not presented as an arranged, preconceived commercial pursuit but rather as an inherent process which materialised in settlements

[375] Pleiner 1969, 30-1.

[376] Hartmann 1982, 59-61.

[377] Hartmann 1982, 102.

[378] *cf.* Pleiner 1980, 388. See section 3.6.2 for an account of the metallurgical examination of tools from *Satricum*.

[379] Follo *et alii* 1988; Panseri and Leoni 1960; 1961.

[380] Panseri and Leoni 1960. The axe from Vetulonia is typologically comparable with an axe from *Satricum* (fig. 52, no. 52).

[381] See sections 3.1 and 3.2. In Addition, I refer to: Strøm 1971, 201-16, 212 and Markoe 1992, 78-81.

located near mineral deposits such as Acquarossa, Populonia and the settlement at Lago dell'Accesa. Once there was a reservoir of iron tools and weapons which could be reused, the devaluation of iron became inevitable. Nevertheless, this account is subject to other considerations such as the additional demand generated by an increasing population. From the presence of iron artefacts in rich tombs, it is deduced that iron was still highly regarded in central Italy during the first half of the 7th century BC. A decrease in value must have occurred during the late 7th and 6th centuries BC. A similar devaluation of iron from precious to base metal was recorded for other regions of the Mediterranean. Decrease in value is also suggested for other categories of artefacts such as certain pottery wares and copper alloy bowls and basins. It appears that the intensification of production resulted in circumstances which led to the standardisation of whole categories of artefacts. The most explicit condition which caused an increase in output and standardisation is the workshop which employed a number of people. Expanding output would have promoted devaluation which was aggravated once the initial extra demand due to a general economic progress, started to decline. The advance of the workshop mode of production in central Italy is demonstrated in this chapter though specific conditions varied from site to site. Nucleation of workshops is recorded at Marzabotto and Populonia. The existence of several metalworking shops is probable for *Ceare* during the 7th and 6th centuries BC while at other sites, such as *Satricum* and Poggio Civitate the reconstruction of more than one workshop is not possible.

The development of the iron industry in central Italy cannot be separated from the production of artefacts made from copper alloys. It is generally accepted that a separation of copper/bronze-workers and iron-smiths had not yet occured during the Orientalising Period.[382] The combined processing of copper alloys and iron in the local metal workshop which may occupy various smiths, accounts for the close typological parallels between objects made from either metals. Moreover, there are several sites such as *Pithekoussai*, Poggio Civitate and Acquarossa, where working of both copper alloys and iron is recorded simultaneously. Even on Elba and at Populonia copper and iron slags are found side by side.[383] This implies that for an assessment of the output of a metal workshop, it is necessary to incorporate the copper alloy artefacts. At the Archaic industrial quarter of Populonia and at Marzabotto it is possible to perceive a separation between both metals. Iron and copper alloys may have been worked in different workshops at the major sites though detailed metallurgical analyses of the debris found in the metal workshops, is absent. An examination of the slags in the various workshops at Marzabotto could verify this separation in the processing of both metals. For example, the workshop in *Regio* V, *Insula* 5 appears to be merely involved in the working of copper alloys though debris from the workshops in *Regio* IV, *Insula* 1 records a combined processing of iron and copper alloys. At smaller settlements it is probable that copper and iron were still manipulated in one establishment during the 6th and 5th centuries BC.

[382] *cf.* Pleiner 1988, 35-6; Hartmann 1982; Ampolo 1980, 176-7.

[383] Crew 1991 a, 113-4; Fedeli 1983, 177; Sperl 1985, 49.

Chapter IV *STANDARDISATION AND PRE-MONETARY EXCHANGE*

All who do not study geometry remain outside

Cottrell 1958, 73[1]

4.1 *Introduction*

Standardisation is a continuous process and occurs at different economic levels. Two major examples of this process in our era are the Euro and the GATT treaty. Europe is at present heading towards one single European Currency Unit while at the same time many nations in the world are implementing the GATT treaty to facilitate the flow of manufactured goods between one country and another. Nowadays, standardisation is usually applied to industrial procedures. This industrial standardisation is of no assistence for the pre-industrial period examined in this book. Nevertheless, the process of standardisation consists of successive stages and is in economic terms related to the sequence of commoditisation that was presented in section 1.7. I am particularly interested in the transition from stage 4 to 5, the progress from reciprocal and other basic mechanisms of transfer to the exchange of commodities through the market mechanism by quantification. This is accomplished by weights and measures and these represent early standards. It will be established in this chapter that in central Italy this mechanism of quantification is correlated to the workshop mode of production.[2]

Standardisation is a universal economic concept and it can be applied to the pre-industrial 18th century AD[3] as well as to prehistoric times. Braun for example, has discussed the high degree of standardisation of valuables during the Hopewell phase of exchange in the North American Midlands around the first centuries AD.[4] Its development is described in terms of increasing population densities, expansion of exchange activities, subsistence intensification, decreasing mobility and gradual nucleation into larger villages that contain between 50 and 100 people. Standardisation as well as imitation occured at the level of highly crafted goods such as small ceramic jars and bowls with Geometric and zoomorphic designs, carved stone pipes, copper earspools, copper panpipes and ceramic figurines. The stylistic standardisation of valuables has been the subject of various analytical and speculative explanations. Standardisation of valuables was either due to a single, relatively unified mechanism of transaction among the participating regions or to the existence of a few highly productive artisans. Other explanations elaborated ideas such as travelling artisans or shared symbolisation of positions of authority. According to Braun, all these explanations have considerable weaknesses. He presents an interpretation that incorporates the concept that standardisation of valuables is a '*consequence of certain basic characteristics of communication networks typical of peer polity interaction. The key, in this instance, is to recognise that the stylistic phenomena occured during a*

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[1] Cottrell mentions an inscription above the study while he describes Schliemanns' mansion in Athens. This inscription refers to a philosophical principle of Pythagoras. Geometry is considered to be harmony as well as a condition for knowledge. Knowledge of geometry is knowledge of the nature of things. I refer to Thom and Huffman for a discussion of this principle in Pythagorean philosophy: Thom 1995, 174-7, 186-91; Huffman 1993, 54-77, 193-9.

[2] In this chapter I discuss measures and units which is one aspect of standardisation. I refer to Rice for an examination of standardisation of materials such as ceramics: Rice 1991. According to Rice, this concept is closely related to specialisation of crafts and as such was a component of my previous chapters. For example, Rice mentions that '*Specialization for elites is likely to be distinguished in terms of skill and/or resources, and specialization/intensification for "commoners" is likely to emphasize production to create high-volume/low-value goods.'*: Rice 1991, 266. This process is in fact illustrated in Figures 15 and 16, Chapter II. Devaluation and mass production is associated with the transition from luxury to subsistence goods which is one of the main topics in chapters II and III.

[3] Johnson 1993, 334, 352.

[4] Braun 1986, 117, 126.

period of residential nucleation, reduced mobility, and increasing supralocal exchange activity, and therefore of increasing intralocal and supralocal interaction and communication'.[5]

Many of the explanations and features that were described by Braun such as travelling artisans, settlement nucleation, increasing trade, peer polity interaction *etc*., are also encountered as characteristics of developments in central Italy from 800 BC onwards. However the level of economic growth in central Italy is not compatible with that of the Hopewell phase of exchange. The Hopewell phase of exchange represents a society that consists of developing small villages of at the most 50 to 100 inhabitants while in central Italy by 600 BC a range of emerging towns is encountered with, occasionally, thousands of residents. This difference in scale and level of basic economic conditions has consequences such as the tendency towards an exchange mechanism that required regulation. The rate of standardisation in central Italy indicates the introduction of a metrological system in line with the advance of craft specialisation and the workshop mode of production.

The principles of standardisation are defined at present by the International Organisation for Standardisation (ISO) in Geneva.[6] Some of these principles can be applied to central Italy for the period 800 to 400 BC. A selection of the relevant principles includes:

a. Standardisation is essentially an act of simplification as a result of a conscious effort of society. It is not only a reduction of present complexity but aims at the prevention of unnecessary complexity in the future;

b. Standardisation is a social as well as an economic activity and should be promoted by the mutual cooperation of all concerned. This requires propaganda and public relations in order to obtain this cooperation. The effect of standardisation can be appreciable only if standards are implemented;

c. The mere publication of a standard is of little value unless it can be implemented;

d. Standards should be reviewed at regular intervals and revised as necessary. The interval between revisions will depend on particular circumstances.[7]

These principles can be transferred to the region and period examined in this study. For example, principle a. might illustrate that measures were implemented as an act of simplification due to increasing demand and exchange activities. Axiom b. represents the mutual cooperation between indigenous people and foreign traders. Principle c. could exemplify the implementation of measures at ports of trade and emerging local markets while principle d. could rationalise the existence of various measures in central Italy once local and regional markets developed. Another illustration of the revision of standards recorded in principle d., is the continuous modification of early Roman coinage during the 3rd century BC.[8]

I will relate the principles of standardisation to increasing trade and to the workshop mode of production. This mode of production is a consequence of the raised demand for commodities, the local adoption of new technologies and of the development of regional and local markets. These changes were embraced with enthusiasm in central Italy during the Orientalising Period. To me, this means that the social structure was advanced enough to accomodate and even to direct the transition to an early market mechanism that is characterised by quantification. These transformations account for the origin of metrological systems in central Italy.

The measures that are examined are weights, units of capacity and linear quantities. The search for early measures is complicated by several factors. In general, measures in antiquity were less accurate than in our present time. When units were applied for practical purposes, this inaccuracy could increase. Furthermore, there are some

[5] Braun 1986, 122.

[6] Sanders 1972.

[7] Sanders 1972, 12-3.

[8] *cf*. Burnett 1989.

physical shortcomings. Metal weights corrode and this affects their original mass whereas measures of capacity which were made of earthenware, shrink as a result of firing in the kiln. Shrinkage that is caused by firing also affects an examination of units of length that is based on data from terracotta roof systems. In addition, profit motives obscure the search for standard units. For the sake of earnings, merchants and shopkeepers meddled with measures. Measures of weight and capacity which were used on markets in antiquity, could deviate widely from the official value and content of fixed measures.[9] In the above I have commented on the inaccuarcy of measures in antiquity though it is essential to recognise that the precision of quantification entails both theory and practice. As such, principle a. of standardisation is illuminating because standardisation is theoretically based on the concept of simplification as well as on the concept of complexity. Measures were in theory reliable. The two ancient scales from *Satricum* and Chiusi, which will be examined in section 4.2, suggest relatively precise, fixed weights. Evidence from measuring rods records this accuracy. From a collection of archaeological measuring rods and from mathemathical deductions carried out on the oldest concrete measuring rod that is preserved, the Nippur cubit, Rottländer calculated that ancient units of length only vary within margins of 0.2 %.[10] The accuracy of measuring devices deviates from the precision that is obtained when units were employed for exchange activities. This contrast between theory and practice complicates the perception of early metrological systems. However the main difficulty concerning early measures is the dearth of evidence. The limited evidence for measures from the primary sites of central Italy indicates an incomplete adoption of metrological systems during the period 800 to 400 BC. Nevertheless, the few data that are available, record that quantification was practised during exchange activities. Measures were employed in central Italy in proto-historical times, from the 7th century BC. Those who have labelled the early use of measures before historical confirmation, a fantasy, deny history its own history.[11] A historical process such as the implementation of units and standards has to mature in any culture and it is obvious that during this developing stage, the actual evidence is limited. Besides, a metallic unit is clearly implied by the Twelve Tables that are dated around 450 BC. In the Tables fines are recorded in asses to be taken as weights of bronze and not of coins.[12] The account given of the early measures in this chapter resembles the reading of the alphabetic graffito from Osteria dell'Osa. These five letters which are dated to 770 BC and which at present predate the earliest known inscription from Greece, cannot be translated. It has been suggested that these letters indicate a stage in the adaptation of the Phoenician alphabet for the Greeks on Ischia since at *Pithekoussai* both Greeks and Easterners were living together during the 8th century BC.[13] It is unfortunate that we cannot make out the message of these letters but it cannot be denied that they are letters and symbols which convey meaning. The analogy between these letters and early measures is that a discussion of protohistoric measures of weight, capacity and length is bound to be hypothetical. The actual evidence is limited because it debates the origin of what in later times, becomes a historical mechanism. The evidence is destined to be restricted during the initial stages of quantification by measures.

In order to substantiate aspects of standardisation in central Italy, I will first present the early evidence for units of weights, volume and length that are known from later historical sources. Secondly, I describe a reconstruction of a local system of quantification for Marzabotto. The evidence for weights derives from a limited number of sites and is presented in combination with its archaeological context.

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[9] *cf.* Pernice 1894, 10-1; Lang and Crosby 1964, 39-57.

[10] Rottländer 1993, 118-9.

[11] Pink 1938, 10-1; Houben personal communication.

[12] Crawford 1985, 20.

[13] *cf.* Ross Holloway 1994, 112, 167. I also refer to Ridgway who recently discussed the meaning of these letters as well as their archaeological context: Ridgway, 1996.

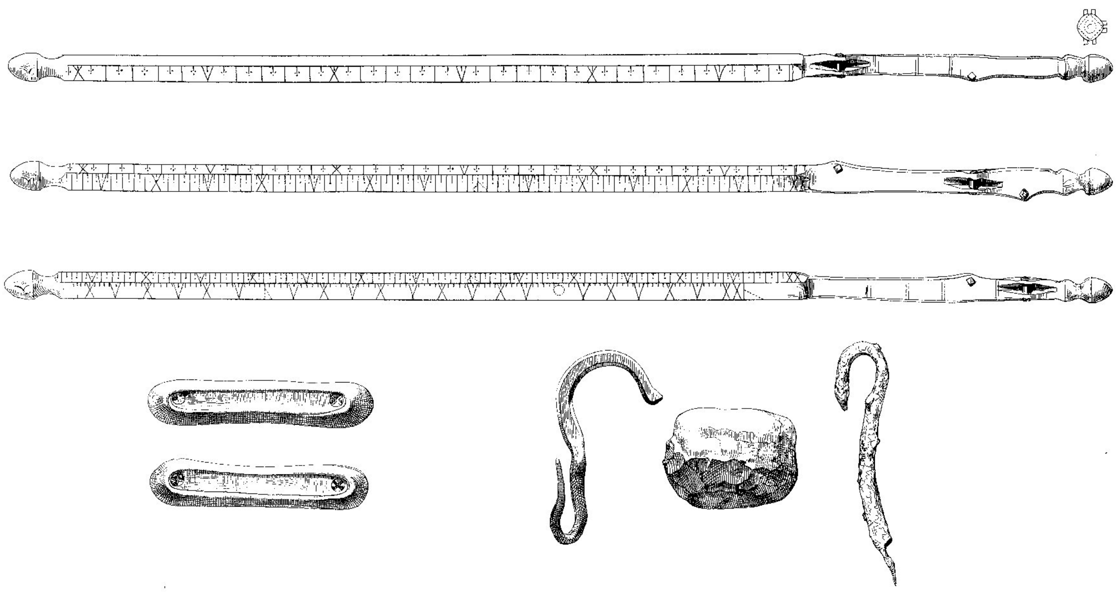

Fig. 64. Chiusi, ancient balance.

4.2 *Weights*

Weight was applied as a measure of quantity as soon as materials became available of sufficient value to make precision desirable.[14] The exchange in metals in particular, required precision. In central Italy only a limited number of pre-Roman weight-standards have been published. These include:
Chianciano, weighing 250 g.
Chiusi, weighing 214-212 g. (deduced from balance)
Chianciano, weighing 212 g.[15]

The units of weight from Chiusi and Chianciano imply a standard of *circa* 212 g. However their archaeological contexts are far from conclusive which makes it difficult to date the evidence precisely. For example, the balance discovered at Chiusi was found in a cistern, the content of which was labelled Etruscan (Fig. 64).[16]

This section on weights expands the corpus of pre-Roman weights and reviews aspects of pre-monetary exchange mechanisms that were based on metallic weight standards. Since I found most of the early evidence on measures at the Latin site *Satricum*, I will start by discussing the evidence from this settlement in detail. Two metallic weight standards and a pair of scales were found at the site. The first of these weights corresponds to the so-called *Roman-Oscan* pound and was excavated in a settlement context that is dated to the second half of the 7th century BC.[17] The second weight corresponds to the so-called *Campanian* pound and was found in the oldest votive deposit, votive deposit I, dated between the 8th and 6th centuries BC (Fig. 65). In the same votive deposit a pair of scales was found which, because of its dimensions, can be described as a jeweller's balance (Fig. 66).

[14] Renfrew 1972, 408-12.

[15] Crawford 1985, 16.

[16] *Notizie degli Scavi* 1883; Gamurini 1889.

[17] This context is depicted in Figures 67 to 70.

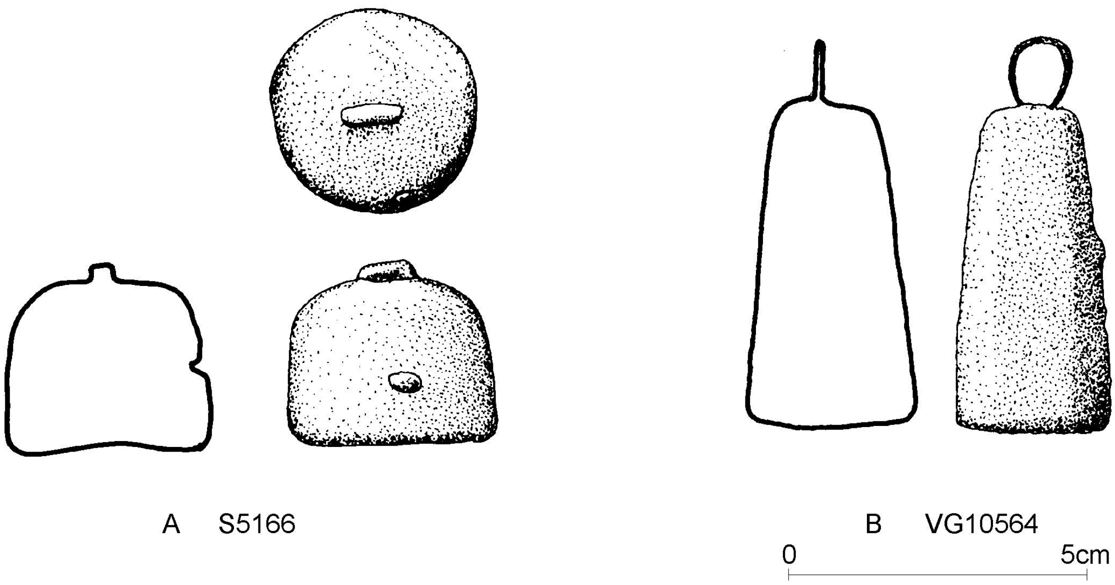

Fig. 65. Satricum, Roman-Oscan pound (a) and Campanian pound (b).

The use of weight-standards at *Satricum* is closely linked to some activities of a proto-urban centre such as trade and local production of artefacts. I have recorded that iron artefacts and pottery were manufactured in the settlement from the 7th century BC.[18] It is likely that at *Satricum* other metals were processed as well. A close parallel to this situation occurs in *Pithekoussai* where an Euboean weight-standard was excavated in the metal-working quarter dated to the early 7th century BC.[19]

The designation of standards of weight as fixed metallic monetary units is considered to be the most important stage in the early history of money.[20] A discussion of this important stage for Italy and Rome is hampered by the lack of known weights. Unfortunately no reference book for pre-Roman Italian weights is available. This is even more unfortunate taking into consideration the long-lived tradition in early Rome of transactions *per aes et libram*, by bronze and scales, a procedure for transferring commodities by weighing pieces of bronze in a pair of scales, which continued well into the Republican period even though the Greek colonies in South Italy had adopted coinage centuries before.

The views of numismatists on early Italian weight standards tend to be polemic. The discussion is mainly theoretical since, as stated above, actual weights with conclusive contexts are scarcely available. I present two lead weights from *Satricum* which correspond to the average weight of two later Roman coins; the *Roman-Oscan* pound for the cast Prow Aes coins and the *Campanian* pound for the heavy Apollo series.

Weight 1 (Fig. 65 a) is a *Roman-Oscan* pound that was excavated at *Satricum* and dated to the second half of the 7th century BC. It is identified as a unit by its embossed mark. It is a lead weight with an iron hook for suspension and a single embossed iron mark. It has a conical body with a slighly concave base and a convex top. It weighs about 267 g. and was somewhat damaged in antiquity due to scratching. Moreover, it has lost some of its original weight through corrosion.[21] Taking this into consideration the closest parallel for this weight is the *Roman-*

[18] See sections 2.6.1 and 3.6.2.

[19] Buchner 1979, 135.

[20] Crawford 1985, 19.

[21] *cf.* Hitzl 1992, 244.

Oscan pound of about 273 g.[22]

The second weight (Fig. 65 b), which is on display in the Villa Giulia Museum in Rome, was found during the excavations at the turn of the century in votive deposit I. This deposit is dated between the 8th and 6th centuries BC. It is a lead weight with a copper alloy ring for suspension. It has an elongated, conical body, tapering towards the top and in section it is slighly octagonal. It is corroded and weighs about 340 g., which is close to the weight Haeberlin called the Italian pound and others the Roman-Attic/Campanian *mina* or pound, being about 341 g.[23]

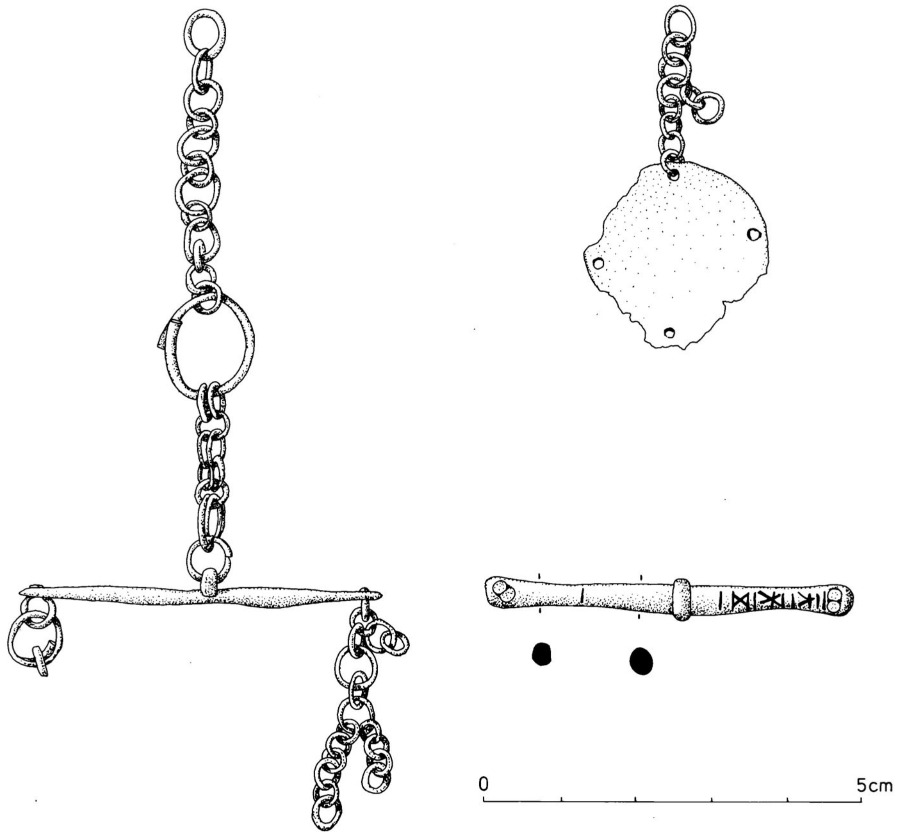

Fig. 66. Satricum, weighing scales from votive deposit I.

Of these two weight-standards, the *Roman-Oscan* pound is still debated. Scholars have either denied the existence of this weight unit[24] or have taken a more pragmatic view stating that different weights for the pound existed in Italy.[25] The second weight found at *Satricum*, the *Campanian* pound, seems not to be mentioned anymore. However it appears to confirm the view that different weights existed for the pound.

The third object from *Satricum* which relates to weighing and weights is a pair of scales (Fig. 66). It was also found in votive deposit I. It is made of copper alloy and consists of chains of small rings and a bar. The bar is incised on one side with ten parallel lines and three hatched crosses, one of which appears incomplete. The other side is incised in the middle with one line. Though the incisions on the extreme right of the bar are difficult to read

[22] Haeberlin 1909, 31-6.

[23] Haeberlin 1909, 82; Pink 1938, 11.

[24] Thomsen 1957, Vol. II, 22-33.

[25] Crawford 1985, 1-6, 15.

and are represented in an arbitrary fashion, they indicate a subdivision of weights to be measured in ten units while the hatched crosses are positioned, approximately at a quarter, a half and three quarters. The balance from *Satricum* has a design that suggests the use of an equipoise. On the right arm of the balance an equipoise was moved in order to obtain an equilibrium. The position of the equipoise indicates the difference in weight of the objects in the scales. Similar balances are reported for the measurement of the specific weight of gold and silver.[26] The actual scales are missing though I located a pan from votive deposit I which is suitable for this balance, in the store rooms of the Villa Giulia Museum (Fig. 66). The scales would have hung on four chains of small rings since one of the chains divides into two. The other chains of the balance are incomplete. The dimensions of the balance make it only suitable for measuring small quantities. Thus, this pair of scales was intended for measuring the weights of precious metals or materials. In this context it is interesting to mention several small lead weights found at *Satricum* by the excavation team of the University of Amsterdam. These small square or rectangular lead cubes were discovered in a disturbed context. They are provisionally interpreted as stray finds from the refuse of votive deposit I that were discarded by the excavators who worked at *Satricum* at the turn of the century. Details of these smaller weights from *Satricum* still await publication.[27]

The balance and weight no. 2 (Fig. 65 b) were both found during the excavations at the turn of the century. They are mentioned in the field-reports of the objects that were discovered in votive deposit I during February 1896 and are listed amongst fibulae, small copper alloy figurines and some scarabs. The presence of weights in sanctuaries is not uncommon in antiquity since religious institutions probably vouched for the value and content of fixed measures.[28] This custom is reflected in Rome where weight standards were kept in the Temple of Jupiter Capitolinus.[29] Thus, it is not surprising to encounter units of measurement in temple precincts. For example, among the weights found at Olympia, three copper alloy weights are known to correspond with the weight of 1, 1/2 and 1/4 *mina* of Aeginetan standard.[30] The widespread custom of consecrating weight standards at sanctuaries also occurs at Francavilla Marittima in southern Italy. At this site, a remarkable silver weight was found which was dated to the 6th century BC. Zancani Montuoro suggested that this weight was dedicated at the temple by the Sybarites in order to vouch for the value of their coins.[31]

Discussion of early weights has attracted much attention from scholars from different fields. One of the topics debated is the introduction of these measures. Crawford suggests that a state-designated metallic monetary unit existed at Rome from the middle of the sixth century BC,[32] while Peruzzi argues on linguistic grounds that the Latins used standard weights from the 8th century BC.[33] The weight units that are presented in this section are the

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[26] Ibel 1908, 51, 61.

[27] I thank drs. M. Gnade and Dr. D.J. Waarsenburg for this information and their permission to mention these finds.

[28] *cf*. Hitzl 1996. He describes weights which were found at Olympia while presenting evidence for the involvement of priests in the emission of these weights: Hitzl 1996, 101-4.

[29] Kisch 1966, 150.

[30] Hitzl 1992, 247.

[31] Zancani Montuoro 1965-1967, 21-5.

[32] Crawford 1985, 21.

[33] Peruzzi 1985, 39-63. The existence of systems of weights in Italy prior to the 8th century BC cannot be excluded. Negroni Catacchio catalogued two stone objects from Sorgenti della Nova dated to the late Bronze Age which are tentatively interpreted as weights: Negroni Catacchio 1995, 384. The stones have holes for suspension and one has a similar form as the Roman-Oscan pound that was discovered at *Satricum*. Unfortunately Negroni Catacchio does not report the weight of both stone artifacts. It is suggested that both objects could have a ritual connotation. See for example, the exceptional collection of stones some of which with holes, that were found in the 6th century BC deposit at the Comitium in Rome: Bartoloni 1989-1990, 756-7. Unfortunately the weight of these 130 pebbles is not documented. Bartoloni presents some interpretations for these stones but she does not include the option that they could represent weights such as the river pebbles from Marzabotto:

result of archaeological research and indicate their introduction during the period of the *formazione della città*, the Orientalising Period, that is from 720 to 580 BC. With this introduction of measures of weight in *Latium Vetus*, I do not propose a sudden introduction of commercial exchange based on a market system with prices fixed according to supply and demand. Other exchange mechanisms must have dominated. Therefore reciprocal exchange based on social relationships and equivalence rather than profit and loss, or redistributive exchange based on redistribution of products which were collected by a central power, may have existed for diverse commodities and services side-by-side with market exchange.[34] For *Latium Vetus* and Etruria the role of gift-exchange of prestigeous goods between members of the 'upper-class' has been stressed, though this can never account for all forms of exchange during the period discussed.[35] I consider that the *Satricum* weights may indicate an Italian exchange mechanism based on commercial exchange with fixed correlations for the value of different metals. These weights show that market mechanisms existed in central Italy at least from the middle of the 7th century BC. A fixed correlation was calculated on the basis of copper alloy and silver coins of the 3rd century BC according to which a quantity of 273 g copper alloy, that is the as of ten ounces, was worth two scruples, that is 2.2 g silver.[36] Whatever the ratio silver to copper might have been during the second half of the 7th century BC, the unit of 273 g was employed at *Satricum* at an early date.

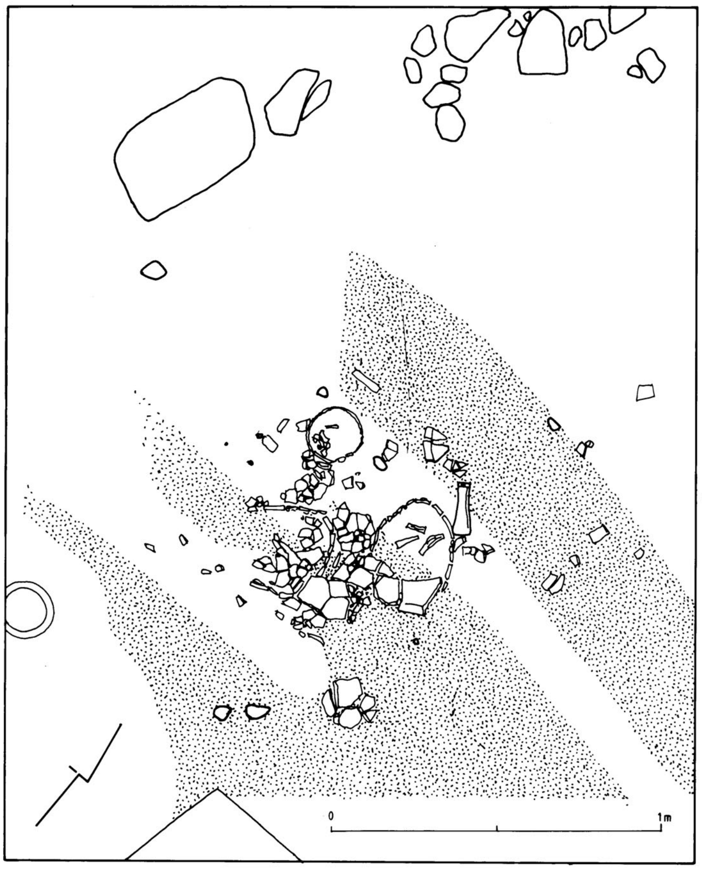

Fig. 67. Satricum, square B 18, deposition of pottery and metals in between recent ploughed furrows.

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see section 4.5.

[34] *cf.* Greene 1990, 46-8. Greene presents the main economic exchange mechanisms such as reciprocal, redistributive and market exchange.

[35] *cf.* Bartoloni 1989, 201-2; Anzidei *et alii* 1985, 220.

[36] Burnett 1989, 34.

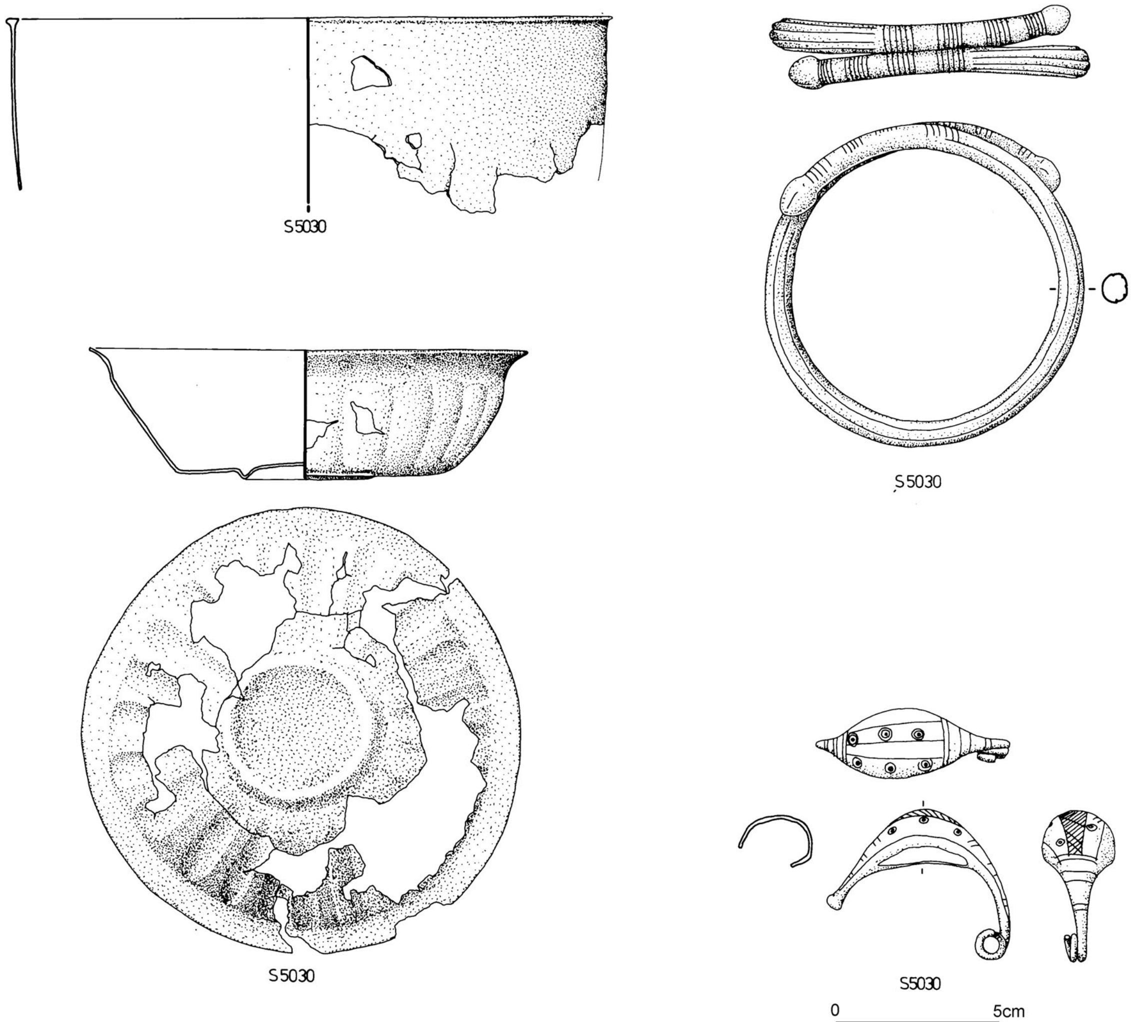

Fig. 68. Satricum, metal artefacts which were excavated in square B 18.

In the remainder of this section on weights, I will first present the archaeological context in which the weights were found because of its significance on the interpretation. Secondly, information from other sites with similar circumstances will be examined in order to integrate the *Satricum* weights into the commercial exchange mechanism of the 7th century BC.

The development of *Satricum* can be divided into two stages. In the first stage of approximately 830 to 600 BC, the settlement consisted of huts that were grouped around a sacred water basin. After a destruction and levelling of the site around 600 BC, the second stage began. This stage was characterised by temples and houses on stone foundations. The last temple of *Satricum* was destroyed around 500 BC and was not rebuilt although life on the site continued.[37] By 500 BC, *Satricum* had lost its economic significance and was of mere local importance.

In 1991 the excavation of an area south of the temple (Fig. 49, square B18 on the excavation plan) yielded a

[37] Maaskant-Kleibrink 1991, 51; Kleibrink 1997.

consistent metal and pottery concentration that included the above mentioned *Roman-Oscan* pound. Stratigraphically the material was found to lie between ploughed furrows (Fig. 67). The metal concentration included a copper alloy vessel, bowl, bracelet and fibula (Fig. 68) as well as iron axes and knives (Fig. 69).[38] Moreover a piece of raw, unworked iron was discovered.[39] 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 (Fig. 70). The lead weight with the embossed iron mark was excavated near these objects which can all be dated to the second half of the 7th century BC. Most of the objects were found next to, or on top of, each other (Fig. 67) and no other material was found in this part of the excavations. Some vessels were fairly complete which is unusual for a settlement context. This implies some sort of deposition. I interpreted one of the vessels found with the weight, as a measure of capacity.[40] The objects were excavated in an area of about 2 m^2 and were 50 cm below the ground surface. In fact their preservation was quite unusual, since they were found in between ploughed furrows. These furrows are the result of ploughing with a steam-driven plough apparently used on the acropolis around 1929.[41] The objects were found in the settlement area of the excavation though the general context is not yet known because of the ploughing. However the direct context in which the weight was found, can be identified. Apart from the implication of a deposition, the weight was excavated together with raw iron and square socketed iron axes. The raw iron may have been imported though the axes were most likely produced locally, since iron smithy-slags from the 7th century BC were excavated in the settlement.[42] Besides, similar axes were found in votive deposit I which makes a total of ten square socketed iron axes excavated at *Satricum*. When compared with the number of iron axes from other sites in *Latium Vetus* from the same period, *Satricum* clearly stands out. From the presence of these axes in rich tombs, it is deduced that iron axes were still regarded valuable during the 7th century BC. Because of the large number of axes at *Satricum* and the attested iron production recorded by the iron slags and the piece of raw iron, it is assumed that iron socketed axes were produced at the site from the second half of the 7th century BC.[43] Thus, the immediate context in which the weight was excavated, indicates trade in iron artefacts. The presence of some copper alloy objects in the same context makes it likely that copper alloy artefacts were also exchanged (Figs. 68 and 69). Another important indication is that the artifacts that were found with the weights (Figs. 68 to 70), indicate an indigenous framework since this context does not retain evident Levantine or Greek goods.

The development of the settlement at *Satricum* can be described as a faltering urbanisation process. To demonstate this, I discuss two economic activities, exchange and local production, separately from many other aspects such as architecture and public works which also indicate urban development. Exchange of artefacts at *Satricum* is recorded by the quantity of imported goods, the weights and the balance. Judging from the distribution of imported goods in the three archaeological contexts of the site (sanctuary, necropolis and settlement), it is probable that trade was centered around the religious activities at the sanctuary. During the 7th century BC, goods from all over the eastern Mediterranean area changed hands at *Satricum* in what can be described as a centre of

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[38] The copper alloy bracelet in Figure 68 is identical, though larger, to two bracelets in tomb 652 at *Pithekoussai*. This tomb is provisionally dated to the late Geometric II period and contained besides the bracelets, 22 fibulae, another bracelet and a scarab. A girl was buried in this tomb. It may be that the original context was disturbed since the bracelets are too large and the fibulae too numerous to have been worn by the girl. See: Buchner and Ridgway 1993, 630-5. For my comments on the metal objects from *Pithekoussai*, I refer to section 3.6.1.

[39] See section 3.6.2.

[40] See section 4.3.

[41] Maaskant-Kleibrink 1992, 8. The furrows contained much charcoal from charcoal-firing that was carried out on the acropolis during the last century. The carbon was C^{14} dated to the second half of the 19th century AD.

[42] See section 3.6.2.

[43] See section 3.6.2.

trade. In time this trade was reduced to interregional/regional and local importance. A similar account can be given of the local production. Local production is recorded from the 7th to the 4th centuries BC. The production of pottery and iron artefacts during the 7th century BC is characterised as technologically advanced. Iron was hardened, highly crafted vessels of fine *impasto* were made while ceramic stands were fired in a kiln with separate combustion- and firing chamber. Though the production of pottery and iron continued in later centuries, the products became indistinctive. The local workshops did not contribute any longer to the significance of the site. This could have been due partly to the decrease in the value of iron and other artefacts. Other factors are a general loss of the economic importance of the site, the transformation in the social position of artisans due to developing craft specialisation and a change in territorial boundaries. Nonetheless, during the late 8th and 7th centuries BC, trade and production at *Satricum* led to the accumulation of reserves or surplus. In this context, the early use of pre-monetary weight units and scales is not surprising. This view is supported by considering the economic development of the economy at the site in more detail. Whereas contacts on a regional and inter-regional level can be found during almost all periods of the settlement, those on an international scale are found especially in the late 8th and 7th centuries BC. The 'international' imports were mainly present in the tombs and the oldest votive deposit, votive deposit I. This deposit yielded imports mainly from Greece but also from Egypt, Rhodos and the Levantine-Cypriote area. Besides ceramic imports, the high economic standard of the site in the 7th century BC is also reflected in votive deposit I by a considerable number of objects of different metals, such as iron, copper alloy artefacts and some gold, silver and gilt silver objects.[44] The formation of votive deposit I may be considered as an accumulation of reserves of wealth taken from daily circulation. The establishment of votive hoards such as the votive deposit at *Satricum*, is one of the methods of storing economic surplus.[45] At *Satricum* one can detect during the 7th century BC a definite shift from 'personal' hoards, exemplified in the rich burials, to 'institutionalised' hoards, exemplified in the wealth of the votive deposits. These 'institutionalised' hoards, however, consisted at least partly of separate votive pits representing personal gifts to the goddess.[46] Moreover, most votive gifts were taken out of daily circulation. The change from 'personal' hoards to votive hoards shows that the religious authorities were able to create reserves of wealth in favour of their institutions. These reserves must have stimulated new market conditions in which the religious institutions played a major role. The wealth of the votive deposits combined with the limitations of the natural resources indicates that the economy of the settlement revolved mainly around the activities at the sanctuaries rather than on its local resources. International contacts gradually disappear during the 6th century BC. In the 5th century BC the economy of the site assumes a mainly local character.[47] Though the economic importance of *Satricum* declined, local production of pottery and iron continued well into the 4th century BC indicating that in this period production was merely distributed locally. The local production of votive terracottas, however, leads us to conclude that the sanctuaries still remained at the heart of the economy.[48]

In addition to the weights and the pair of scales, an early monetary character of the votive deposits at *Satricum* is indicated by the large amount of so called *aes rude*, about 40 to 50 kg, and copper alloy scraps that were found in and around the temples. Among the copper alloy scraps there are several folded artefacts such as strips and vessels, some of which had been folded three to four times. Most of the *aes rude* and copper alloy scraps were found during excavations at the turn of the century and their context is not well recorded. However the assemblage of *aes rude*, including pieces of plano-convex, copper-iron ingots, and scraps from *Satricum* resembles the assemblage of copper alloy artefacts that were excavated in the votive deposits from the sanctuary of Demetra Thesmophoros at

[44] Bouma *et alii* 1995, 193.

[45] Peroni 1979, 16.

[46] Maaskant-Kleibrink 1995.

[47] Bouma *et alii* 1995, 194.

[48] Nijboer *et alii* 1995.

Bitalemi.[49] The deposits at both *Satricum* and *Bitalemi* included *aes rude*, pieces of plano-convex ingots, distorted vessels and an *aes signatum*.[50] The *aes rude* and copper alloy scraps at Bitalemi were interpreted as pre-monetary copper alloy deposits which consisted of thirty-one separate offerings. The offerings at Bitalemi amount to a total of about 100 kg of copper alloy and are dated to between 640 and 540 BC. These individual offerings occured also in votive deposit I at *Satricum*.[51] With the procedure *per aes et libram* in mind, the substantial amount of *aes rude* at *Satricum* supports the pre-monetary character of some of the offerings.

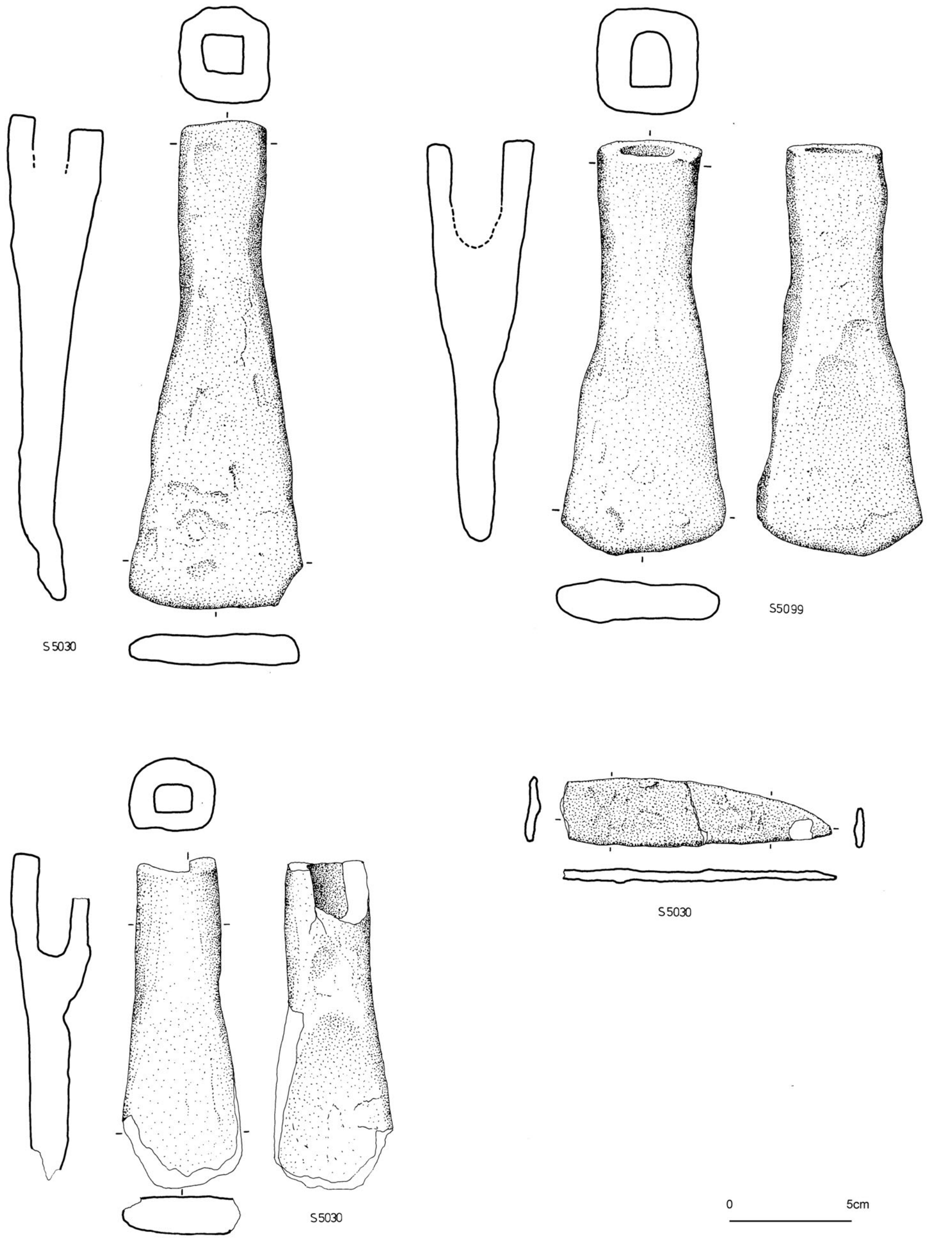

Fig. 69. Satricum, knife and iron axes which were excavated in square B 18.

[49] Orlandini 1965-1967.

[50] *Satricum* 1985, 119. This exhibition catalogue presents the *aes signatum* from *Satricum*.

[51] Maaskant-Kleibrink 1995.

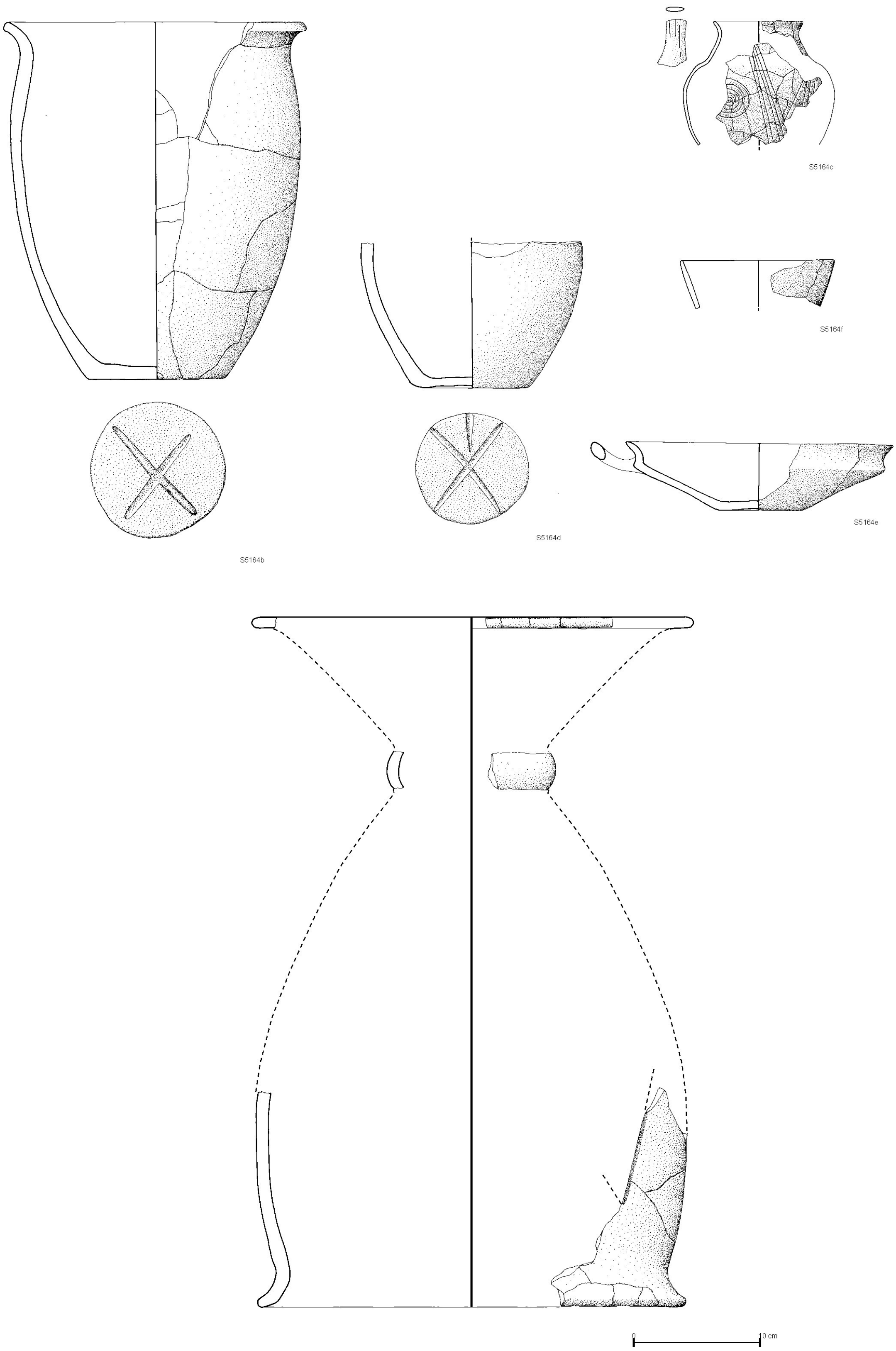

Fig. 70. Satricum, pottery that was excavated in square B 18.

The source or provenance of the weights discovered at *Satricum*, is hard to establish. Traditionally, both weights are associated with the Campanian/Oscan territory through their nomenclature. The *Roman-Oscan* pound as well as the *Roman-Attic/Campanian* pound, imply an origin in the region south of *Latium Vetus*.[52] A subdivision into ten units can also be related to an Oscan origin. The subdivision of weights on the balance is ten (Fig. 66) and this is similar to the subdivision of length which can be associated with the Oscan territory.[53] In later centuries the Romans used a division of twelve units. The southern connotation is not surprising if one considers the position of *Latium Vetus* within the Mediterranean trading system of the 7th century BC. This system was probably stimulated by the developments in the area around *Cumae*. The increase in 'international' trade during the Orientalising Period, accounts for the employment of quantification by weight and other measures for exchange with foreign trading communities. In order to support this argument it is essential to examine other sites with similar evidence for early market mechanisms.

The evidence from other sites is limited, partly because of the lack of detailed accounts since there are some publications in which weights are implied but not specified. However the evidence that is presented in this section is sufficient to support the concept of exchange by quantification and its early introduction in central Italy. These weights were used in a Mediterranean commercial exchange mechanism of which central Italy became part during the Orientalising Period.

The closest parallel to the metrological conditions at *Satricum*, both in date and context, is found on Ischia. In the metal-working quarter at *Pithekoussai*, a disc of lead bound in a bronze ring was found (diam.: 1.7 cm; thickness: 0.6 cm) in the rubbish dump against one of the workshops. It weighs 8.79 g, which is close to the standard weight of the Euboic-Attic stater (8.72 g). The context is definitely pre-monetary and cannot be dated later than the first quarter of the 7th century BC. The excavators imply that the Mazzola pre-monetary weight was used either for weighing precious metals or for weighing the finished products of metalworking. On the basis of circumstantial evidence they argue for jewellers' workshops at *Pithekoussai* where silver and gold could be worked.[54] The weight from *Pithekoussai* would suit in size the pair of scales found in votive deposit I at *Satricum* (Fig. 66).

The evidence for the processing of precious metals such as silver and gold at *Pithekoussai* is indirect. There is, however, direct evidence for the processing of iron and copper alloys.[55] The Mazzola site yielded as *Satricum*, iron slags and raw, unworked iron. The structures that belong to the metalworking activities, are better preserved at *Pithekoussai* than at *Satricum*. There is also convincing evidence for the casting of copper alloy fibulae at *Pithekoussai*. The refuse from the workshop area produced a miscast of a copper alloy fibula and several other copper alloy artefacts.[56] Some lumps of lead from the same refuse are not described in detail but one of them is illustrated by Klein.[57] This piece of lead does look similar in shape and dimensions to the *Roman-Oscan* pound from *Satricum*. However the weights of the lumps of lead from *Pithekoussai* were not published.[58] In the summer of 1994, Buchner kindly showed me another weight that was discovered at *Pithekoussai*. This scratched, rectangular piece of lead has the same weight (268 g) as weight A from *Satricum* (Fig. 65 a). However it was found in the

[52] I refer to Peruzzi for linguistic arguments: Peruzzi 1985, 43, 62.

[53] See section 4.4.

[54] Klein 1972; Buchner 1979, 135-8; Ridgway 1992 a, 95.

[55] See section 3.6.1.

[56] Klein 1972, 36-7; See section 3.6.1.

[57] Klein 1972, fig.5.

[58] It would be interesting to have a more complete account on the lead pieces and the metalworking quarter at *Pithekoussai*.

acropolis dump at Monte di Vico which dates from the Middle Bronze Age to the first century BC.[59] Therefore it unfortunately is from an inconclusive context.

To complete the comparison between *Pithekoussai* and *Satricum* it is necessary to recollect the fundamental difference between both sites. By the late 8th century BC, *Pithekoussai* was inhabited by both Greeks and Levantines while the population at *Satricum* was indigenous. The first archaeological evidence for measures in Italy both in weights as in volume derives from *Pithekoussai,* followed not much later by the evidence from *Satricum*.[60] This indicates that trade between the indigenous population of central Italy and the Greeks/Levantines was to some extent regulated soon after their arrival in mainland Italy. It is open for debate whether this regulation was imposed by local authorities or was the result of common interests between foreign traders and the local elite. The southern connotation of the weights from *Satricum* points to mutual interests since the weights discovered do not appear to be based on locally developed measures. Nevertheless, the context in which the *Roman-Oscan* pound was found at *Satricum*, does not contain evident imported goods from the Levant or Greece and, therefore, indicates an indigenous framework (Figs. 68 to 70). The social stratification in central Italy is exemplified in the 'princely' tombs and was advanced enough to make regulation of exchange feasible. The weights and scale from *Satricum* imply that commercial contacts in *Latium Vetus* between a basically non-market oriented society, (the local population), and a more market adjusted economy, (the Levantine and Greek traders), were monitored for specific commodities, probably metals, from at least the second half of the 7th century BC.

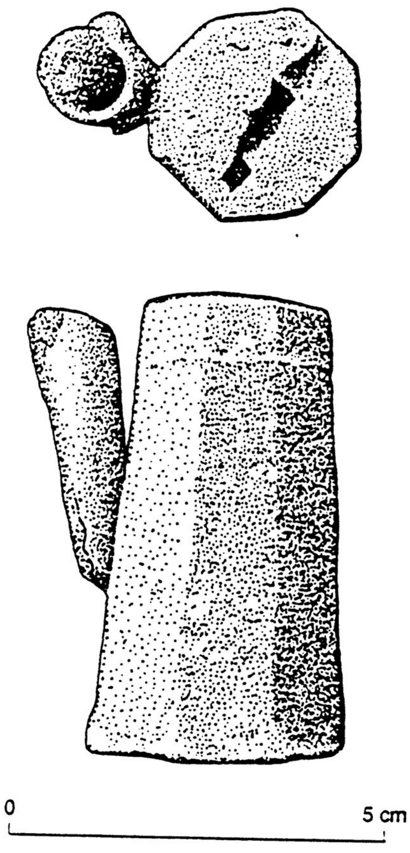

Fig. 71. Campanese Bay, near Isola del Giglio, a weight from the shipwreck.

[59] Ridgway 1992 a, 84-5.

[60] See also section 4.3.

Another site with indications for the use of standard weights and containers is the pre-classical wreck in Campese Bay near Isola del Giglio. The excavation of this vessel was published in an interim report.[61] The wreck is identified as a merchant ship and is dated around 600-590 BC. Because of the merchandise on board it is not surprising that some weights are reported. In addition to unworked amber and raw and worked metals, it contained transport *amphorae* from Etruria, East-Greece, Samos and from Phoenician-Punic centres though most of the *amphorae* were Etruscan. The ship also carried fine wares from Corinth, Sparta, Etruria and from East Greece as well as anchors made from a granite that is available on the Island of Giglio. The freshly dressed anchors were probably loaded onto the ship for trading purposes. On the basis of the commodities on board it is probable that the ship went from relay point to relay point, at each place both exchanging and loading merchandise. The three lead weights recovered from the wreck are not discussed in detail and unfortunately their weight is not mentioned. Bound believes that they were associated with scales.[62] One of the weights from the ship (Fig. 71) has a similar shape to the weight from votive deposit I at *Satricum* (Fig. 65 b). Dr. Rendini from the *Soprintendenza Archeologica Toscana* has kindly informed me that this lead weight including the copper alloy arrowhead, weighs 352 g. Considering that one has to subtract the weight of the small hollow arrowhead but on the other hand must add the weight of the ring for suspension, this weight from the wreck at Campese Bay comes relatively close to the weight of the Roman-Attic pound from *Satricum* (Fig. 65 b). It can, therefore, be assumed that a metrological system existed in central Italy around 600 BC which included at least the unit of 341 g since this unit has been found at two separate sites. The presence on the ship of weights and various commodities including standardised vessels such as *amphorae*, substantiates the view that for certain commodities an early market exchange mechanism existed in central Italy around 600 BC. On account of the evidence presented above and based on the influx of gold, silver and ivory artifacts in central Italy during the Orientalising Period, I suggest that this mechanism developed soon after the arrival of Levantine and Greek traders on mainland Italy. By 600 BC the use of weight units was probably acknowledged at ports of trade and other trading places. The weights from the shipwreck and the weights mentioned at the beginning of this section demonstrate that both in *Latium Vetus* and in Etruria a system of quantification by measuring in pounds of copper alloy existed.

In addition to quantification by weights during transactions, some early Etruscan coins have been reported. However these early coins are controversial because they are limited in number and their date is often uncertain. The early coins that are known do not constitute a single homogenous monetary system.[63] This correlates with the suggested scattered metrological systems.[64] Important Etruscan towns such as *Caere*, Vulci and Veii never minted coins while, according to Crawford, Etruscan silver coinage from the 5th century BC may be assigned to Vulci.[65] Panvini Rosati dates the early Etruscan coins to the late 5th and early 4th centuries BC and assigns an early mint to Populonia.[66] Though the Etruscans were familiar with coinage, they did not employ coins for regular, local transactions. In addition, some Greek coins circulated in Etruria but this did not contribute either to monetary market conditions in central Italy before the 3rd century BC.[67] At the end of 4th century BC, Rome started to strike issues of silver

[61] Bound 1991.

[62] Bound 1991, 229.

[63] *cf*. Catalli 1990; Cristofani 1981, 208-16.

[64] See sections 4.5 and 4.6.

[65] Crawford 1985, 2.

[66] Panvini Rosati 1976, 29-31. See also: Catalli 1990, 41-62.

[67] A regular monetary market mechanism is documented by substantial amounts of copper alloy coins of small denominations. These coins of little value attest that small purchases could be made on local markets. Such conditions did not arise in central Italy during the period 800 to 400 BC.

coinage but it is only after about 270 BC that there is a relatively regular sequence of Roman struck coins which were probably issued for payments to soldiers.[68]

Transfer of commodities can be accompanied by various exchange mechanisms such as gift exchange, barter and more commercial procedures such as exchange by quantification. A pre-monetary exchange mechanism based on scales, *aes rude* and weights, developed in central Italy from 700 BC. The evidence reported in this section implies that this system was adopted on a modest scale. On a regional and local level, transactions were probably still based on barter or set within a social context. These conditions must have affected the market function of the centres and towns. A direct relationship between craftsmen and consumers counters the emergence of middlemen such as stallholders and shopkeepers. The procedure *per aes et libram* on a regular base in a customary setting would have demonstrated the development of markets. However established markets are rarely reported in pre-Roman Italy and their evolution appears to be delayed until the 3rd century BC when coins began to be struck on a regular basis.[69]

4.3 *Volume*

The measures of capacity presented in this section are closely related to the weights which were discussed in the previous section. Both quantities are associated with regulated exchange that depended on fixed standards. Furthermore, one of the units of capacity, the *Kotyle*, contains 273 ml which would weigh 273 g, the weight of the *Roman-Oscan* pound, when it is filled with water. As in the previous discussion on weights, a metrological assessment of ancient measures of capacity remains hypothetical. This is to some extent the result of the method applied. Measuring the contents of containers can be accomplished by several methods such as filling the jar with water or polystyrene granules. Another approach applied in this section is one of simple mathematical calculation.[70] Based on an accurate drawing of the container whose volume is to be determined, a vertical line is drawn down the centre from base to rim which divides the vessel into two equal parts (Fig. 72). One half of the vessel in then subdivided in a multitude of horizontal sections. The volume of each of these sections can be calculated using the formula $V = [a+b : 2]^2\ \pi.h.$[71] The sum of the volume of each section establishes the capacity of the whole container.

$$V = \left[\frac{R1 + R2}{2}\right]^2 .\pi.\ h$$

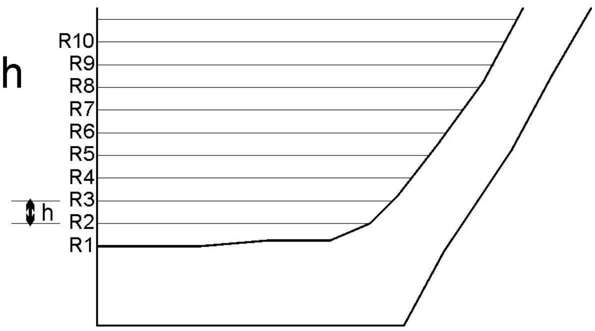

Fig. 72. Illustration of a simple mathematical equation for the calculation of the volume of vessels.

With regard to ancient measures of capacity, it is difficult to determine the level to which one has to calculate the content of a vessel. Some determine the capacity to the rim while others calculate it to the internal angle depending on vessel type and its application. Otherwise, it should be remembered that measures of capacity for liquids may differ from those for dry matter. Containers for liquids could be filled to one level (for example to the

[68] Crawford 1974, 44-5; 1985, 30-8.

[69] See also section 4.6.

[70] Rigois 1981.

[71] *a* and *b* are the length of the lower and upper radius of each section, Ò = 3.14 and *h* is the height of the section.

internal angle), while containers for dry matter might be filled to the rim. These variables lead to confusion when discussing ancient measures. In this context it is appropriate to recall that many medieval towns recognised the custom of measuring grain as a heaped measure of capacity.[72] This medieval example confronts us with regulation of metrological custom as well as with a system of approximation. Both the ancient and medieval metrological practice indicate that our contemporary accuracy of standards which is regulated on a national and even worldwide level, cannot be applied without due regard to ancient customs. Because I am mainly interested in the adoption of known measures of capacity transmitted from the Near East or Greece to central Italy, it is possible to adopt an unconventional approach. The volume of the containers presented in this section are determined to the level at which they equal historically known units. Thus the calculation of the content of a vessel is concluded at levels which correspond with the volume of a *Hin*, *Congius*, *Kotyle*, *Choinix* etc. The adopted method cannot be applied to concealed, local measures or units which are not historically recorded.[73] The research which is presented here does not attempt to decipher the intricacies of international and local metrological systems which were implemented in central Italy before the Romans. It is restricted to the archetypal liquid and dry capacity standards. I will argue that archaeological evidence indicates that measures of capacity were employed in central Italy at least from the 7th century BC. For this purpose, I start with a discussion of a study by Durando on the transport *amphorae* excavated at *Pithekoussai*.[74] Durando judges that the existence of standardised metrological systems for commercial purposes during the late 8th and 7th centuries BC is hard to demonstrate. The calculated contents of the *amphorae* from *Pithekoussai* are quite diverse which makes it difficult to reveal the idea of commercial standardisation. Therefore it is more convincing to discuss metrological systems of the 8th and 7th centuries BC as standardisation by approximation. In spite of this assessment, he was able to identify some clusters of *amphorae* that were produced at *Pithekoussai* and which have approximately the same content. Durando implies that a *Pithekoussan* standard might have existed which was based on an Euboean unit. This corresponds with the early pre-monetary unit that was found at *Pithekoussai*. According to the excavators this weight corresponds with the weight of an Euboic-Attic stater.[75] Moreover, he calculated that six Attic SOS *amphorae* from *Pithekoussai* contained between 51 and 52 l which is close to a duplication of 26.2 l, the Attic *Metretes* of the Classical period. Furthermore, it appears that the *Kotyle*, about 273 ml, was employed as a unit of volume from the 8th century BC. An *amphora* from grave 575 at *Pithekoussai* contained 200 units of a *Kotyle*.[76] This *amphora* is of Greek type, is dated to the third quarter of the 8th century BC and is inscribed with three semitic signs, two of which indicate that the *amphora* was originally a container of 200 units of liquid.[77] Its capacity was calculated as 54.826 litres or 200 standard units of the Ionic-Attic *Kotyle*.[78] Durando considers this *amphora* to be a one-off without parallel.[79] He hessitates to transfer the units that were known in Classical Greece to the Orientalising Period. However the repeated implication of their use from the 8th century BC allows for the hypothesis that during the Orientalising Period, units and standards from the Near East were transmitted to both Greece and central Italy. I will argue that the adoption of these units by the Greek and Italian population took place during the Orientalising Period when the 'international' trade as well as the development of the workshop mode of production required concepts of equivalence. As such the Orientalising

[72] Kula 1986, 65-6.

[73] See section 4.5.

[74] Durando 1989.

[75] See section 4.2.

[76] This *amphora* enclosed the inhumation of a baby, a rite often described as *enchytrismos*.

[77] Ridgway 1992 a, 111-5.

[78] Durando 1989, 81-4.

[79] Durando 1989, 82.

Period constituted the formative stage of concepts which matured in later historic times. This is most distinct for the units of volume which all appear to have been adopted from archetypal liquid and dry capacity standards, already mentioned in the Old Testament (see table 3).

Measures of Capacity for dry matter

Old Testament		Greek	
1 *Log*	0.547 l	1 *Xeste*	0.547 l
1 *Qab* = 4 *Log*	2.188 l	2 *Choinikes*	2.188 l

Measures of Capacity for liquids

Old Testament		Greek	
1 *Hin* = 3 *Qab*	6.564 l	2 *Chous*	6.564 l
1 *Ephah* = 6 *Hin*	39.384 l	1 *Metretes* = 1 *Amphoreus*	39.39 l

Table 3. Some archetypal liquid and dry capacity standards.[80]

The *Kotyle* (273 - 273,6 cc) and its double, the *Xeste* (546 - 547.2 cc), are used in the Greek system as unit of volume for both dry and liquid matter.[81] The *Chous* is the wet measure and equivalent to three *Choinikes* in the dry system, since both contain twelve *Kotylai* (1 *Chous* = 3 *Choinikes* = 12 *Kotylai* = 3280 cc).[82] The Romans used the *Sextarius* as a unit for dry and liquid matter which equals the *Log* and the *Xeste* (547 cc) in content. The Romans used the *Congius* for liquids which equals the Greek *Chous*.[83]

The archetypal system for capacity makes a discussion of its introduction in the various regions of the Mediterranean essential. As far as I know, the employment in Attica of the *Chous* as a unit of volume, can be shown from the 6th century BC.[84] However for central Italy I will present some vessels which predate the 6th century BC *Chous* from Attica. I have concentrated on the content of jars which were marked by the potters before firing. This procedure of marking ceramic measures of capacity in a leather hard state is also reported for the Agora at Athens which can be considered the ultimate market place of the Classical world.[85] The jars selected (Fig. 73) were all marked in antiquity and most likely intended to contain specific quantities.

Two vessels, one from *Satricum* and the other from Rome, contain 1 *Hin* (6.56 l) and 1 *Congius* (3.28 l) respectively at the internal angle. Both vessels were marked in antiquity before firing with an X and they date typologically to the late 7th century BC. Their archaeological context will be discussed below. Two other vessels, one from *Satricum* and the other from Veii, contain 1 *Choinix* (1.09 l) at the rim. These vessels are dated to the 6th century BC. Both jars were marked before firing, the jar from *Satricum* with four lines and the jar from Veii with some X tokens.

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[80] *cf.* Büsing 1982, 28-9.

[81] Büsing 1982, 28.

[82] Lang and Crosby 1964, 57.

[83] Hultsch 1882, 704.

[84] Stazio 1959, 560-1.

[85] Lang and Crosby 1964, 57.

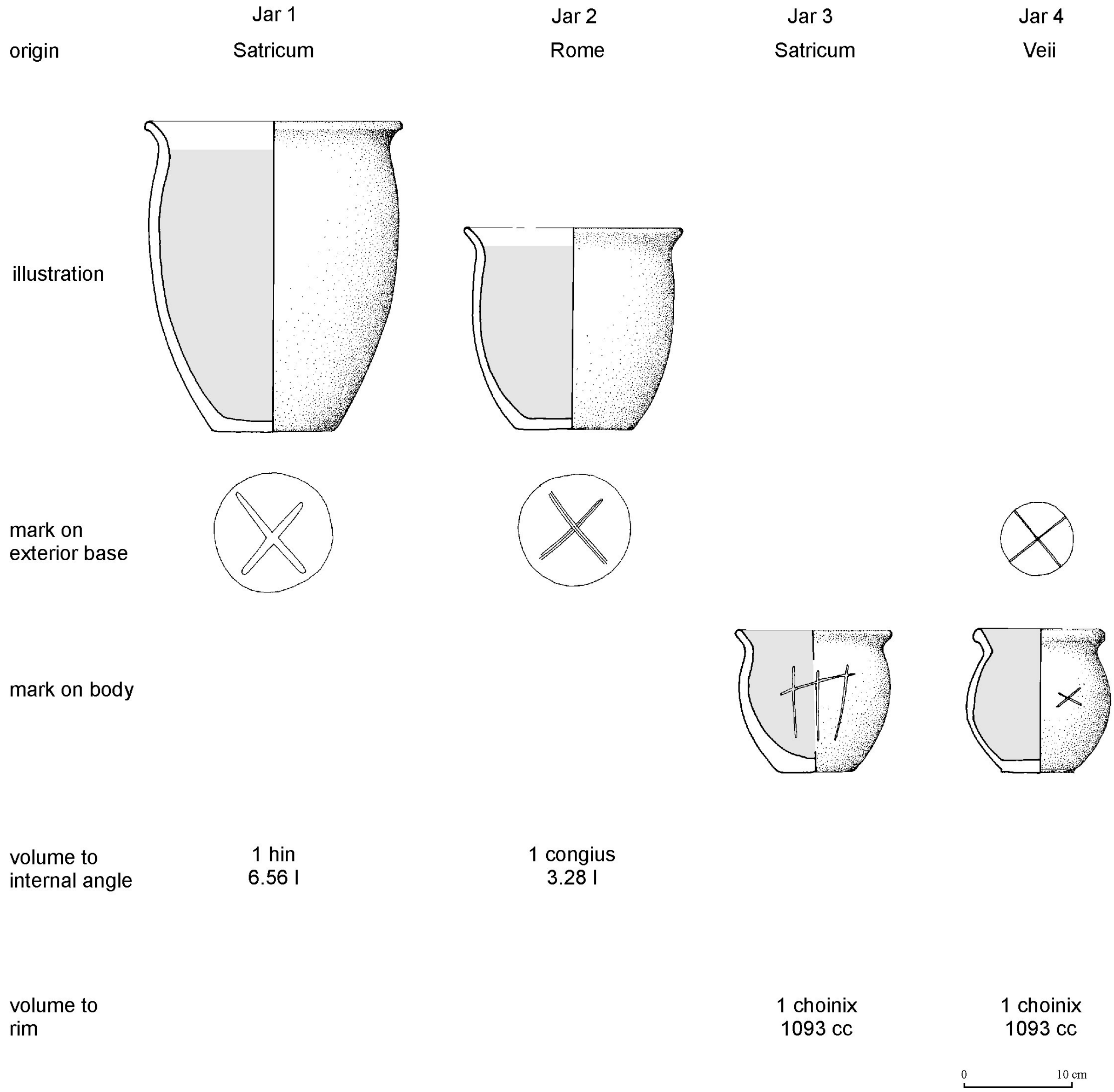

Fig. 73. Early measures of capacity from central Italy.

Jar no.1 (Fig. 73) was excavated at *Satricum* from the same context as the *Roman-Oscan* pound.[86] The archaeological context of this jar is represented in Figure 67. Jar no.1 is immediately to the left of the square socketted iron axe and is represented as the jar with complete profile. Next to jar no.1 was another olla, which was also marked before firing with a token that is similar to the mark on jar no.1 (Fig. 70). Unfortunately a complete profile of this *olla* was not preserved. The dimensions of this jar as well as the mark suggest that the volume it could originally contain might be half the volume of jar no.1.

Jar no.2 (Fig. 73) was excavated on the *Forum Romanum* in the *pozzo arcaico dell'area sacra di Vesta.*[87] From this *pozzo* several jars with complete profile were found which are at present on display in the *Antiquario Forense*

[86] See section 4.2.

[87] Bartoli 1961.

on the *Forum*. These *olle* are dated to the 7th and early 6th centuries BC.[88] Jar no.2 is the only vessel in this collection that is marked. Its volume up to the internal angle is 3.28 l which equals the volume of the standard *Congius/Chous* and is half the volume of Jar no.1.

Jar no.3 (Fig. 73) was excavated in the last century at *Satricum* in votive deposit I. It derives from the same archaeological context as the balance and weight no.2 (Figs. 65 b and 66).[89] The body of this jar was marked before firing with three vertical lines and one horizontal crossing stroke. The jar is dated typologically to the 6th century BC.[90] A classical standard of volume for dry matter, the *Choinix*, contains 1090 cc, which equals the volume of four standard *Kotylai*. The four lines on this vessel may represent four *Kotylai* since its volume equals the volume of four *Kotylai*.

The *Choinix* is also the capacity of jar no.4 from Veii (Fig. 73). This jar is an isolated find but typologically it is dated to the second half of the 6th, early 5th centuries BC.[91] It was marked before firing with an X, once on the exterior base and twice on the body.[92]

Jars 3 and 4 from *Satricum* and *Veii* are equal in volume to the *Choinix* which corresponds to the content of 4 *Kotylai* employed for measuring dry goods such as grain.

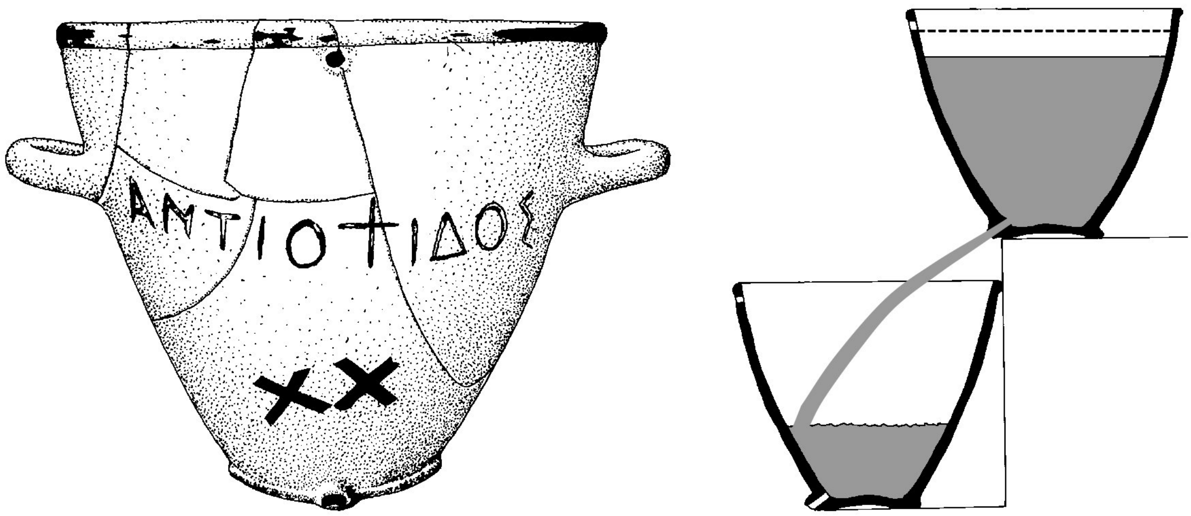

Fig. 74. Athens, Agora, exterior of 5th century BC Klepsydra with inscription and marks combined with an illustration of its function.

The above mentioned containers suggest a pattern of metrological evidence though the evidence is still limited. The jars presented were found in Rome, *Satricum* and Veii and the evidence points to a metrological system from the late 7th century BC.

The vessels presented are marked with simple signs and it is necessary to recollect that the majority of ancient

88 Colonna 1963-1964, 19.

89 See section 4.2.

90 Bouma 1996, 305-419.

91 *Grande Roma* 1990, 104.

92 Cavallotti Batchvarova 1965, 186.

vessels with signs cannot be deciphered as measures. Thousands of ancient containers were marked before or after firing with a simple sign such as a cross. Generally these signs are not interpreted explicitly. The marking of household vessels before firing was carried out in pottery workshops and most likely conveys a practical function. Simple signs on these vessels can be read as:

a. a numeral,

b. a method to separate a batch vessels in a pottery workshop,

c. a serial character,

d. an indication for dimensions or volume.[93]

Leaving aside the options a. to c., simple signs can specify plain vessels as measures of capacity. One of the best illustrations of this principle is a *klepsydra* from the Athenian *agora* marked with XX (Fig. 74). The vessel is dated to the 5th century BC and is a kind of water-clock filled with 2 *Chous* water which could drain from the vessel via a spout close to the base. A *klepsydra* was commonly used in the Athenian law courts from the end of the 5th century BC for restricting speaking time. One could speak in front of the court as long as the spout was draining water which is, starting with a *klepsydra* that contains two *Chous*, approximately 6 minutes.[94]

In my opinion, the vessels illustrated in Figure 73 represent specific quantities for various reasons. First of all, their content is equal to archetypal liquid and dry capacity standards. Besides, jar no.1 (Fig. 73) was found in the same archaeological context as the *Roman-Oscan* pound which is illustrated in Figure 65. Therefore this context contained originally at least two different early metrological standards. Moreover, it can be associated with the exchange of metal artefacts and organic or liquid matter. The exchange of these materials was quantified by concepts of equivalence as the weight and the measure of capacity. A third argument is provided by jar no.3 (Fig. 73). It was found at the turn of the century in votive deposit I at *Satricum* in the same complex as weight B and the jewellers balance (Figs. 65 b and 66). The weight, the pair of scales and the measure of capacity support the view that the religious authorities vouched for the value of metrological units. Furthermore jar no.3 was graded with four lines and its capacity corresponds with four *Kotylai*. The jars from Rome and Veii provide two parallels for the situation encountered at *Satricum*. The idea put forward of an early implementation of the historical metrological system for capacities in central Italy is, therefore, recorded at sites other than *Satricum*. It is suggested that the existence of units of capacity at other sites in central Italy besides *Satricum* points to a factual metrological system. This is supported by the evidence from *amphorae* trade. The indigenous population of central Italy was aware of standardisation from an early period since they were familiar with Phoenician *amphorae*. Several of these *amphorae* were found in *Latium Vetus* since 1970 AD. These *amphorae* signify Levantine trade with central Italy and were excavated in native contexts that are dated to the late 8th and 7th centuries BC. Several of these *amphorae* have been found in well furnished tombs at Laurentina, Ficana and Castel di Decima. A relatively high number of similar Phoenician *amphorae* were found at Sardinia and the *comptoir* of *Pithekoussai* while others were discovered at Mozia, Carthage and Toscanos.[95] Botto considers that commerce with central Italy by foreign traders was directed from *Pithekoussai* as well as from the Phoenician colonies in south-west Sardinia. Whatever the origin of the various commodities, the increase in commerce with central Italy would have facilitated the implementation of the archetypal liquid and dry capacity standards.

[93] Sassatelli 1994, 214.

[94] Young 1939, 275.

[95] Botto 1990, 208-9.

4.4 *Length*

Units of length are the last quantity to be discussed in this chapter. A review of the evidence for the implementation of linear measurements from an early period is more complicated than the previous discussion of units of weight and capacity. This is a result of the absence of rulers and a mass of seemingly unrelated information.[96] The evidence derives from buildings and terracotta roof systems which foster standardisation since they are assembled from many prefabricated parts. The roofs are constructed from various components whose dimensions are usually directly related to each other. However the corpus of measurements of terracotta elements from various Archaic buildings in central Italy, are difficult to relate to particular units of length such as Roman, Oscan or other feet. Recently Wikander subjected the roof systems of central Italy to a study of terracotta modules.[97] He indicates that there are no tile units even though some clusters of linear measurements could be recorded. Furthermore, Wikander mentions that '*there may be a certain tendency in Late Archaic times towards the production of pan-tiles with dimensions close to 63 x 47 cm., but the extent of this development was limited and remained so*'.[98] The measurements of tiles are of little consequence for the examination of early linear measurements since it is assumed that the wooden frame of the houses was adjusted to the proportions of the terracotta components available. Wikanders' research confirms that the mass of linear measurements from Archaic terracotta components is not yet suitable for reconstructing a coherent system for units of length. Nevertheless, Wikander does not reject the idea that the Italic or Oscan foot of 27 cm was employed while constructing the Archaic building at Poggio Civitate (Fig. 36). He is sceptical of the early use of terracotta modules and considers the evidence from Poggio Civitate as an isolated example. The application of the Italic or Oscan foot of 27 cm at this site is most explicit in the dimensions of the interior walls of the complex. These are given in Italic/Oscan feet as 160 by 150 and 149,5. The last figure is considered as an acceptable inaccuracy. Most of the architectural terracottas of the building correspond to the courtyard plan since the ceramic frieze plaques are all 54 cm and thus two Italic/Oscan feet in length. The width of the majority of the pan-tiles and lateral simas is also about 54 cm.[99] Furthermore, the Italic/Oscan foot was employed while constructing the stoa workshop at Poggio Civitate which dates to the the third quarter of the 7th century BC.[100] The pattern established indicates that a common standard of 27 cm was employed at Poggio Civitate from about 650 BC. This is supported by the other metrological evidence presented in section 4.2 and 4.3.

Other indications for the application of module systems during planning and constructing houses in central Italy, have been presented by Maaskant-Kleibrink.[101] She made some schematic reconstructions of the layout of buildings excavated at *Satricum*. These reconstructions were compared with buildings from Acquarossa and Veii and Maaskant-Kleibrink submitted the view that a regular building system existed from the early Archaic period. Her proposed system has a basic unit of 4.80 m, which is 16 Roman feet.[102]

The only documentary evidence for linear measures is from a much later date but confirms the use of both the

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[96] Rottländer mentions a figurative image of the *Pes Romanus* from the 5th century BC, that is kept at Oxford and which is published by Wesenberg. The measurement given for this depiction of the *Pes Romanus* is 296 mm: Rottländer 1993, 125, table 2. I was unable to find additional references nor other details on this comment.

[97] Wikander 1993 b.

[98] Wikander 1993 b, 68.

[99] Phillips 1993, 9, 19.

[100] Nielsen 1987, 91.

[101] Maaskant-Kleibrink 1991.

[102] Maaskant-Kleibrink 1991, 99.

Oscan and Roman foot by the end of the Republic. Varro and Frontinus record that the Roman unit for land measurement was one of 120 by 120 feet. In Umbria, in Oscan territory and in Campania with its Oscan population, the *vorsus* was a unit of 100 by 100 Oscan feet.[103]

The evidence on units of length suggests that from the 7th century BC standards were known but reluctantly applied. They may originally have been employed for limited purposes. On the other hand, the mould-made terracotta roof systems demonstrate an increase in linear standardisation based on their mode of production. Thus linear standardisation increased from the 7th century BC but is difficult to relate to specific units apart from the evidence discovered at Poggio Civitate.[104]

4.5 *Marzabotto*

So far I have presented evidence for the early use of metrological systems that were based on units which were either archetypal or whose existence was confirmed in a later period by literary sources. The reconstruction of a local system of measures is only possible when sufficient evidence is available. The sole Etruscan town which revealed an adequate corpus of measures, is Marzabotto.[105] A reconstruction of the means of exchange at this site is essential since it has abundant workshops. The mere existence of various of these workshops in the urban centre demonstrates that commodities were exchanged. Its early market mechanism by quantification has not been discussed before in detail except in the case of one of the metalworkshops which seems to have been actively involved in the manufacture of currency bars.[106]

The weights known from Marzabotto, indicate a local system based on various stones and pebbles which are incised with numerals and marks (Fig. 75). The stones were collected at random in the last century and cannot be dated more precisely than to the second half of the 6th and 5th centuries BC. The lowest standard appears to be around 120 g while the two largest stones weigh about 38 kg, one of which is inscribed with the Etruscan family name *Lautunia*.[107] The 24 published stone weights from Marzabotto seem to be a random collection of unrelated weights. However if one accepts an inaccuracy of about 5% then there is some regularity in their distribution (Fig. 76).[108] For example, there are six stones which vary from 3.5 to 3.8 kg. which is equal to the smallest unit, 120 g, ± 5% multiplied by thirty. The stone weights reflect a metrological system by approximation which could be accounted for if one considers these weights not as consecrated, official units but as market weights. A market system of measures by approximation is also recorded for the *Agora* at Athens where a variation of 5 to 10% is given.[109]

A determination of the local measures of capacity also requires a suitable collection of marked items, in this case containers with complete profile. The marked and inscribed vessels from Marzabotto were recently published

[103] Crawford 1985, 14. Crawford gives details on the passages in the ancient texts.

[104] The section on length is confined because it is not directly related to pre-monetary exchange.

[105] The data in this section derive from: Brizio 1889 and Sassatelli 1994.

[106] See section 3.6.9.

[107] Brizio 1889, 320, 343-4.

[108] Eleven of the twenty-four weights that were reported by Brizio, are incorporated in the diagram of Figure 76. Most of the remaining thirteen marked stones can be interpreted with a unit of 120 g when an inaccuracy of ± 5% is accepted but their presentation is not convincing because they have not been preserved in pairs. The unit of 120 g is the greatest common divisor that I can discern. Some of the stones can not be interpreted.

[109] Lang and Crosby 1964, 18, 47-8.

in detail by Sassatelli.[110] It is characteristic that most of the marked ceramic vessels derive from workshop contexts. If these vessels convey measures of capacity, they may illustrate the exchange mechanism between workshop and customer in an Etruscan city. From the catalogue of marked ceramic vessels compiled by Sassatelli, I was able to abstract six bowls, three of which contain approximately two units of 120 ml. while the other three bowls hold around three units of 120 ml (Fig. 77).[111] This corresponds to the marks on some of the bowls. One bowl is inscribed with two lines and two other bowls with three lines. Figure 76 combines the evidence from Marzabotto in a diagram. On one side are the measures of capacity and on the other side the weights. From the diagram it is deduced that the inaccuracy of the units of volume is more than ± 5%. Actually, this imprecision corresponds with marked vessels from the *Agora* at Athens where only some of the containers officially assessed can be considered reliable.[112]

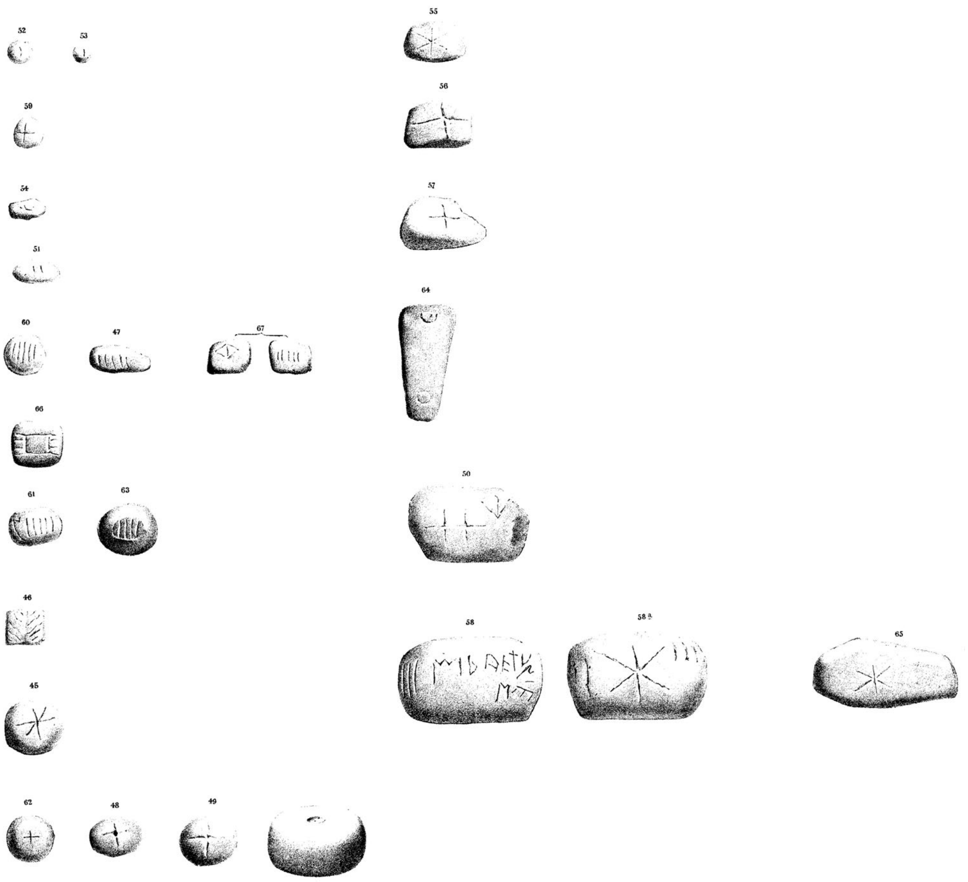

Fig. 75. Marzabotto, incised and marked stones and pebbles that are interpreted as weights.

[110] Sassatelli 1994.

[111] I refer to section 4.3 for the mathematical method that was employed for the calculation of the capacity of the bowls.

[112] Lang and Crosby 1964, 39-61. The inaccuracy is that large that one might wonder whether these marked vessels can be considered measures of volume. I decided to incorporate the bowls from Marzabotto in this section because:

- the conformity of weights and capacity by a unit of 120 g or ml, similar to the conformity between *Kotyle* and *Roman-Oscan* pound by a unit of 273 g or ml,
- the marks, some of which correspond with the quantity of units, two or three times the unit 120 ml.

Moreover, Lang and Crosby report related problems with the marked vessels from the *Agora* at Ahens.

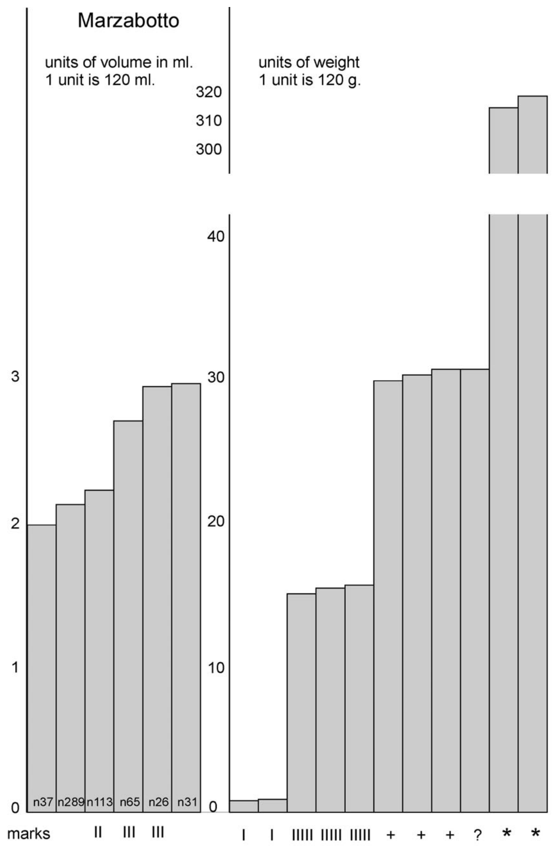

Fig. 76. Marzabotto, diagram of measures of volume and weight.

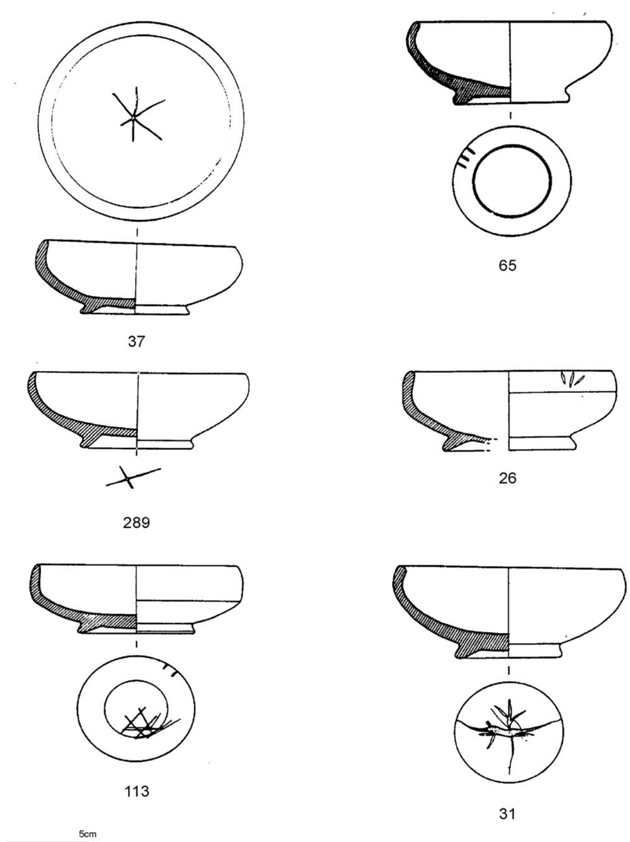

Fig. 77. Marzabotto, marked bowls that could represent measures of capacity.

The examination of the marked objects from Marzabotto show that one of the mechanisms for local exchange was determined by quantification, probably at or near the workshops. Other mechanisms such as barter may have occurred as well. So far, the units that were calculated for this site are not known at other centres. Therefore they remain an isolated metrological system. It could be a local system because during the 5th century BC, most of the Etruscan early states became in economic terms increasingly independent. This corresponds with the considerable diversity of measures in central Italy once they developed from the international standards that I recorded for the Orientalising Period.[113]

4.6 *Conclusion*

The concepts of standardisation and metrology appeal to our notions of value, equivalence, measures, regulation, authority and ever expanding markets. However in many pre-capitalist societies, the '*political elite tends to be the custodian of restricted exchange*'.[114] By 600 BC it appears that the religious authorities vouched for the value and content of fixed measures in central Italy. This elite controlled the metrological systems and simultaneously may have regulated the foreign access to the markets of central Italy.[115]

As such, metrological systems belong to the technical infrastructure of exchange and their development is usually associated with a marked expansion in the scale of consumption. Economic development such as described for the period 800 to 400 BC, is generally correlated with an increase in standardisation. Thus, the introduction of metrological systems during the 7th century BC is in accordance with the conspicuous consumption of the establishment in central Italy. During the Orientalising Period, the prominent members of society made by taste, a selection from imported goods and ideas while providing models and control for social discrimination and local production. Due to the increase in local demand, craft specialisation occured which by itself necessitated exchange and the formulation of concepts of equivalence, weights and measures.[116]

Several metrological systems were recorded for central Italy in this chapter. However the evidence is scarce while the monetary system for market purposes developed at a later date. It seems that commodities were still transferred in their social context within a limited market structure. The measures which I was able to isolate, were essential for exchange by quantification. Hart describes the determination of value by quantification as exchange through the market system. It is a significant step in the abstraction of social labour and occurs often in a customary setting.[117] The evidence so far collected suggests the early use of standards for exchange with outside traders and transactions of metal goods. As such, these standards functioned as a pre-monetary system since they grade metals by weight. Furthermore, the early use of measures of capacity imply organic commodities. From the evidence presented, I deduce that concepts of a commercial exchange mechanism for certain products existed in central Italy, though it remains open to debate how and to what extent these ideas were applied. It could be that they were originally intended for transactions with foreign trading communities such as the Levantines and Greeks. This suggestion is supported by the lack of evidence from the main Etruscan centres and the marked development of entrepôts such as Gravisca, *Pyrgi* and others. For example, Arafat and Morgan suggested that these highly ritualised entrepôts controled foreign access to the markets of central Italy.[118] These ports-of-trade functioned as an

[113] Crawford 1985, 14. See sections 4.2 and 4.3.

[114] Appadurai 1986, 33.

[115] See section 1.7.

[116] Renfrew 1972, 493.

[117] Hart 1982, 40-1. See also section 1.7.

[118] Arafat and Morgan 1994, 113.

institutional means of restricting the zone of commodity exchange. Internal distribution of commodities could have been structured along other lines. The spheres of exchange of prestige and subsistence items are likely to have been independent of each other. This separation can, however, never have been absolute. Appadurai states that '*many societies create specialised arenas for tournaments of value in which specialised commodity tokens are traded, and such trade, through the economies of status, power, or wealth, affects more mundane commodity flows*'.[119] The evidence from 5th century BC Marzabotto suggests that the various workshops were directly involved in the exchange of their commodities and that quantified measures were involved.

An enigma remains the customary setting in which market transactions proceeded in central Italy during this period. The *emporia* along the coast of Etruria functioned as markets for external trade while early markets for internal exchange in the primary centres are yet to be defined. It seems that these markets may have developed around some of the sanctuaries. At *Latium Vetus* these have been termed '*emporic* sanctuaries' and this corresponds with the highly ritualised setting of the factual *emporia* along the coast.[120] Clear examples of such sanctuaries are those at St. Omobono in Rome, St. Cecilia in Anagni and the sanctuary on the acropolis at *Satricum*. The term '*emporic* sanctuary' is misleading for this study because it does not correspond with the description of *emporia* presented in section 1.7 because the presence of foreign trading communities near these sanctuaries though implied, is not recorded.[121] Moreover, these sanctuaries clearly functioned within a local framework.[122] Therefore I will not employ the phrase '*emporic* sanctuaries' but rather early or incipient *fora* because these locations combine religious, public and market functions like the *fora* of later periods. The difference between the incipient and later *fora* is their grandeur. The early *fora* are marked by monumental sanctuaries which received imports from various regions. However the structures associated with market functions are not clear whereas the later *fora* are characterised by temples, shops and porticoed squares.[123] These features are less evident at the incipient *fora* though the last major reconstruction of the layout of the acropolis at *Satricum* around 500 BC might present an illustration of the stages involved.[124]

The implementation of measures is related to a pre-monetary exchange mechanism based on metallic weight standards and measures of capacity. Several of these metrological units were found at the Latin site of *Satricum*. The *Roman-Oscan* pound was found together with a jar with a capacity of one *Hin*, in a settlement context dated to the second half of the 7th century BC. The *Campanian* pound was found in votive deposit I which is dated from the 8th to 6th centuries BC. Moreover, a pair of precision scales and a jar with a capacity of one *Choinix*, were discovered in the same deposit. These implements were discussed in detail relating them to their archaeological context and the economy of the site. In connection with the measures from *Satricum*, two aspects of the economy, local production and trade, are essential. Both aspects are examined for the site and revealed a close parallel with circumstances at *Pithekoussai* where an Euboean weight standard was excavated in the metal-working quarter dated to the early 7th century BC. Systems of weights are initially tools of industry and ultimately trade.[125] The association of early

[119] Appadurai 1986, 50.

[120] I refer to Bartoloni, Coarelli and Gatti for the notion of *emporic* sanctuaries: Bartoloni *et alii* 1989-1990; Coarelli 1988 a; Gatti 1994-1995.

[121] *cf*. Coarelli 1988 a.

[122] *cf*. Bartoloni 1989-1990.

[123] *cf*. Boëthius 1978, 145-9.

[124] During this last reconstruction the temple area was elaborated with *stoai* which replaced the courtyard houses: Maaskant-Kleibrink 1992, 139-44. See on early markets also the *Epilogue*, Chapter V.

[125] Petruso 1978, 163. Illustations of the close relation between workshops with weights and balances are from all periods. They are known from workshop contexts in Mesopotamia that are dated to about 2000 BC, on Crete where a tomb of late Minoan date contained besides other

weights and measures with the workshops at *Pithekoussai*, *Satricum* and Poggio Civitate shows that craftsmen were directly involved in the transmission of these units of equivalence. They were instrumental for the dispersion of the concept of quantitative exchange as they were for the transmission of writing.[126] Their role in cognitive information indicates that craftsmen were not of subordinate status during this period. It indicates that they were independent and played an active role in the spread of concepts and general knowledge. Furthermore, the metrological evidence from *Pithekoussai* and the shipwreck at *Isola del Giglio* were presented in order to substantiate the concept of exchange by quantification in Italy itself. Thus, the evidence for measures from *Satricum* could be related to the Mediterranean exchange mechanism during the Orientalising Period.

Wikander and Durando labelled some of the units of capacity and length, one-off isolated examples.[127] In my opinion the evidence presented constitutes too many isolated examples to be dismissed as accidental. The corresponding units at *Pithekoussai*, *Satricum*, the pre-classical wreck at Campese Bay, Rome and Veii add up to the hypothesis that measures were known and implemented in central Italy during the Orientalising and Archaic periods. As previously mentioned, it remains open to debate how and to what extent these measures were employed.

The metrological systems which have been described, indicate an integrated character. The system for capacities is based on the volume of the *Kotyle*, about 273 cc, while the *Roman-Oscan* pound has the weight of a *Kotyle* filled with water, that is 273 g. According to Haeberlin, the Oscan pound derived from Babylonian and later Phoenician weight-systems. The Oscan pound of 273 g descended from the original subdivision of the *Talent* of 32745 g in sixty *Mina* which equals 120 Oscan pounds.[128] I am unable to disentangle the several inextricably linked Babylonian and Levantine weight standards and other metrological systems, to which all Mediterranean and even some modern measures seem to be related.[129] To present an example of the complexities involved I elaborate on the integrated nature of *Kotyle* and *Roman-Oscan* pound. Büsing mentions that, in antiquity, one *Kotyle* water would have had a weight of 60 *drachm* which means that a *Drachma* weighs 4,55 g.[130] The Attic measure of weight of 4.55 g. was the unit of numerous market weights discovered on the Athenian *Agora*. Moreover, the *Drachma* unit of 4.55 g. was employed for the gold staters of Pantikapaion which are dated to the second half of the 4th century BC. This weight-unit can also be related to Roman coins from the late 3rd century BC. The *Roman-Oscan* pound of 273 g is subdivided as one pound of silver into 60 *denarii* of 4,55 g.[131] The early Roman silver *denarii* did indeed weigh 4,55 g. This basic conformity and the early use of the *Roman-Oscan* pound in central Italy suggests the existence of an integral, archetypal metrological system for the Mediterranean during the Orientalising Period. This system is most likely to be related to the Levantine trading diaspora which explicitly regulated exchange with indigenous

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tools for working precious metals, crystal lenses with a magnification of 10X, a bronze scale and 3 weights while scales and weights might also be depicted in workshop contexts on for example, Egyptian or Roman reliefs: Moorey 1994, 84; Renfrew 1972, 340-5; Neuburger 1926, 33-68.

[126] *cf.* Cristofani 1993, 505.

[127] *cf.* Wikander, Ö., 1993 b, 70; Durando 1989, 82.

[128] Haeberlin 1909, 1, 31-2.

[129] *cf.* McDonald 1992. For example, I traced two similar weights from Mesopotamia which might in theory be related to the *Roman-Oscan* pound. These weights were recovered at Susa and were listed by: Karwiese 1990. Karwiese presented one third of a total of 560 weights which were found at this site. Among these weights there are two of about 270 g. One was made of chalkstone in the shape of corn, 271 g, while the other is made from sandstone in the shape of a duck, 272 g. However, these weights are dated to the third and second millenium BC and cannot be transferred without intermediate stages, to central Italy during the Orientalising Period. Moreover, the standard of Susa is calculated to be aroud 504 and 510 g and this standard can not be directly correlated to the early weights from central Italy. See: Karwiese 1990, 68-71, 108.

[130] This *Drachma* corresponds with an Attic measure of weight and should not be understood as the weight of the Attic *drachma* coin of 4.36 g.

[131] Büsing 1982, 29-39.

groups.[132] Asylum was granted at sanctuaries which during this period, functioned partly as meeting points between the different economic zones.[133] With the advance of regional trade and urban development this system might have been broken up into several, local varieties. This projected development would correspond with one of the characteristics of standardisation since standards require revision depending on particular circumstances.[134]

I have mainly concentrated on an economical interpretation of the origins of coinage as fixed metallic monetary units. As an illustration of this principle, one can quote Aristotle, who wrote a passage on trade and currencies in the *Politeia*. Aristotle mentions that: '*The supply of men's needs came to depend on more foreign sources as men began to import for themselves what they lacked and to export what they had in superabundance; and in this way the use of a money currency was inevitably instituted. The reason for this institution of a currency was that all the naturally necessary commodities were not easily portable and men therefore agreed, for the purpose of their exchanges, to give and receive some commodity which itself belonged to the category of useful things and possessed the advantage of being easily handled for the purpose of getting the necessities of life. Such commodities were iron, silver and other similar metals. At first their value was simply determined by their size and weight; but finally a stamp was imposed on the metal which, serving as a definite indication of the quantity, would save men the trouble of determining the value on each occasion*'.[135] Aristotle described a sequence of mechanisms for exchange. Originally men reciprocated '*naturally necessary commodities*'. After this stage goods were exchanged for metals by size and weight. This phase corresponds with stage 5 in the sequence of commoditisation described in section 1.7. In antiquity, iron spits or *obeloi* are recorded as a proto-monetary system of value at sanctuaries such as the Argive Heraion and the Apollo sanstuary at Delphi. Nevertheless, most of these spits in sanctuaries and tombs are related to the roasting of meat during banquets. Strøm argues on the basis of archaeological and epigraphical evidence, that the transition to the proto-monetary system of *drachmai* consisting of six *obeloi*, is closely related to exchange activities with the Near East as well as with the assimilation of the Near Eastern banquet at Greek sanctuaries around 700 BC.[136] Standardised units of six *obeloi* were eventually replaced by the institution of coinage. Strøms' reconstruction reflects conditions in central Italy because both the banquet and pre-monetrary exchange mechanisms were introduced during the same period. Moreover, it supports the hypothesis that sanctuaries were essential as locations for the transmission of goods and ideas. However the communities in central Italy adopted coinage slowly. They maintained the system in which some commodities were exchanged for metals by weight. The preservation of this mode of exchange during the 5th and 4th centuries BC is one of the archaic features of the economy of central Italy. The Etruscan communities accepted occasionally coinage and even struck some issues during the 5th and 4th centuries BC[137] but these early coins did not include smaller denominations and, therefore, were hardly suitable for routine market purposes. Some of the archaic characteristics of the economy can be associated with the decrease in 'international' trade with central Italy. Measured by the imported pottery, this trade was restricted in *Latium Vetus* from 600 BC while it ceased in Etruria during the 5th century BC.[138] The economy of the early states in central Italy became essentially independent. During the 5th century BC, the towns became primarily economic and political centres for their territories while imported goods were relatively scarce. The economy, including the workshops,

[132] See section 1.7.

[133] *cf.* Sherratt and Sherratt 1993.

[134] Sanders 1972, 12-3.

[135] Aristotle, Politics I, 1257 a, 31-41; translation: E. Barker, 1946, 24.

[136] Strøm 1992, 51.

[137] Catalli 1990; Crawford 1985, 2-3.

[138] *cf. Rasenna* 1986, 124-39, 145-54. It can be noticed that in terms of market economy, northern Etruria is advanced during the 5th century BC when compared with other regions in central Italy.

became structured along with the urban and regional polities and thus reduced the need, for the institution of coinage. The self-sufficient economy of these polities accounts for the development of local metrological systems such as found in Marzabotto.

In general terms, the 6th century BC was a period of transition between on one hand the long-distance and inter-regional trade of the 7th century BC with their archetypal metrological systems, and on the other hand, the scattered systems of the 5th century BC that are probably related to the early states of central Italy. This conforms with the change in production and markets. During the 6th century BC, the advance of the workshop mode of production is recorded simultaneously with a shift in the nature of goods. The workshops were no longer involved in the production of luxury goods. Instead they produced primarily common household commodities. I mentioned above that the polities in central Italy of the 5th century BC did not develop a monetary system except for a few specific coins. Neither did they become fully literary as Classical Athens, the capital of the Ancient World. In central Italy markets seem, therefore, rudimentary and I have described some of them as incipient *fora*. The evidence from Marzabotto indicates another option since exchange at this site was probably still closely associated with individual workshops along some of the towns' major roads.

I presented an economic interpretation of measures but this view can be augmented with an ethical meaning. The development of these measures belongs in the '*framework of the development of social relations and the definition of values*'.[139] The evolution of an urban community cannot occur without the existence and implementation of norms known to all inhabitants. The employment of units as argued here, corresponds with the context of urbanisation in central Italy during the period 800 to 400 BC.

[139] Austin and Vidal-Naquet 1977, 56.

Chapter V *EPILOGUE*

'*Dieselbe Wichtigkeit, die der Bau von Knochenreliquien für die Erkenntnis der Organisation untergegangner Thiergeslechter, haben Reliquien von Arbeitsmitteln für die Beurtheilung untergegangner ökonomische Gesellschaftsformationen. Nicht was gemacht wird, sondern wie, mit welche Arbeitsmitteln gemacht wird, unterscheidet die ökonomischen Epochen. Die Arbeitsmitteln sind nicht nur der Gradmesser der Entwicklung der menschlichen Arbeitskraft, sondern auch der Index der gesellschaftlichen Verhältnisse, unter denen gearbeitet wird*'.

Marx 1867, 144.

The transitions in central Italy during the period 800 to 400 BC were momentous and involved all aspects of society. I have presented some of these aspects as models and processes in chapter I. The main characteristics are the advance of social stratification, the urbanisation process, the early state formation and eventually the legal definition of private family property of resources. These transformations were sustained by a growing population.[1] The archaeological evidence presented in this study, demonstrates that the organisation of production is an intrinsic feature of these changes.[2] The described intensification of industrial activities and the transition from household production to workshops, would not have been feasible without the associated social-economic changes such as the the stratification process and the introduction of the market mechanism. In a society undergoing significant progression in a relatively short period that basically occurred during the 8th to 6th centuries BC, one can expect to encounter various forms of increasing specialisation.[3] I have, therefore, mentioned that economic centralisation initially occurs around:

- resources,
- natural harbours, *emporia*,
- sanctuaries or
- homesteads of the elite.

In my opinion these four options are represented in this study.

The settlements at Lago dell'Accesa and at Acquarossa flourished on account of their location near mineral deposits. The processing of ores and metals is shown at Lago dell'Accesa for the 6th century BC and for Acquarossa

[1] *cf.* Potter 1976; Enei 1993.

[2] By various scholars, much emphasis has been placed on transmission of technology by diffusion and the role of immigrant craftsmen in central Italy. This was not the point of departure for my study though I acknowledge that transmission of both goods and ideas assisted by freedom of trade, was essential for the development of the Etruscan and Latial culture during the early Orientalising Period. The methodology of my research, that is the analysis of primary industrial evidence, generates predominantly data on the local arrangements and less on the position of Levantines and Greeks in central Italy especially since their presence is hardly documented by inscriptions or by other data in the workshops recorded in this study. This coincides with the regulation by the indigenous communities of the internal social-economic conditions. This aspect is illustrated in this thesis because immigrant craftsmen and transmission of concepts by diffusion is not the main point but rather the internal social-economic arrangements to which immigrants and other intermediaries were submitted. Thus, I read the continuous imitation of imported pottery as a manifestation of the strength of the internal demand and market since it could accommodate the output of these workshops. Implicitly or explicitly, others prefer to record this imitation as a sign of superiority of the Greek culture. I refer to Hemelrijk for an explicit manifestation of this attitude: Hemelrijk 1984, 193. See for a reaction against such views: Morris 1994 a; Gill 1994; Arafat and Morgan 1994.

[3] As mentioned in the preface and in section 1.5, agriculture remained the sound base on which the intensification of industrial activities could proceed.

from the late 8th century BC. This substantiates the hypothesis that their economic progress partially depended on accessible mineral deposits. However their development became hampered by a gradual devaluation of iron especially and by deficient social-economic dynamics.

The settlement at *Pithekoussai* exemplifies an *emporion* at a natural harbour. At this port of trade various ethnic communities lived together during the 8th and early 7th centuries BC. The settlers manufactured goods for their own consumption as well as for the Italic population on the mainland. *Pithekoussai* is a type B *emporion* which are distinguished by import trade and workshops.[4] *Pyrgi*, Gravisca and Regisvilla are well defined Archaic *emporia* along the coast of central Italy but unfortunately workshops have not been reported from these sites.[5] It is, however, likely that workshops existed at these gateway communities.

Economic centralisation around a sanctuary is so far best illustrated by the development of the settlement at *Satricum*. Workshop activities are known from about 650 BC and originally concentrated in the area around the main temple on the acropolis. Moreover, early evidence for exchange by quantification is reported at and nearby the shrine. As such the area around the sanctuary combined the functions characteristic of the later Roman *fora*.[6] The contents of the votive deposits at sanctuaries such as St. Omobono at Rome and St. Cecilia at Anagni are related to votive deposit I at *Satricum* and thus they could represent similar conditions. Nevertheless, workshops have not been excavated around these sanctuaries at Rome and Anagni.

The last option, that is clustering of industrial activities around the homesteads of the elite, is probably exemplified by the structures at Poggio Civitate. Monumental workshop remains were excavated at this site. They record a combination of various crafts in a stoa-workshop during the second half of the 7th and early 6th centuries BC.

It is significant that none of the above mentioned sites flourished after the Archaic period. Most of them even vanished. This reflects the volatile nature of economic prosperity of centres which did not develop into urban communities and thus they illustrate a proto-urban stage with insufficient social and political centralisation. With the advance of state formation their fate became increasingly subject to the primary centres of central Italy. The development of the workshop mode of production at some of these towns such as Populonia and *Caere*, was examined in this study and indicates urban nucleation of local industries. These primary centres represented urban communities with a mixed, socially stratified population domineered by a political clique. The elite families at these centres became increasingly involved in internal affairs. During the Orientalising Period they had confirmed their position with prestige goods which were imported or made by the local incipient workshops. Their preoccupations became gradually redirected towards the organisation of internal conditions. The export of Etruscan commodities especially towards some regions in the western Mediterranean, is illustrated by the discovery of Etruscan transport *amphorae* and *bucchero* overseas from the 7th century BC. This reflects effective control over surplus production while the central Italian transport *amphorae* reveal some kind of administration.[7] This scenario makes it likely that the elite of central Italy registered and directed external trade and import by the *emporia* along the coast which developed from about 600 BC. During the 6th century BC, they improved their position by increasing appropriation

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[4] The characteristics of various types of *emporia* and their development are presented in section 1.7.

[5] At this stage I would like to recall the trade routes from central Italy towards the north which are also marked by some significant gateway communities. An early example is Frattesina in the Po plain. It is dated to the late Bronze - early Iron Age and is documented as a production centre where metals, antler, ivory, glass and probably amber was worked. It had strong Protovillanovan ties and was located along the trade route that led from Etruria to trans-Alpine and eastern Europe: Bietti Sestieri forthcoming. This route evidently revived during the second half of the 6th century BC when *emporia* such as Spina and Adria were established. Their rise is related to the increasing economic dynamics in northern Etruria: *cf*. Sassatelli 1990 a, 60-2; *Rasenna* 1986.

[6] The gradual development of a shrine into a monumental *forum* with a temple and porticoes with numerous *tabernae*, is illustrated by the Spanish excavations at the sanctuary of Juno at Gabii where also some weights are recorded: Almagro-Gorbea 1982.

[7] *cf*. Cristofani 1984.

of resources which lead to social tensions once economic progress could no longer be sustained in the 5th century BC.

The outline of the economic development of central Italy from about 800 to 400 BC seems mechanic but this impression fades when the general tendencies are applied to the sites examined. They all seem to represent a stage within the early state formation processes of Etruria and *Latium Vetus*. It appears that during the 7th century BC the economy came under the direction of central places of diverse character, some of which developed into towns during the following centuries.

The concept of towns is defined by many aspects but in the context of the workshop mode of production, towns are identified by the nucleation of workshops.[8] This nucleation is a significant stage in the process of craft specialisation since it indicates that artisans became increasingly occupied with one craft. A combination of crafts as was suggested for previous centuries, becomes unlikely once nucleation of workshops is attested. Moreover, urban nucleation of pottery workshops leads to a lengthening of the production season as far as possible while the industry tends to become a full-time profession. Nucleation furthermore, creates opportunities for additional services, such as fuel and material supply. The ancient literary tradition mentions particularly that craftsmen were organised in *collegia* during the Orientalising or Archaic period.[9] This suggests at least two principles which are not always acknowledged in the present archaeological literature:

1. the relatively independent character of workshops,
2. urban nucleation and collaboration between the various workshops.

I could record the simultaneous existence of several workshops in one urban centre in the previous chapters for sites such as Populonia, Laurentina-Acqua Acetosa, Marzabotto and probably *Caere*. Concerning nucleation, Peacock writes that: '*co-operation rather than competition seems to be the rule and mutual aid is commonplace*'.[10] This co-operatian may have lead during the 7th and 6th centuries BC, to a communal organisation of workshops at those centres where nucleation occurred. The association of groups of craftsmen could have been an prototype of what later became the *collegia opificia*. It is probable that nucleation and presumably collaboration existed between the various workshops in the major centres of central Italy from the 7th century BC. An illustration of this hypothesis is presented by the situation at *Caere*. At this primary Etruscan centre, several pottery workshops could be identified during in the 7th century BC such as workshops producing *bucchero*, Italo-Geometric ceramics and the *Bottega dell'Urna Calabresi* which produced large vessels like funerary urns and probably other related fabrics, for instance, painted architectural terracottas.[11]

Two examples of nucleation were presented but both exemplify different processes. At Laurentina-Acqua Acetosa the pottery workshops were located next to each other in an industrial quarter. This type of concentration

[8] Various characteristics of towns are described in section 1.6. The existence of industrial quarters around towns by the late 6th century BC does not merely establish that the urbanisation process had advanced significantly but also that the perceptible and intentional centralisation of industrial activities in these quarters, contributed to the early urbanisation process of central Italy.

[9] The ancient literary texts on *collegia* refer to conditions in Rome. This indicates that nucleated workshops existed in Rome by the 6th century BC as was recorded for other sites in central Italy. Thus Vulca from Veii and other itinerant master craftsmen were requested for specific assignments and entered a town with substantial local industries: see section 2.7. The activities of these master coroplasts in central Italy mirror the itinerant masters who made the monumental bronze statues in Classical Greece: *cf*. Zimmer 1990.

[10] Peacock 1982, 43.

[11] Buranelli 1985, 27. It remains at present hypothetical whether the Red Ware production at *Caere* included painted architectural terracottas as were recovered at Acquarossa. The resemblance of the painting tradition at Acquarossa and *Caere* makes it probable that building materials were decorated at *Caere* as well: Wikander, C., 1988, 131-2. Fabric descriptions of the coarse wares for large ceramic artefacts could demonstrate to what extend one workshop was involved in the production of *amphora*, *pithoi*, *pissides*, house urns, *sarcophagi* as well as architectural terracottas. The content of kiln II at *Satricum* indicates that during the late 6th century BC one workshop was involved in the production of both architectural terracottas and large vessels like storage jars and *teglie*.

probably also developed at Populonia where the metal workshops became located in an industrial quarter outside the original settlement. The evidence from Marzabotto presents another type of workshop concentration. Several metal and pottery workshops are recorded at this site but these are not nucleated in specific quarters of the town but dispersed over the whole urban area. This may be due to the existence of workshops prior to the orthogonal layout of the town. It was established that the location of various workshops survived the urban reorganisation of Marzabotto during the early 5th century BC. Thus the archaeological evidence presents two options:

1. a dispersed nature of workshops in urban centres because of previous territorial prerogatives as demonstrated by the evidence from Marzabotto and the continuity of workshop activities in the urban area of Lavinium and *Caere* and

2. a nucleation of workshops in specific urban quarters because of a functional reallocation of the urban functions. This is established by the developments at Laurentina-Acqua Acetosa and probably Populonia.

The urban nucleated workshops that could be examined, date to the late 6th and 5th centuries BC. It is, however, likely that in primary urban centres such as *Caere*, Vulci and Tarquinia, nucleation of some kind occurred prior to the late 6th century BC. Early workshops were attributed to these centres on the basis of distinctive artefacts which were mainly recovered from the necropoleis. The actual remains of the workshops are lost or still await excavation. Another gap in the archaeological record are early kilns and furnaces. For instance, the earliest examples of large rectangular kilns are dated to the 6th century BC while on account of the 7th century BC tiles from Poggio Civitate and Acquarossa, one can expect these kilns to have existed from the middle of the 7th century BC. Nevertheless, the positive archaeological evidence for urban nucleation of workshops from the late 6th century BC indicates a complex economy acquainted with market exchange. This complexity is confirmed by the early acceptance of measures.[12]

The archaeological evidence for workshops and pre-monetary exchange by quantification from the 7th century BC, is not in line with the still prevailing minimalist opinion of the economy in antiquity.[13] The main argument for playing down the progress in economic operations was the absence of evidence from the countryside. However surveys in central Italy during the past decades demonstrate again and again that the territory around urban centres became increasingly settled from the 7th century BC onwards. The development of settlement patterns in central Italy is characterised by nucleation of settlements during the 9th and 8th centuries BC, followed by a substantial increase in population and their subsequent dispersal over the countryside.[14] With advancing exploitation of the hinterland, the urban centres must have functioned as regional markets. This encouraged the development of craft specialisation. In this context it is noteworthy that the workshop remains of this period are excavated in central places and early towns. So far, neither workshop nor the nucleation of workshops is found in the countryside.[15] Concentration of industrial facilities in the hinterland is probably of later date and emerges from the reallocation of workshops outside urban centres which is recorded from the 6th century BC.

[12] See chapter IV.

[13] *cf.* Finley 1981. Morris writes in a review article on the Athenian economy twenty years after Finleys trend-setting *Ancient Economy*, that '*recent agricultural history perhaps points toward a level of market activity far beyond what Finley imagined*': Morris 1994 b, 366.

[14] The initial phases of settlement nucleation emerged in Etruria during the early Iron Age. Within each territorial unit sites were abandonned and the larger plateaux were settled by several communities. These nucleated settlements matured into the primary centres of the early Etruscan polities. Bietti Sestieri accurately pointed out that this change in settlement organisation is intentional and documents the emergence of state formation from the early Iron Age onwards. She also records that in Etruria the socio-political structure was far more complex than in other regions in Italy such as *Latium Vetus* and Campania: Bietti Sestieri forthcoming. The subsequent arrival of overseas merchants and craftsmen must be read within this context.

[15] The settlement at Lago dell'Accesa cannot be classified as a rural concentration of workshops since the households were involved in various activities among which mining and processing of metal ores.

During the Archaic period, state formation evolved and the primary centres absorbed the smaller units in their territory. Several of these minor centres lost their significance or even disappeared altogether during the 6th and 5th centuries BC. These smaller units are represented in this study by the settlements at Poggio Civitate, Acquarossa, *Satricum* and Lago dell'Accesa. A reconstruction of the process of craft specialisation at these secondary sites is complicated since the number of variables increase. Several possibilities, such as part-time engagement, itinerant craftsmen or a combination of industrial activities by the same artisan, become feasible. Except possibly at Acquarossa, nucleation of workshop did not develop at these sites. For the settlement at Lago dell'Accesa, it is feasible to reconstruct a stage in the complex process of industrial intensification. At this site, mining and processing of ores were combined with subsistence activities. The limited specialisation at this settlement represents, however, another stage of specialisation in comparison with the high quality production at secondary centres such as Poggio Civitate and *Satricum*. These sites did not present any evidence for nucleation but are rather distinguished by the simultaneous existence of various crafts. The settlements at Poggio Civitate and *Satricum* present two examples where craft specialisation occured in pottery production, metalwork and carving of materials such as bone, amber or ivory. A combination of crafts or an alliance of crafts and services is possible at these sites. For example, the close relation between potters and other craftsmen during the Orientalising Period is recorded in the similarities between on the one hand metal and ivory artefacts and on the other hand *bucchero* vessels.

The information presented in the previous chapters indicates that the origins of the urban development and the market place in central Italy are closely related to centres of production that became established during the 7th century BC. In these centres various types of workshops emerged. One might differentiate between:
- family workshops with two to five workers. A stage that is probably represented by for example, pottery workshop C at *Satricum*;
- master workshops which employ five to ten people, mainly assistants and possibly slaves depending on the social-economic development. Such workshops will have existed at *Caere* and Marzabotto;
- nucleation of workshops could lead to a concentration of 30 to 40 people. These conditions are probably represented by the workshops at Populonia, Marzabotto and Laurentina-Acqua Acetosa during the late 6th and 5th centuries BC.[16]

It is not possible to make a rigid distinction between these options. For example, the late Archaic pottery workshop at *Caere* is substantial. Its layout was not completely excavated but the kiln, tanks and waterworks cover an area of about 350 square metres and this could indicate a workshop which exceeds the size of a master workshop.[17] Nevertheless, large industrial complexes which may employ up to 100 workers are not recorded in central Italy during the period 800 to 400 BC. The industrial quarter at Populonia must have been extensive during the late 6th and 5th centuries BC but its features are incompletely documented (Fig. 60). Thus, the archaeological evidence indicates that the workshop mode of production developed ultimately into nucleation of workshops either as family or master-assistant units. At smaller sites, less matured arrangements emerged.

Finally, I would like to present a concluding account of the prevalent transitions in central Italy based on the available evidence. It incorporates other features than merely economic prospects and constitutes a reconstruction of events introduced as a hypothesis of long-term phenomena. It seems that each of the four centuries represents a different stage when the general disparity between Etruria and *Latium Vetus* is acknowledged.[18]

By 800 BC the indigenous population exploited the mineral resources for an advanced industry in copper, lead

[16] Scheibler 1984.

[17] It may have been a manufacture which employs more than 12 labourers: Peacock 1982.

[18] *cf*. Bietti Sestieri 1992 b; forthcoming. See also sections 1.6 to 1.8. Some of the general economic tendencies that are presented in the epilogue were previously documented: *cf*. Rasenna 1986, 79-156.

and tin working possibly enhanced by local iron production. In most villages metalwork was a part-time activity by a resident smith and was probably combined with agricultural labour. Specialisation of the pottery craft is not yet discernible. There was a regional and interregional exchange network which involved limited surplus production of the resources which were owned by the community and not by individual families. Settlements nucleated and the social structure evolved from a ranked into a primeval stratified society which is exemplified by the early warrior tombs.[19] The clustering of villages occasionally led to considerable concentrations of people. It is reported, for example, that the population at Veii had reached the treshold of 1,000 inhabitants by 800 BC.[20] According to Arnold a population of this size would lead to specialisation of the pottery craft.[21] Increasing, though small scale, specialisation occurred which was predominantly located within hut settlements during the 8th as well as the major part of the 7th centuries BC.[22] It appears that a number of industrial activities were combined on the same site. Some innovative pottery as well as metalwork technologies were introduced around 750 to 700 BC. The local application of these specialised crafts was assisted by population growth as well as by the socially generated demands of the elite who tried to assert their position by the destruction of goods in a conspicuous burial rite. Because of this competition and the size of the population it is not surprising that various of these new technologies were adopted locally since there was sufficient demand. This development was accommodated by the opening of the seaborne trade relations. Central Italy became incorporated in a network which encompassed nearly all coastal regions of the Mediterranean. The Levantine and Greek intermediaries provided new markets, favouring increased exploitation of the resources and stimulating the conditions for an Orientalising *koinè.* Especially the intensification in central Italy of metallurgical industries provided opportunities for economic growth and is illustrated in this study by the development of Acquarossa and Populonia.

The events dated to the 7th century BC were essential in many aspects because various concepts were introduced which matured during the following centuries. The developments show that the economic progress was immense and this would have eased the tensions between the various social strata that were emerging. The economic growth could meet the increasing though different material needs of a considerable group of people. This progress is exemplified by the expanding exploitation of the countryside (Fig. 2) as well as by the transformation that occurred at Acquarossa where huts were replaced by houses during the second half of the 7th and early 6th centuries BC. The dimensions of these houses varied though their average size of about 60 square metres indicates that the majority of the households could participate in the increased prosperity. Also at other sites in Etruria, houses with stone foundations and tiled roofs were erected during the second half of the 7th century BC and somewhat later in *Latium Vetus*. The manufacture of the ceramic building materials required for construction works, influenced the development of the pottery craft significantly because it supported a continuation of the indigenous *impasto* tradition. The replacement of huts by houses coincides with an acceleration of the local industrial production by the middle of the 7th century BC which is recorded at various centres discussed in this thesis. The expanding output of the early workshops was supported by the continuing process of social stratification and population growth. An assessment of the social position of craftsmen has to be integrated in this framework of social dynamics in which private possession of land and resources became gradually defined in line with advancing state formation. During this stage reciprocity and tribute seem to have remained essential. The continuing patron-client relations in central Italy must have preserved a mechanism based on tribute and redistribution. Nevertheless, I could substantiate the introduction and partial adoption of the principles of market exchange around 650 to 600 BC. Exchange through the market mechanism is a significant step in the abstraction of social labour since it brings together craftsmen, traders

[19] *cf*. Bietti Sestieri 1992 a, 875-7; De Santis 1995. See also: Angle and Gianni 1985.

[20] Berardinetti Insam 1990, 22-4; Bartoloni *et alii* 1994.

[21] Arnold 1989, 156-7.

[22] At Marzabotto this stage is documented for the 6th century BC.

and consumers irrespective of their social position unlike reciprocal and redistribution exchange mechanisms. This step is characterised by the determination of exchange value through quantification.[23] It was established that quantification by employing measures, was occasionally adopted for certain transactions. This means a more complex economy than previously anticipated. Some of the early measures published in this study, are based on systems which derived from the Near East which implies Levantine mediation and the importance of overseas imports and freedom of trade. This evidence supports the idea that the influence from the Levant on events in central Italy was profound during the early Orientalising Period as it was for Greece.[24] The association of weights and measures with the early workshops at *Pithekoussai*, Poggio Civitate and *Satricum* suggests that craftsmen were directly involved in the transmission of metrological units. They were instrumental for the dispersion of the concept of quantitative description. This indicates that craftsmen were probably free intermediaries since they played an active role in the spread of cognitive information. However they had to function within the prevailing social context and were, therefore, subject to an emerging establishment that dominated the internal social-economic conditions while being simultaneously open-minded in cultural affairs. This establishment gradually redirected their preoccupations because they became involved in the distributions of commodities on a grander, more institutionalised level.[25] For example, overseas export of Etruscan commodities was at its height from the late 7th to the middle of the 6th centuries BC. This can be ascertained from the distribution of the *bucchero* pottery, transport *amphorae* and copper alloy artefacts (Fig. 7). The concern of the elite with the administration of surplus production signals that external trade was supervised before 600 BC when export of these goods was at its peak. *Emporia* were established in central Italy and some sanctuaries functioned partly as meeting points between the different economic zones because asylum could be granted. It appears that freedom of trade turned into regulated exchange in the decades around 600 BC. This could actually reflect a strategy because seaborne trade may have become a threat once the scale of it crossed a certain threshold. The strategy involved sumptuary laws for *Latium Vetus* and the legal confinement of the *emporia* to some neutral location along the coast for Etruria. In *Latium Vetus*, the Levantine and Greek imports were curtailed in line with restrictions of the conspicuous funerary practice while in Etruria this period reflects the marked development of entrepôts like *Pyrgi*, Gravisca and Regisvilla which became the highly ritualised, gateway communities for long-distance trade of the Etruscan early states of *Caere*, Tarquinia and Vulci. This view on restricted access is substantiated by the evident separation of exchange mechanisms since Greek coins were accepted during the 5th century BC at *emporia* but not distributed internally. At these gateway communities Greek coins became what they effectively represented, that is bullion. This must have been a deliberate policy in order to protect the internal social-economic conditions. Nonetheless, the strength of the economy in central Italy is characterised by the increasing development of the regional exchange systems. These were essential for the economy during the late 7th and 6th centuries BC. Long-distance trade involving luxuries which was typical for the late 8th and early 7th centuries BC was superseded during the Orientalising Period by local production of luxury items. In time, the output of the workshops is distinguished by increasing standardisation. Workshop production gradually altered from the manufacture of luxury items into the production of standard commodities during the second half of the 7th and 6th centuries BC. The devaluation of products is recorded in the case of iron objects and *bucchero* pottery but also affected other types of artefacts. This decrease in value continued during the following century and probably influenced workshop organisation and working conditions. For example, the existence of nucleated workshops in central Italy demonstrates that productivity and output had increased which must have affected the value of the products made in these workshops. The emergence of an evaluation system by quantification assisted the assessment of this devaluation process.

An intriguing aspect of early market exchange in central Italy remains the customary setting where transactions

[23] Hart 1982. See section 1.7.

[24] *cf*. Strøm 1984, 1992; Botto 1990; Buchner 1982; Burkert 1992; van Loon 1974; Niemeyer 1990, 1993 and Rathje 1984, 1990.

[25] *cf*. Cristofani 1984.

could take place. It is evident that some of the Archaic sanctuaries were associated with markets. The *emporia* along the coast of Etruria functioned as markets for seaborne trade and have been described as highly ritualised.[26] Nevertheless the early markets for internal exchange in the primary centres at Etruria are yet to be defined. Some of the sanctuaries in *Latium Vetus* acted partially as the customary place for early market transactions.[27] The main sanctuary at *Satricum* is a clear example. Besides a wealth of depositions, early measures are documented in the oldest votive deposit from which I conclude that the religuous authorities actually sanctioned early market exchange by quantification.[28] Other sanctuaries in *Latium Vetus* which are related to the main shrine at *Satricum* are those at St. Omobone in Rome and at St. Cecilia in Anagni. These have been termed '*emporic* sanctuaries' but I consider this term not appropriate because *emporia* are characterised by seaborne trade and a location along the coast.[29] In my opinion these sanctuaries regulated internal exchange of imported goods from diverse provenance rather than overseas trade. I, therefore, suggest to reconstruct these and similar sanctuaries as incipient *fora* because the locations combine religious, public and market functions like the more monumental *fora* of later periods. This view is supported by the nature of the depositions at *Satricum*. Overseas imports were even during the period that freedom of trade can be reconstructed, in the minority when compared with the other artefacts in the votive deposits but gradually disappeared during the 7th century BC. This reflects a transition from international contacts to interregional-regional exchange activities and as such is in line with the increasing regulation of seaborne trade in the decades around 600 BC, mentioned above. Similar transitions can be observed at other sanctuaries in *Latium Vetus* because overseas imports became rare in this region during the 6th century BC. Another aspect is the gradual architectural development of the incipient *fora*. The monumental features of later *fora* are temples, shops and porticoed squares as recorded, for example, at Gabii.[30] An early manifestation of this architectural concept is, in my opinion, temple B at *Pyrgi* around 500 BC where the 'building of the twenty rooms' against the south boundary wall of the sanctuary, may have been associated with exchange activities in a ritualised setting.[31] An example of an intermediate stage towards a classic *forum* may be the last reconstruction of the temple area at *Satricum* around 500 BC when *stoai* were erected which replaced the courtyard houses.[32] Apart from market exchange at sanctuaries, transactions by quantification took place during the 6th and 5th centuries BC at workshops as recorded from the evidence at Marzabotto.[33]

The 6th century BC is characterised by increased productivity which was sustained by a growing demand and

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[26] Arafat and Morgan 1994, 113.

[27] I would like to stress here that most sanctuaries did not develop into incipient *fora*. Many religious deposits in *Latium Vetus* are confined assemblages of specific materials and do not display characteristics of the sanctuaries associated with early markets. These are distinguished by deposits with mixed materials, a relatively high incidence of imported goods and metals. For example, votive deposits of miniature vessels as found at Campo Verde or Lavinium, signify ritual acts and have little in common with some of the depositions that occurred at the sanctuaries where early market exchange was concentrated: *cf*. Kleibrink forthcoming; Guaitoli 1990, 184; Fenelli 1984, 331. Bartoloni wrote in this respect a commendable study of the early votive deposits at Rome from which one can abstract that the nature and meaning of these deposits is miscellaneous: Bartoloni 1989-1990.

[28] Waarsenburg is preparing at the moment a catalogue of the offerings from votive deposit I: Waarsenburg forthcoming.

[29] I refer to Bartoloni, Coarelli and Gatti for the notion of *emporic* sanctuaries: Bartoloni 1989-1990; Coarelli 1988; Gatti 1994-1995. I give a description of *emporia* in section 1.7.

[30] Almagro-Gorbea 1982.

[31] Serra Ridgway mentions other interpretations of the building such as cubicles for sacred prostitution, shelter for pilgrims or a series of ritual dining rooms: Serra Ridgway 1990, 522.

[32] Maaskant-Kleibrink 1992, 139-44.

[33] See section 4.5.

the urbanisation process. The industrial installations were enlarged which is reflected by the dimensions of the workshops and their nucleation. Apart from the evolution of master-assistant workshops, the household remained the primary economic unit since the production facilities for the workshops were mainly located within or near individual houses. The construction of various industrial quarters in the region signal urban planning and the vigourous growth in regional markets. However during the second half of the 6th century BC, export overseas decreases and marks a levelling off in the economic growth because external expansion became more arduous. Internal conflicts and the more important role of conquests indicate the progress of state formation but also a preoccupation with domestic conditions. This is exemplified by the fading or disappearance of some of the sites presented in this study, such as Poggio Civitate, Acquarossa, Laurentina-Acqua Acetosa, *Satricum* and the settlement at Lago dell'Accesa. During the second half of the 6th and 5th centuries BC, their fate became steadily subject to the political power of the primary centres. Especially the fading of Laurentina-Acqua Acetosa is noteworthy since it has been related to the upsurge of Rome.[34] Its decline substantiates the vigourous growth of Rome because the excavations by Bedini revealed a settlement with distinct urban features such as the nucleation of workshops. Around 500-450 BC Rome must have held a comparable position in *Latium Vetus* as some of the most potent primary centres in Etruria.

The 5th century BC is characterised by a consolidation of previous conditions though appropriation of resources by individual families resulted in increasing social tensions between the various strata once these could no longer be pacified by substantial economic growth. During the previous centuries demand had favoured production and *vice versa* which sustained increasing social-economic complexity. Whenever this mechanism falters it will cause severe friction between the different social units. Economic dynamics shifted to the northern regions of Etruria. In southern Etruria, the economic level of the previous century was maintained though reallocation of resources continued with increasing social inequality. It appears that in Etruria, the primary urban centres with their respective hinterlands became virtually self sufficient, early states during the 5th century BC since the political elite was primarily interested in domestic affairs. Imports became unusual and market conditions remained limited. Workshops were probably directly involved in the exchange of their commodities. Rome as a polity, increased its territory and became dominant in *Latium Vetus* and eventually in the entire region of central Italy.

[34] Bedini 1981, 257. See also section 2.6.3. Another Latin site that declined during this period is Ficana: Pavolini 1981. I refer to Cornell and Bouma for comments on the general shift in *Latium Vetus* towards warfare and political instability from the late 6th century BC: Cornell 1995, 293-309; Bouma 1996, 192-5.

Samenvatting

De directe aanleiding tot dit boek is de opgravingscampagne in de zomer van 1991 te *Satricum*, 60 km ten zuidoosten van Rome. Gezien mijn belangstelling voor productieprocessen groef ik dat jaar twee ovens op en had ik de supervisie over de opgraving in het vak B 18. Dit vak bleek, onder andere, een gewicht, ruwijzer en vaatwerk met merktekens te bevatten, allen daterend rond 650-600 v.Chr. De inventarisatie van deze primaire overblijfselen van productie en meetkunde uit een vroege nederzetting in Midden-Italië leidde ertoe, dat ik naar vergelijkbare sporen van andere opgravingen zocht. In dit stadium breidde mijn onderzoek zich topografisch en chronologisch snel uit, omdat bleek dat de verslaglegging van archeologische resten van productie minimaal was, terwijl een inventarisatie van feitelijke maten en gewichten überhaupt niet bestond voor Midden-Italië. In deze omissie poogt dit boek te voorzien. Het bevat een beschrijving van de intensivering van productieprocessen in Midden-Italië; een intensivering die nauw samenhangt met de introductie van een gedeeltelijke markteconomie voor de periode van 800 tot 400 v.Chr. Het onderzoek is gebaseerd op een analyse van feitelijke resten van zowel productie als meetkunde. De gegevens worden gepresenteerd in relatie tot een reconstructie van de individuele nederzettingen waarin zij zijn aangetroffen. Het is een reconstructie in sociaal-economische zin voor zover de archeologische informatie dat toelaat. Binnen de gemeenschappen in Midden-Italië voltrekken zich fundamentele veranderingen in een relatief korte periode van 400 jaar. Dit heeft tot gevolg dat de aard van deze nederzettingen divers is. Elke nederzetting die in dit boek wordt besproken, lijkt een specifieke aanpassingsvorm te vertegenwoordigen binnen de algehele gedaantewisseling van het maatschappelijk bestel.

Het eerste hoofdstuk vormt een uitgebreide inleiding op basis van thema's zoals theoretische achtergrond, chronologie en de onderzoeksmethodiek. Daarnaast bevat dit hoofdstuk een introductie tot de parameters waarbinnen de veranderingen in arbeidsspecialisatie tijdens de periode van 800 tot 400 v.Chr. kunnen worden geplaatst. Onderwerpen als de ontwikkeling van de landbouw, het urbanisatieproces en sociaal-economische dan wel culturele veranderingen worden besproken.

Technologische veranderingen zijn inherent gerelateerd aan de organisatie van productieprocessen. Technologie op zich is theoretisch vooral ingebed in algemene theorieën, zoals het marxisme en de systeemtheorie. Een recentere theorie die door enkele archeologen wordt gepropageerd is de contextuele archeologie. Deze theorie gaat uit van de rol van het individu en de duiding of betekenis van een opgegraven context. Het blijkt dat technologie nauwelijks is verankerd in de contextuele archeologie. Hierdoor kan zij geen aanspraken maken op algemene geldigheid. In feite slaat de contextuele benadering de archeoloog een belangrijk uitgangspunt uit handen. Archeologie kan immers worden omschreven als de bestudering van de materiële neerslag van culturen uit het verleden. Juist dit stoffelijke grondvlak van de archeologie bepaalt grotendeels de methodologie van het vak. Dit vindt zijn uitdrukking in de `ladder van Hawkes'. Deze `ladder' is een methodologische rangschikking van aspecten die kunnen worden bestudeerd op basis van tastbare, archeologische resten ofwel materie. Volgens Hawkes dient eerst deze materie in haar kenmerken, samenstelling en vervaardigingswijze te worden onderzocht. Vervolgens kan een archeoloog op basis van deze gegevens overgaan tot de bestudering van andere dimensies van culturen zoals economie, sociaal-politieke organisatie en religie. De `ladder van Hawkes' is een methodologie en staat los van de doelstelling van archeologisch onderzoek. Onderzoek kan zich, bijvoorbeeld, tot doel stellen een reconstructie te geven van sociaal-economische aspecten of van religieuze kenmerken. Dit boek is impliciet een uitwerking van de ideeën van Hawkes ook al betwist ik zijn uitgangspunt dat technologische handelingen in principe een weerslag zijn van eenvoudige redeneringen. Immers, uit de bundeling van etnografische en archeologische gegevens blijkt dat de wijze waarop culturen reageren op nieuwe technologieën zeer divers is. Er bestaat vooral een relatie tussen technologie en ethiek. Dit gegeven vindt heden ten dage zijn uiting in discussies over bio-industrie en genetische manipulatie, maar kan in principe worden overgedragen op iedere technologische aanpassing. Veranderingen in technologie worden met name gereguleerd door wat sociaal-politiek haalbaar en wenselijk is. Bovendien vertonen technologische aanpassingen een welhaast onmetelijke diversiteit op sociaal en individueel niveau. Dit heeft volgens mij tot gevolg dat technologische veranderingen niet te vangen zijn in een algemeen model dat de contextuele benadering kan onderbouwen. Om die reden heb ik als motto voor het eerste hoofdstuk een uitspraak van Braudel genomen, die aangeeft dat technologie misschien slechts het lichaam van culturen vertegenwoordigt maar zeker niet de ziel.

Voor de chronologie binnen dit onderzoek zijn twee aspecten van belang:
1. Recente publicaties hebben de beginfase van de vroege ijzertijd ter discussie gesteld, en
2. De periode 800 tot 400 v.Chr. is protohistorisch, wat tot gevolg heeft dat de absolute dateringen die in dit boek worden gehanteerd een marge hebben van ± 10 tot 20 jaar.
Door de discussie omtrent de absolute datering van de vroege ijzertijd dient de traditionele tijdsindeling misschien te worden aangepast (Fig. 1). Voor twee nederzettingen in Midden-Italië worden ^{14}C-dateringen gepresenteerd die inderdaad aangeven dat contexten, die traditioneel zijn gedateerd rond 750 v.Chr., minstens 50 jaar ouder zijn en in de 9de eeuw v.Chr. dienen te worden geplaatst. Deze dateringen van slechts twee nederzettingen zijn voor mij geen aanleiding om in dit onderzoek een nieuwe chronologie voor de vroege ijzertijd in Midden-Italië te presenteren. Daarom wordt in dit boek de traditionele fasering gebruikt. Vooralsnog wordt ervan uitgegaan dat de absolute dateringen vanaf 700 tot 400 v.Chr. min of meer correct zijn. Het enige gevolg dat een verschuiving van de beginfase van de vroege ijzertijd voor dit onderzoek heeft, is dat de ontwikkelingen die ik postuleer voor de 8ste eeuw v.Chr. zich voordoen over een langer tijdsbestek.

De onderzoeksmethodiek in dit boek is in eerste instantie gebaseerd op een analyse van feitelijke productie-sporen. Deze sporen worden vervolgens geïnterpreteerd, waarbij gebruik wordt gemaakt van etnografische gegevens, archeometrisch onderzoek, experimentele archeologie, geologische informatie en uiteindelijk de antieke teksten. Deze teksten zijn overgeleverd uit latere eeuwen en geven slechts zeer spaarzaam informatie over sociaal-economische omstandigheden in de periode van 800 tot 400 v.Chr. Als men de teksten echter ontleed dan zijn er voor dit tijdvak twee hoofdzaken die een rol zouden kunnen spelen. De antieke teksten spreken met name over de vroege totstandkoming van de *collegia opificia*, een soort gilden of beroepsgenootschappen, en over rondtrekkende meesters. Indien men de teksten letterlijk zou nemen, dan worden in Rome rond 500 v.Chr. meesters als Vulca uit Veii aangesteld voor specifieke opdrachten. Deze meesters komen echter in een stad waar reeds verscheidene werkplaatsen aanwezig zijn. Dit laatste wordt in de huidige literatuur vaak over het hoofd gezien, omdat men noch het bestaan van stedelijke gebieden met ambachten noch het daaraan gekoppelde marktmechanisme heeft ingevuld. In deze leemte voorziet dit boek. Daarnaast moet vermeld worden dat het tijdsbestek van 800 tot 400 v.Chr een protohistorische periode vertegenwoordigt. Dit houdt in dat de antieke teksten slechts kunnen worden geïnterpreteerd aan de hand van archeologische gegevens en niet omgekeerd, zoals bijvoorbeeld door Cornell wordt beweerd.

Hoofdstuk 1 bevat eveneens de parameters waarbinnen het proces van arbeidsspecialisatie in Midden-Italië gedurende de periode van 800 tot 400 v.Chr. kan worden geplaatst. Enkele punten die van belang zijn voor deze periode betreffen:

- Vroege staatsvorming. Individuele nederzettingen in Etrurië worden gedurende de overgang late brons-tijd/vroege ijzertijd verlaten. Tegelijkertijd vindt er een clustering plaats van nederzettingen op de plateaus waar vervolgens de grote Etruskische steden ontstaan. Dit kan worden beschouwd als een eerste aanwijzing van staatsvorming. Uit etnografisch onderzoek blijkt bovendien dat processen die leiden tot staatsvorming zich ontwikkelen vanuit maatschappijen met een zwak ontwikkelde definitie van persoonlijk bezit. De natuurlijke hulpbronnen, zoals land en ertsgebieden, zijn eigendom van de gemeenschap. Dit komt overeen met de kenmerken van het maatschappelijk bestel in de late bronstijd/vroege ijzertijd. Voortschrijdende vroege staatsvorming vindt plaats bij toenemende sociale verschillen, verstedelijking en grotere controle over het beheer van territoria. Dit zijn aspecten die zijn waar te nemen in Midden-Italië van de 8ste tot 5de eeuw v.Chr.;

- De nederzettingsclusters bereiken een grootte van enkele honderden inwoners gedurende de 9de eeuw v.Chr. Bevolkingsaanwas in deze centra leidde tot hogere aantallen inwoners. Veii, bijvoorbeeld, had rond 800 v.Chr. minstens 1000 inwoners. De situatie in *Latium Vetus* is in politiek-economisch opzicht minder ontwikkeld, maar ook in dit gebied zijn reeds centra te onderscheiden in de vroege ijzertijd. Vooral de dichtheid van nederzettingen langs de Tiber valt op;
- Een stratificatieproces gedurende de 8ste en 7de eeuw v.Chr. Sociale rangordening, die was gebaseerd op verworven status, ontwikkelde zich in gestratificeerde standen met een bij geboorte toegeschreven status. Een maatschappij met standen gaat uit van economische verhoudingen waarbij de elite geleidelijk de natuurlijke hulpbronnen in handen krijgt. Dit is echter een zeer langzaam proces met tussenstadia waarin tribuut, reciprociteit en een gemeenschappelijke ideologie een rol spelen. Dergelijke tussenstadia zijn te herkennen tijdens de Oriëntaliserende periode (720-580 v.Chr.). Het bezit van de natuurlijke hulpbronnen kan impliciet worden geclaimd door enkele families, maar tegelijkertijd brengt dit verplichtingen met zich mee opdat de overige bevolkingsgroepen in hun onderhoud kunnen blijven voorzien. Gedurende de Archaïsche periode (6de en vroege 5de eeuw v.Chr.) worden deze claims omgezet in wettelijk gedefinieerd bezit van land en andere natuurlijke hulpbronnen, zoals blijkt uit 5de-eeuwse wetten uit Rome (Wet der Twaalf Tafelen). Het vastleggen van wetten onderstreept dat vroege staten zich onderhand daadwerkelijk hebben gevormd;
- Het stratificatieproces gaat vooral in de 7de eeuw v.Chr. gepaard met toenemende competitie tussen de rangen. Dit is van groot belang voor het productieproces, omdat de vraag naar luxegoederen enorm toeneemt, temeer daar per centrum meerdere families deelnamen aan dit competitieve proces. Archeologisch wordt dit herkend in het groeiende aantal rijke bijzettingen en de *tombe principesche* rondom nederzettingen in Midden-Italië gedurende de late 8ste en 7de eeuw v.Chr.;
- Te midden van dit stratificatieproces dient men de toekenning van maatschappelijke stand aan ambachtslieden te plaatsen. Ik beweer dat het niet passend is om deze ambachtslieden in een sociale positie te manoeuvreren, zoals slaaf of behorend tot een middenstand, in een periode dat deze standen feitelijk worden gevormd, dat wil zeggen in de Oriëntaliserende periode;
- Algehele culturele veranderingen. Rond 750-650 v.Chr. worden onder andere het schrift, nieuwe technologieën en *symposia* ofwel drinkgelagen geïntroduceerd. De acceptatie van culturele invloeden van buitenaf duidt op de open structuur van het maatschappelijk bestel;
- Door aanhoudende bevolkingsaanwas wordt het landbouwareaal rondom de centra geleidelijk in bezit genomen gedurende de 7de en 6de eeuw v.Chr. (Fig. 2). Dit wordt de laatste decennia keer op keer aangetoond door de archeologische surveys in Midden-Italië. Het daadwerkelijk in bezit nemen van territoria bevordert de marktfunctie van de opkomende steden;
- De opkomst van olijfteelt en wijnbouw gedurende de 7de eeuw v.Chr. Hierdoor neemt de verscheidenheid van landbouwproductie toe. De introductie van de typische Mediterrane landbouw gaat gepaard met een toename van het landbouwoverschot. Dit wordt geïllustreerd door de export van Italische transportamforen naar overzeese gebieden, vooral in het westelijke gedeelte van de Middellandse Zee (Fig. 7). De lokale productie van amforen geeft aan dat de handel in dit landbouwoverschot wordt gereguleerd vanaf de 7de eeuw v.Chr. Dit duidt op marktwerking;
- De oorspronkelijke centra ontwikkelen zich gedurende de 7de en 6de eeuw v.Chr meer en meer tot steden. Sommige van deze steden hebben duizenden inwoners. De verstedelijking wordt onder andere uitgedrukt in het vervangen van hutten door huizen en de bouw van monumentale tempels. De belangrijkste steden in dit gebied worden geleidelijk het economische, politieke en religieuze centrum van hun ommeland. Archeologisch kan verstedelijking ook worden aangetoond door clustering van werkplaatsen. In hoeverre hiervan sprake is wordt onderzocht in de hoofdstukken 2 en 3;
- Handelsvrijheid gedurende de 8ste en begin 7de eeuw v.Chr. veranderde in gereguleerde handel gedurende de 7de eeuw v.Chr. In de decennia rond 600 v.Chr. vindt een kentering plaats om de interne sociaal-economische verhoudingen af te schermen. In Etrurië ontstaan er *emporia* langs de kust voor handel met overzeese gebieden,

terwijl in *Latium Vetus* het overdadige grafritueel dat zich kenmerkt door het bijzetten van luxegoederen verdwijnt. Dit doet een gedeeltelijk verbod op luxegoederen vermoeden. Een dergelijk verbod zou van invloed zijn op de ontwikkeling van ambachten, omdat de aard van de producten verandert en de lokale productie vooral gericht zal zijn op het maken van gebruiksgoederen. Het afschermen van de interne sociaal-economische verhoudingen is met name zichtbaar in de omgang met munten of geld. In de *emporia* langs de kust van Etrurië werden Griekse munten wel aanvaard in de 5de eeuw v.Chr. maar vervolgens niet gebruikt voor interne doeleinden. Een verdere invoering van het marktmechanisme in Midden-Italië was blijkbaar niet mogelijk of werd afgewezen.

Binnen de algehele verandering van het maatschappelijk bestel in Midden-Italië tijdens de periode van 800 tot 400 v.Chr., zijn er enkele aspecten die tot nog toe niet systematisch zijn onderzocht met behulp van archeologische gegevens. Dit betreft met name de ontwikkeling en organisatie van ambachten en de opkomst van markten. In de hoofdstukken 2, 3 en 4 wordt de feitelijke archeologische informatie over ambachten en markten geïnventariseerd.

Hoofdstuk 2 handelt over aardewerkproductie. Eerst wordt de diversiteit van productie-eenheden omschreven aan de hand van etnografische modellen. Op deze wijze worden de kenmerken van huishoudproductie, huishoudindustrie en werkplaatsproductie bepaald. Werkplaatsen zijn archeologisch eenduidig waar te nemen omdat werkplaatsproductie onder andere wordt gekenmerkt door een snelle draaischijf en geavanceerde ovens met stook- en bakkamers (Fig. 17). De verschijning van de afzonderlijke productie-eenheden is echter zeer divers omdat zij elkaar niet uitsluiten. Zo kunnen in één nederzetting zowel huishoud- als werkplaatsproductie naast elkaar optreden. Naast een analyse van de diversiteit van productie-eenheden worden in dit hoofdstuk de stadia binnen de aardewerkproductie besproken in relatie tot omstandigheden in Midden-Italië; achtereenvolgens winning van grondstoffen, bewerking van kleien en tenslotte het bakken. Aansluitend volgt een analyse van de feitelijke archeologische resten die duiden op lokale aardewerkproductie. Aan de hand van deze archeologische informatie worden nederzettingen als *Satricum*, Lavinium, Laurentina-Acqua Acetosa, *Caere*, Acquarossa, Poggio Civitate en Marzabotto besproken.

In Midden-Italië is vroege werkplaatsproductie vooral waarneembaar door middel van:
1. Lokaal aardewerk dat de geïmporteerde keramiek imiteert vanaf ongeveer 750 v.Chr., en
2. *Bucchero*-aardewerk, vanaf ± 700 v.Chr.

Specialisatie binnen de lokale aardewerk- of *impasto*-traditie volgt een andere route dan de imitatie van het geïmporteerde aardewerk. Het lijkt alsof hierbij twee produktiemechanismen elkaar ontmoeten. De imitatie van de geïmporteerde keramiek vindt plaats binnen een werkplaats en wordt gekenmerkt door efficiëntie en massaproductie. Daartegenover staan rond 700 v.Chr. hoogst bewerkelijke *impasto* en *bucchero*-vormen die individueel worden geproduceerd, waarbij productietijd geen rol lijkt te spelen (Fig. 15). De productie van dit soort *impasto*- en *bucchero*-aardewerk staat in nauw verband met methoden, vormen en technieken die worden gebruikt bij de metaalbewerking. Het systeem van de lokale aardewerkproductie verandert echter binnen 50 tot 100 jaar, omdat een toenemende standaardisatie kan worden waargenomen (Fig. 16). Bovendien ontstaat er vanwege het vervangen van hutten door huizen een toegevoegde vraag naar keramische bouwmaterialen, zoals dakpannen en andere terracottas, die in de *impasto*-traditie worden uitgevoerd. De lokale productie van *impasto*-aardewerk nam toe door de vraag naar keramische bouwmaterialen. Deze gang van zaken is met name waar te nemen bij de *impasto rosso*-productie en leidde tot plaatselijke werkplaatsen die *impasto*-gebruiksgoederen maakte. Het gevolg is een continuering van de reeds bestaande *impasto*-traditie maar dan op een grotere schaal. Dit proces wordt aangetoond door verscheidene werkplaatsen die in hoofdstuk 2 worden gepresenteerd. Daarnaast wordt het geïllustreerd door de toenemende standaardisatie van het gebruiksaardewerk gedurende de Archaïsche periode. Zelfs clustering van werkplaatsen hetzij naast elkaar, hetzij verspreid over het stedelijke gebied kan worden bewezen. De stedelijke werkplaatsen maken vooral gebruiksaardewerk: tafelservies, huishoudaardewerk en keramische bouwmaterialen. Het toenemende aanbod aan *impasto*-aardewerk gaat gepaard met waardevermindering. Depreciatie treedt het duidelijkst op bij het *bucchero*-aardewerk. Het *bucchero* ontstaat rond 700 v.Chr. en wordt oorspronkelijk beschouwd als een luxegoed. In de loop van de 7de en 6de eeuw v.Chr. wordt het meer en meer een gebruiksgoed door toenemende massaproductie. Dit onderzoek toont aan dat de geleidelijke waardevermindering een gevolg is van een intensivering van het productieproces, waarin het ontstaan van werkplaatsen een belangrijke rol heeft gespeeld.

De algehele ontwikkeling van de aardewerkproductie, van huishoud- tot werkplaatsproductie, leidde ertoe dat het aardewerk niet langer door vrouwen werd gemaakt, zoals dat het geval was rond 800 v.Chr. Met een toenemende specialisatie namen mannen taken over die voorheen aan vrouwen waren toebedeeld.

Hoofdstuk 3 bespreekt de veranderingen die plaatsvonden binnen het lokale productieproces van metalen aan de hand van negen archeo-metallurgische sites: *Pithekoussai*, *Satricum*, *Caere*, Acquarossa, Gran Carro, Lago dell'Accesa, Populonia, Poggio Civitate en Marzabotto. In tegenstelling tot aardewerk was de vervaardiging van metalen voorwerpen al een gespecialiseerd ambacht rond 800 v.Chr. In de meeste dorpen maakte een smid op deeltijdbasis gebruiksvoorwerpen, zoals gereedschappen en wapens. Daarnaast bestond er een beperkte productie van luxegoederen. Het merendeel van de metalen voorwerpen bestond rond 800 v.Chr. nog uit koperlegeringen. De uitwisseling van de grondstoffen koper, tin en lood vond plaats binnen een regionaal en interregionaal handelsnetwerk. Dit vereiste een surplusproductie op die plaatsen waar ertsen werden gewonnen en gesmolten, hetgeen eveneens in deeltijd gebeurde. Het is niet duidelijk of ijzer al op lokaal niveau werd gesmeed, maar er zijn aanwijzingen dat het wel op incidentele schaal werd bewerkt. In de loop van de 8ste eeuw v.Chr. nam de productie binnen de plaatselijke smederijen enorm toe. Enerzijds werd een toenemend aantal voorwerpen van koperlegeringen in serie gefabriceerd, anderzijds nam ijzer de plaats in van koper als basismateriaal voor gereedschappen en wapens. De omslag van koper naar ijzer voltrok zich in een korte periode. De gewijzigde verhouding in aantallen gereedschappen en wapens van koperlegeringen tot die van ijzer toont aan dat de kentering plaatsvond in de 8ste en vroege 7de eeuw v.Chr. De vaart waarmee ijzer koper verving als basisgrondstof onderstreept dat de intensivering van de metaalbewerking een enorme vlucht nam tijdens de 8ste eeuw v.Chr. Voorraden van dit nieuwe basismetaal dienden te worden aangelegd in de vorm van ruwijzer en in de vorm van ijzeren voorwerpen die opnieuw konden worden gesmeed. De activiteiten rondom de mijnbouwgebieden namen in intensiteit toe, ook al acht ik *fulltime*-arbeid nog uitgesloten gezien de ontwikkeling van enkele archeo-metallurgische sites. De nederzetting bij het Lago dell'Accesa bijvoorbeeld, toont duidelijk aan dat het winnen en smelten van ertsen in deeltijd gebeurde. De kenmerken van deze site beklemtonen dat specialisatie rondom mijnbouwgebieden geen rechtlijnig proces was.

De intensivering van activiteiten in smederijen werd versterkt door bevolkingsaanwas en de handel met overzeese gebieden, waarin de exploitatie van de rijke metaalvoorraden in Etrurië een belangrijke rol speelde. In de nederzettingen waar metallurgische activiteiten zijn aangetoond, schijnen de lokale smederijen zowel ijzer als koper te hebben bewerkt. Echter, de specialisatie binnen een werkplaats werd bevorderd omdat beide materialen andere eisen stellen aan de smid. Daarnaast blijkt keer op keer uit de diverse contexten die worden besproken, dat metaalbewerking en het snijden van organische materialen, zoals bot, ivoor, barnsteen, hoorn *etc*., in nauw verband met elkaar staan. Het wordt bewezen dat in dergelijke werkplaatsen meerdere soorten materiaal werden bewerkt. Dit verband is zelfs in de 5de eeuw v.Chr. nog aanwijsbaar. De clustering van smederijen is eveneens archeologisch gedocumenteerd in enkele steden. Ook wat betreft de metaalnijverheid geldt dat clustering zowel in ambachtswijken kan plaatsvinden als verspreid over een stedelijk gebied.

Een sociaal-economisch aspect waaraan in dit hoofdstuk eveneens aandacht wordt besteed, is de waardevermindering van metalen goederen die optrad vanaf ongeveer 650 v.Chr. Dit proces is aantoonbaar voor ijzer maar betrof ook andere categorieën metalen voorwerpen, zoals mantelspelden en gehamerde kommen en bekkens van koperlegeringen. Depreciatie zal noch de arbeidsomstandigheden binnen een smederij, noch de sociale positie van de ambachtsman hebben bevorderd. De waardevermindering zal bovendien de positie van Etrurië binnen het handelsnetwerk met overzeese gebieden niet hebben gestimuleerd omdat dit gebied vooral rijk is aan koper- en ijzerertsen.

In hoofdstuk 4 wordt de introductie van het marktprincipe in Midden-Italië besproken. Dit principe wordt gekenmerkt door kwantificatie en komt overeen met stadium 5 in de reeks van Hart. Deze reeks beoordeelt de ontwikkeling van goederen en markten waarbij de aard van de uitwisselingssystemen centraal staan. De stadia 4 en 5 zijn met name van belang voor de periode en maatschappelijke verhoudingen die in dit boek worden geanalyseerd. Deze stadia zijn:

- Goederen worden uitgewisseld volgens bepaalde principes. Reciprociteit is een algemeen principe maar is niet het enige uitwisselingsmechanisme om producten van arbeidsverdeling te verhandelen;
- Goederen worden uitgewisseld volgens het marktprincipe. Dit is een belangrijke stap in het sociaal abstraheren van arbeid omdat de voorgaande fasen meer op sociale afhankelijkheid zijn gebaseerd. De waarde van een product wordt uitgedrukt in hoeveelheden, in maten en gewichten. Dit gebeurt vaak op een plek die voor dit doel algemeen aanvaard is, een publieke, openbare ruimte.

Stadium 6 in de reeks van Hart betreft geld en aangezien munten tot de 3de eeuw v.Chr. slechts sporadisch werden gebruikt voor het interne handelsverkeer in Midden-Italië, speelt deze fase geen rol in dit boek.

De introductie van het marktprincipe in Midden-Italië is tot nog toe altijd onduidelijk geweest omdat feitelijke, vroege maten nauwelijks zijn gepubliceerd. Uit deze studie blijkt echter, dat gewichten, volume-eenheden en lengte-eenheden al in de 7de eeuw v.Chr. bekend waren. De vroege eenheden worden in hoofdstuk 4 gepubliceerd in samenhang met de archeologische context waarin zij zijn gevonden. Het blijkt dat het gebruik van maten vooral is gerelateerd aan werkplaatsen, heiligdommen en handelsschepen. De vroege volume-eenheden uit *Satricum*, Rome en Veii, zijn gebaseerd op eenheden die afkomstig zijn uit de Levant. Hieruit kan men afleiden dat vooral de handel met overzeese gebieden heeft geleid tot de adoptie van het marktprincipe. Intern handelsverkeer kan worden gereguleerd volgens andere principes die meer zijn gebaseerd op sociale verhoudingen. Ook al kon ik aantonen dat het uitwisselen van goederen volgens het marktprincipe bekend was in Midden-Italië, tegelijkertijd dient te worden opgemerkt dat er terughoudend op werd gereageerd. Dit geeft aan dat arbeid in vele gevallen nog steeds uitging van patroon-cliënt-verhoudingen.

De analyse van de feitelijke gegevens over de organisatie van productie en ambachten, in combinatie met de gedeeltelijke introductie van een markteconomie en de parameters zoals die zijn besproken in het eerste hoofdstuk, hebben geleid tot de volgende reconstructie van de sociaal-economische veranderingen in Midden-Italië gedurende de periode 800 tot 400 v.Chr. De reconstructie van de gebeurtenissen die plaats vonden in deze periode, wordt gepresenteerd als een hypothese van lange-termijn-verschijnselen. Het lijkt alsof ieder van de vier besproken eeuwen een ander stadium vertegenwoordigt als men de algehele verschillen tussen Etrurië en *Latium Vetus* onderkent.

Rond 800 v.Chr. exploiteerde de bevolking in Etrurië de lokale rijkdom aan ertsen voor een geavanceerde metaalbewerking in koper, lood en tin, misschien uitgebreid met plaatselijke ijzerbewerking. Metaalbewerking was in de meeste dorpen deeltijdarbeid, uitgevoerd door een smid die daarnaast andere bezigheden had. Specialisatie van de aardewerkproductie kan nog niet worden vastgesteld. Er was regionaal en interregionaal handelsverkeer in goederen. Dit duidt op surplusproductie van de natuurlijke hulpbronnen. Deze hulpbronnen, zoals land en mijnbouwgebieden, waren in handen van de gemeenschap en niet in bezit van individuele families. Er ontstonden clusters van nederzettingen en de eerste aanzetten tot een stratificatieproces worden waarneembaar in de vroege graven van krijgslieden. De clustering van dorpen kon leiden tot aanzienlijke nederzettingen. Voor Veii bijvoorbeeld, is het aannemelijk dat het rond 800 v.Chr. reeds 1000 inwoners telde. Een dergelijk inwonertal wordt beschouwd als een drempel voor specialisatie van de aardewerkproductie. Toenemende doch kleinschalige specialisatie vond plaats gedurende de 8ste en het merendeel van de 7de eeuw v.Chr., binnen nederzettingen die uit hutten bestonden Uit de onderzochte contexten blijkt dat meerdere takken van nijverheid in nauw verband stonden tot elkaar. Sommige vernieuwende technieken voor aardewerk en metalen werden geïntroduceerd rond 750-700 v.Chr. Deze technieken vereisten gespecialiseerde ambachtslieden. De plaatselijke toepassing van de nieuwe technieken werd ondersteund door bevolkingsaanwas alsook door vraag naar luxegoederen van de opkomende elite. Deze elite probeert haar positie te verstevigen door rituelen, zoals destructie van goederen tijdens opzienbarende begrafenisplechtigheden. Daarnaast vond competitie plaats tussen de afzonderlijke families. Als gevolg van deze competitie en de groeiende bevolking is het niet verwonderlijk dat verschillende van de nieuwe technieken plaatselijk konden worden toegepast; er was immers voldoende vraag. De omstandigheden bevorderden het ontstaan van lokale werkplaatsen, een ontwikkeling die werd ondersteund door toenemende handel met overzeese gebieden. Midden-Italië werd opgenomen in een handelsnetwerk dat bijna alle kustgebieden van de Middellandse Zee omvatte. De tussenpersonen uit de Levant en Griekenland zorgden voor nieuwe markten waardoor toenemende exploitatie van de natuurlijke hulpbronnen in Midden-Italië werd bevorderd en het ontstaan van een Oriëntaliserende *koinè* werd gestimuleerd. Vooral de intensivering van de metaalwinning en -bewerking verschafte mogelijkheden voor verdere economische groei. Dit wordt in dit boek geïllustreerd aan de hand van de ontwikkeling van Acquarossa en Populonia.

De gebeurtenissen tijdens de 7de eeuw v.Chr waren fundamenteel voor de verdere ontplooiing van Midden-Italië. Verscheidene begrippen werden geïntroduceerd die in de volgende eeuwen zouden worden uitgewerkt. De archeologische gegevens tonen aan dat de economische groei aanzienlijk was waardoor sociale spanningen tussen de opkomende standen konden worden beperkt. Door deze groei was het merendeel van de bevolking in staat deel te nemen aan de toenemende materiële behoeften ook al nam het verschil tussen de verschillende bevolkingslagen toe. Deze omstandigheid wordt aangetoond door het ontstaan van nederzettingen in het ommeland (Fig. 2) en door de ontwikkeling van Acquarossa, waar hutten in de loop van de tweede helft van de 7de eeuw v.Chr. werden vervangen door huizen. De afmetingen van deze huizen varieerden, maar de gemiddelde grootte van 60 m^2 geeft aan dat het merendeel van de huishoudens kon deelnemen aan de toenemende welvaart. Ook op andere plaatsen in Etrurië en *Latium Vetus* werden gedurende de 7de en 6de eeuw v.Chr. de hutten geleidelijk vervangen door huizen. Deze woningen werden voorzien van tegels en andere terracottas, waardoor er een toegevoegde vraag naar keramische bouwmaterialen ontstond zoals in hoofdstuk 2 wordt aangetoond. De vervanging van hutten door huizen in de belangrijkste centra wordt ondersteund door groeiende lokale nijverheid. In dit boek wordt deze toename geïllustreerd aan de hand van verscheidene centra waar zich vroege werkplaatsen ontwikkelden rond 650 v.Chr. De lokale productie werd gestimuleerd door bevolkingsaanwas en aanhoudende sociale stratificatie. Te midden van dit stratificatieproces dient men de toekenning van maatschappelijke stand aan ambachtslieden te plaatsen. Dit stratificatieproces leidde er uiteindelijk toe dat particulier eigendom van de natuurlijke hulpbronnen, zoals land en ertsgebieden, kon worden gedefinieerd in nauwe samenhang met voortgaande staatsvorming. Het bepalen van eigendomsrechten is echter een langzaam proces, vooral in een maatschappij waar deze rechten tot een à twee eeuwen daarvoor slechts zwak waren gedefinieerd. Het vereist bovendien een tussenstadium waarin reciprociteit, tribuut en redistributie een rol spelen. Dit tussenstadium bleef een belangrijke basis voor het maatschappelijke bestel in Midden-Italië en wordt van oudsher uitgedrukt in patroon-cliënt-verhoudingen binnen *gens* of familieverband. Toch kan ik in dit boek aantonen dat het marktmechanisme gedeeltelijk werd geadopteerd rond 650-600 v.Chr. Het uitwisselen van goederen via markten is een belangrijke stap in de scheiding tussen arbeid en sociale structuren. Reciprociteit en redistributie vertegenwoordigen twee mechanismen waarin arbeid sterk gekoppeld is aan een sociale structuur waarin de onderlinge afhankelijkheid voorop staat. Echter bij een markteconomie komen ambachtslieden, handelaars en verbruikers bijeen, onafhankelijk van hun sociale positie. Markten worden gekenmerkt door de waarde van goederen te relateren aan kwantiteit, dat wil zeggen door te wegen en meten. Het gaat gepaard met productie binnen werkplaatsen. In hoofdstuk 4 wordt aangetoond dat bij bepaalde transacties maten en gewichten werden gebruikt. Dit houdt in dat de economie in Midden-Italië tijdens de Oriëntaliserende periode complexer was dan voorheen werd aangenomen. Enkele van de maten en gewichten die in dit boek zijn gepubliceerd, zijn afkomstig uit de Levant. De invloed van tussenpersonen uit het Nabije Oosten op de sociaal-economische ontwikkeling van Midden-Italië werd ondersteund door handelsvrijheid. De nauwe samenhang tussen meetsystemen en werkplaatsen wordt onderschreven door de besproken contexten. Het merendeel van de vroege maten en gewichten zijn gerelateerd aan werkplaatsen, zoals die te *Pithekoussai*, Poggio Civitate en *Satricum*. Dit geeft aan dat ambachtslieden direct waren betrokken bij de overdracht van kennis omtrent metrologische eenheden. Het onderstreept dat ambachtslieden ongebonden tussenpersonen waren, temeer daar zij een belangrijke rol hebben gespeeld bij de verspreiding van cognitieve informatie. Zij functioneerden echter binnen een maatschappij met opkomende standen. De ambachtslieden waren onderworpen aan een elite, die de interne omstandigheden dirigeerde maar tegelijkertijd open stond voor culturele invloed van buitenaf. Deze bovenlaag stelde geleidelijk haar bedoelingen bij en kreeg aandacht voor de distributie van goederen op een grotere, meer geïnstitueerde, schaal. Bijvoorbeeld, export overzee van Etruskische goederen nam een grote vlucht vanaf 625 tot 550 v.Chr. Dit kan worden afgeleid uit de verspreiding van *bucchero*-aardewerk, Etruskische transportamforen en voorwerpen van koperlegeringen rondom de Middellandse Zee (Fig. 7). De belangstelling van de elite voor het beheer over surplusproductie geeft aan dat externe handel reeds voor 600 v.Chr. werd gereguleerd, toen de export van de Etruskische goederen het grootst was. *Emporia* werden gesticht in Midden-Italië en enkele heiligdommen functioneerden als trefpunt tussen de verschillende economische systemen omdat asiel kon worden verleend aan Phoenisische en Griekse handelaren en andere tussenpersonen. Het lijkt alsof handelsvrijheid veranderde in gereguleerde handel in de decennia rond 600 v.Chr. Dit is waarschijnlijk een teken van bewust beleid omdat de toenemende import van goederen een bedreiging vormde voor de interne verhoudingen. Dit beleid hield in dat het grafritueel werd aangepast in *Latium Vetus*. De begrafenis werd niet meer gemarkeerd door het bijzetten van goederen. Daarnaast werden *emporia* gesticht in Etrurië op neutrale locaties langs de kust. In *Latium Vetus* wordt de import van Phoenisische en Griekse goederen aan banden gelegd en in Etrurië wordt deze periode gekenmerkt door de ontwikkeling van overslagplaatsen, zoals *Pyrgi*, Gravisca en Regisvilla. De *emporia* worden gekenschetst door monumentale heiligdommen en verduidelijken dusdanig, dat externe handel plaatsvond in een geritualiseerde omgeving aan de rand van het territorium van de Etruskische stadstaten *Caere*, Tarquinia en Vulci. De hypothese van gereguleerde handel tussen Midden-Italië en gebieden overzee wordt onderbouwd door de duidelijke scheiding in uitwisselingsmechanismen. Griekse munten werden in de 5de eeuw v.Chr geaccepteerd in de *emporia* maar vervolgens niet gebruikt voor interne handel. In de Etruskische handelsnederzettingen vertegenwoordigden deze munten slechts een bepaalde hoeveelheid edelmetaal. Een dergelijke gang van zaken duidt op een doelbewuste politiek om het maatschappelijk bestel te beschermen tegen verdergaande introductie van het marktprincipe. Echter, de kracht van de economie in Midden-Italië werd niet bepaald door handel met overzeese gebieden maar door een verdere ontwikkeling van de interne markt en regionale handel tussen de verschillende stadsstaten. De regionale uitwisselingssystemen waren essentieel voor de laat-7de en 6de eeuw v.Chr. In dit opzicht vond er een ommekeer plaats omdat de decennia rond 700 v.Chr worden gekenmerkt door import van luxegoederen uit gebieden overzee. In de loop van de 7de eeuw v.Chr. werden meer en meer van deze goederen geïmiteerd in lokale werkplaatsen. De productie van deze lokale werkplaatsen veranderde stapsgewijs door toenemende standaardisatie van luxegoederen tot gebruiksgoederen. Deze omslag vond plaats vanaf ongeveer 650 v.Chr. en tekent de kracht van de plaatselijke economie. Vanaf die tijd kan men een voortgaande devaluatie waarnemen van goederen die in een werkplaats werden geproduceerd. Deze waardevermindering is het best gedocumenteerd in de ijzeren voorwerpen en het *bucchero*-aardewerk, maar betrof ook andere groepen voorwerpen. Depreciatie nam toe naarmate de productie zich intensiveerde door grotere en toenemende aantallen werkplaatsen. Zo is in dit boek de clustering van werkplaatsen gedocumenteerd vanaf de 6de eeuw v.Chr. Clustering bewijst dat een verdere schaalvergroting van de lokale productie had plaatsgevonden. Dit moet de waarde van de gemaakte goederen hebben beïnvloed. Het proces van waardevermindering moet medebepalend zijn geweest voor de verdere ontwikkeling van werkplaatsorganisatie en de werkomstandigheden.

Voor Midden-Italië blijft het enigszins een raadsel hoe de toegenomen lokale productie werd verhandeld. Het is niet bekend hoe lokale markten zich manifesteerden. Markten vereisen een reguliere openbare locatie. Het is duidelijk dat enkele Archaïsche heiligdommen zijn geassocieerd met vroege markten. De *emporia* langs de kust van Etrurië functioneerden als markten voor handel met overzeese gebieden. Omdat deze overslagplaatsen eveneens worden gekenmerkt door monumentale heiligdommen, wordt het aannemelijk dat priesters een rol speelden bij uitwisseling via het marktprincipe. Echter, voor de belangrijkste steden in Etrurië moeten de vroege markten voor interne handel nog worden bepaald. In *Latium Vetus* fungeerden enkele heiligdommen gedeeltelijk als de reguliere locatie waar markttransacties konden plaatsvinden. Het hoofdheiligdom te *Satricum* is hiervan het meest aperte voorbeeld. Naast een grote rijkdom aan offergaven, zijn bij dit heiligdom vroege maten en gewichten gevonden, waaruit ik concludeer dat de religieuze ambtsdragers feitelijk instonden voor de vroege markthandel met behulp van maten en gewichten. Andere heiligdommen in *Latium Vetus*, die kunnen worden gerelateerd aan het heiligdom te *Satricum*, zijn die te St. Omobone in Rome en te St. Cecilia in Anagni. Deze heiligdommen zijn omschreven als `*emporium*-heiligdommen', maar ik acht zo'n omschrijving niet in overeenstemming met de kenmerken van *emporia*. *Emporia* worden namelijk gekarakteriseerd door een locatie aan open wateren en handel met overzeese gebieden. Volgens mij zijn deze heiligdommen meer betrokken bij interne uitwisseling van goederen van diverse herkomst, dan bij handel met overzeese gebieden. Daarom stel ik voor dit soort heiligdommen te omschrijven als vroege *fora*. Immers deze locaties combineren religieuze, openbare en marktfuncties zoals de meer monumentale *fora* uit de latere eeuwen. Deze hypothese wordt onderbouwd door de aard van de offergaven te *Satricum*. Import uit overzeese gebieden is altijd in de minderheid geweest te *Satricum*, zelfs in de periode waarin handelsvrijheid gold. Deze importen verdwijnen echter gedurende de 7de eeuw v.Chr. De kentering komt overeen met de veranderende handelscontacten. In de loop van de 7de eeuw v.Chr. worden de `internationale' contacten omgezet in interregionale en regionale handelscontacten. Dit correspondeert met de toenemende regulering van de handel met overzeese gebieden in de decennia rond 600 v.Chr., zoals ik hierboven heb beargumenteerd. De gewijzigde handelsstromen komen overeen met de aard van de offergaven in andere heiligdommen in *Latium Vetus*. Gedurende de 6de eeuw v.Chr. worden importen uit overzeese gebieden zeldzaam in *Latium Vetus*. Een ander aspect van vroege markten is de architecturale vorm die zij aannamen. De monumentale kenmerken van latere *fora* zijn tempels te midden van een plein met zuilengalerijen omringd door winkels, zoals is aangetoond door de ontwikkeling van het heiligdom te Gabii. Een vroege manifestatie van deze vorm is volgens mij tempel B te *Pyrgi,* waar rond 500 v.Chr. het zuidelijk tempelgebied werd afgesloten met een rij van 20 aaneensluitende kamers. Een ander voorbeeld van een tussenstadium naar het klassieke *forum* zou de laatste reconstructie van het tempelgebied te *Satricum* kunnen zijn. Rond 500 v.Chr. werden de grote woningen met binnenhof vervangen door een soort *stoai* of zuilen-gangen. In Midden-Italië vond uitwisseling via het marktprincipe niet alleen plaats rondom enkele van de heiligdommen, maar ook bij werkplaatsen. In dit boek is dat aangetoond voor de werkplaatsen te *Pithekoussai, Satricum* en Marzabotto.

Gedurende de 6de eeuw v.Chr. nam de productiviteit van de werkplaatsen verder toe. Deze groei werd gedragen door bevolkingsaanwas, stijgende vraag en het urbanisatieproces. De werkplaatsgebouwen en de benodigde installaties namen in omvang toe, zoals in hoofdstuk 2 en 3 is aangetoond. Daarnaast is voor deze eeuw clustering van werkplaatsen aangetoond. Het ontstaan van werkplaatsen met een meester-gezel-verhouding is plausibel. Niettemin, de meeste arbeid binnen werkplaatsen vond plaats in familieverband. Het huishouden was en bleef de belangrijkste economische eenheid omdat de faciliteiten voor productie zijn aangetroffen in of rondom individuele woningen. De aanleg in Midden-Italië van verscheidene kleine wijken met ambachten bewijst dat urbane groei werd gereguleerd. Tevens documenteert de clustering van werkplaatsen dat de regionale markten krachtig toenamen. Handel met overzeese gebieden verminderde vanaf ongeveer 550 v.Chr. Economische groei door externe expansie vlakte af en interne conflicten zijn aangetoond door het verdwijnen van verscheidene centra. De toenemende rol van plaatselijke veroveringen geeft aan dat centrale sturing steeds prominenter werd, maar ook dat de aandacht van de politieke bovenlaag verschoof naar interne aangelegenheden. Dit wordt aangetoond door inkrimping of zelfs verdwijning van diverse nederzettingen die in deze studie zijn geanalyseerd, zoals Poggio Civitate, Acquarossa, Laurentina-Acqua Acetosa, *Satricum* en de nederzetting bij het Lago dell'Accesa. Vanaf 550 v.Chr. werd hun lot in toenemende mate bepaald door de politieke macht van de primaire centra. Vooral het verdwijnen van Laurentina-Acqua Acetosa is veelzeggend, omdat dit kan worden gerelateerd aan de opkomst van Rome. Rond 500-450 v.Chr. moet Rome een positie in *Latium Vetus* hebben bekleed die vergelijkbaar is met de machtigste primaire centra in Etrurië.

De 5de eeuw kan worden beschouwd als een eeuw waarin de veranderingen uit de vorige periode worden geconsolideerd, ook al leidde de toe-eigening van land door enkele vooraanstaande families tot sociale onrust. De lagere standen in de steden konden niet langer in toom worden gehouden door een algehele economische vooruitgang. In de voorafgaande eeuwen werd toenemende vraag beantwoord met toenemende productie en *vice versa*. Dit proces werd ondersteund en gereguleerd door groeiende sociale complexiteit. Toen dit mechanisme van toenemende vraag en aanbod niet langer functioneerde, leidde dat tot spanningen tussen de verschillende sociale groepen. Dit zal de positie van ambachtslieden hebben aangetast. Een sterke economische groei wordt kenmerkend voor Noord-Etrurië terwijl in Zuid-Etrurië het economisch niveau van de Archaïsche periode werd gehandhaafd. Het schijnt alsof in Etrurië de primaire steden met hun ommelanden in economisch opzicht meer en meer autarkisch werden. De sociale bovenlaag in deze vroege stadsstaten lijkt voornamelijk geïnteresseerd te zijn geweest in het versterken van interne machtsverhoudingen. Import uit overzeese gebieden werd zeldzaam en uitwisseling via het marktprincipe bleef beperkt. Lokale werkplaatsen waren waarschijnlijk direct betrokken bij de uitwisseling van de geproduceerde goederen. Rome, als politieke macht, vergrootte zijn territorium en overheerste geleidelijk de rest van *Latium Vetus*. Uiteindelijk zou zij de belangrijkste machtsfactor worden in geheel Midden-Italië.

APPENDIX Iron artefacts that are recorded at *Satricum*

In the appendix, the iron artefacts from the three archaeological contexts of the Iron Age/Orientalising Period at *Satricum* (sanctuary, necropolis and settlement), are described. These descriptions are based on the following literature:
Votive deposit I: *Giornali* by Fenelli; translated by Nijboer,
Iron age Necropolis: Waarsenburg 1994; Ginge 1996
Settlement context: Maaskant-Kleibrink 1987; 1992 and Nijboer 1994;

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, are not recorded every day and the workers are excavating at various places and at several depths, which could be indicative for the deposition as assemblages.
The original handwritten Italian text is 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.
-Ax without socket, length 120 mm, width 95 mm.
-Part of another ax, length 135 mm, width 95 mm.
-Ring, preserved diam. 17 mm.
-Butt-spike without point, length 170 mm.
-Socket of a lance, length 160 mm.
-A circular ingot, in the centre of which there is a hole, maybe 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.
-Iron, 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 pieno*.
-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, lenght 320 mm.
-Some fragmentary nails.
February 20.
-Iron *sterratore** fragmentary, length 140 mm.
-Ax, 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.
-Four fragments of blade of knives.
-Six *puntali* (shaft-tips) of lances, nearly all fragmentary.
-Many shapeless pieces.
February 24.
-Semicircular, 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 ingrossato* 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. mm 50.
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 O.58 m.
March 23
-Iron, fragments of lances
March 26
-Iron, *sterratore d'aratio**, length 110 mm.

Last entry of this campaign is made on May 4, 1896. Fenelli recorded in 1896, about 65 iron objects from votive deposit I, apart from remarks as *molti pezzi informi, frammenti di lancie* and *molti chiodi*. Figures 50 to 56 total 148 iron artefacts from this deposit. The omission of quite a few iron artefacts found in votive deposit I, can be explained by the simultaneous excavations of the necropolis area from onwards April 7th. These excavations had to be recorded by Fenelli as well, which created serious difficulties for the registration.[1]
The descriptions by Fenelli are accurate and most objects he described can be related to individual objects of Figures 50 to 56.

* *Sterratore* and *sterratore d'aratio*: Fenelli used either of these designations seven times and I cannot 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 Figures 50 to 56 looks like one, see for an image of a ploughshare, the famous statue of the *Aratore di 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 the metal points, Figures 53 and 54, no.s: 86 to 97.

[1] Waarsenburg 1994, 45-6.

IRON FROM THE NORTHWEST NECROPOLIS AT *SATRICUM*

The inventory numbers are the Villa Giulia numbers.

Tomb II (between c. 700/685 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 *Giornale* mentioned two iron lance heads with their relative butt-spikes from the west corridor; reconstructed from the *Giornale* are seven or eight iron lances and seven butt-spikes; the inventorybook describes
-eleven lance heads; inv. 11985,
-two butt-spikes *di forma 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; double edged sword, inv. Cer/sn-73; l.max. 7.9; w. 4.2-4.4,
-circular plaque; thick iron plate conssiting 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,
-spine (of grip?); oblong fragment of iron with roughly rectangular section; inv. II/unit 3/sn-8; 1.7 x 2.1 x 0.6.

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 sheating; 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 glaze; inv. 12067; l. 3.8 and 5.1; diam. 0.85; iron shaft with turquoise glaze.

Tomb XIV (c. 675-650 BC):
-lance head; inv. 12145; l.max. 17.3; w.max. 3.9,
-lance (?); inv. 12147; l.max. 3.6-6.4 (?),
-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 finial of the sheath; inv. 12146; l.max. 13.6; estimated total lenght c. 30; pommel diam. 6.6.

Tomb XIX bis (c. 690/675):
-iron object, decayed; inventory book: *cuspide di lancia in ferro*; 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 butts (?); oblong conical hollow tubes; inv. 12235; l.5.2-7.4; diam. shaft 2.3-2.8.
I consider these objects to be pendants, for parallels see votive deposit I, Figure 50; no.s 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.max. 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; *schede*, 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).

In between 1907 and 1910, about 30 tombs were excavated from the Northwest Necropolis, which is published by Ginge.[2] 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 III and/or IV a.; 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.

[2] Ginge 1996.

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 exacavated 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 IIa, 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/near an activity area with associated finds as a stand, spools and bone and antler showing knife cuts.[3]

In Square B 18 were found:
-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 found 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.[4]

[3] Maaskant-Kleibrink 1992, 69-70; 94-98.

[4] Nijboer 1994, 9.

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