

ANALYSING POTTERY

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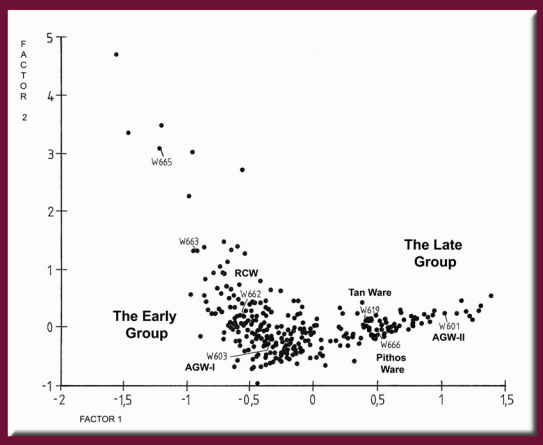

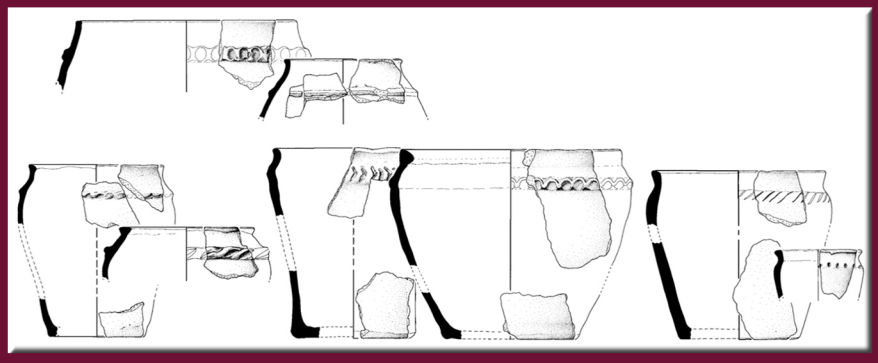

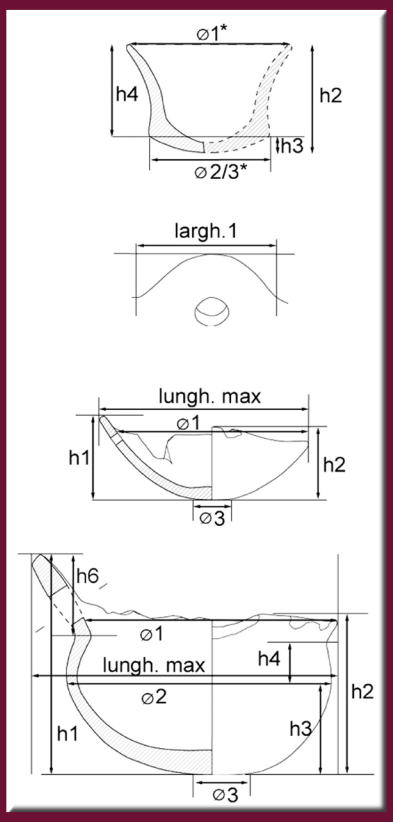

edited by

Barbara Horejs – Reinhard Jung – Peter Pavúk

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Preface

Archaeologists working on ceramic finds from long-term, large-scale excavations all face similar problems: heaps of pottery from hundreds of contexts of diverse quality, more often than not re-deposited in a secondary or even tertiary position. There can be no general approach since each site has its own specific characteristics, be it a flat settlement lasting just a couple of generations or a tell-settlement in use for millennia. Likewise, pottery with simple or no decoration must be viewed from a different perspective than pottery with complex decoration. Hand-made pottery will pose different problems to mass-produced wheel-thrown ceramics and sherds from a settlement must be treated in yet another way than whole pots from a cemetery.

It was, therefore, our intention to produce an edited volume offering fresh insight into modern approaches to processing large amounts of ceramic finds from settlement excavations, going 'back to basics' so to speak. The volume focuses on archaeological practice and more specifically on factors that determine the methodological choices made by researchers under specific working conditions. In other words: which methodological approach is appropriate to which kind of ceramic assemblage and for which type of stratigraphic context, especially if the analysis is supposed to be completed in a reasonable period of time. The choice of a suitable method also depends on the questions for which we seek answers by analysing the material: chronology, pottery production and use, social structures etc.

We believe that there is no general answer to these questions and that a methodological pluralism is justified by the specific problems which arise from the nature of the material and its archaeological contexts. Nevertheless, by concentrating on practical case studies it should be possible to assemble a list of conditions that determine which methods of analysis – and especially which statistical methods – can be employed in order to analyse most effectively certain kinds of pottery from certain types of contexts.

At this stage the volume can look back at a history of its own. Initially, a group of young archaeologists working in Slovakia, Austria and the Czech Republic met for a two-day workshop in Bratislava on 28th-29th November 2003, funded by the Österreichisches Ost- und Südosteuropa-Institut. We then attempted to bring the topic to a pan-European level and organised a session at the XII. Annual Conference of the European Association of Archaeologists in Cracow held on 22nd September 2006. Finally, to round off the issue thematically and geographically, other colleagues were invited to contribute to the volume, along with the participants at the two meetings. We are now pleased to offer perspectives ranging chronologically from the Bronze Age down to the Early Middle Ages and geographically covering the Aegean, Anatolia, the Levant, Egypt, as well as Central Europe. It was decided to arrange the volume by subject, which in the end proved a daunting task since many contributions covered several aspects and were not easy to categorise.

Even if a specific model developed for a particular site cannot be applied en bloc to other sites, there is always something inspirational about other people's models. We therefore humbly hope to offer some inspiration with the contributions collected in this volume.

Bratislava, Salzburg and Vienna, 20.11.2009

The quantification of amphorae from Roman Sagalassos, Southwest Turkey

MARKKU CORREMANS, JEROEN POBLOME, PHILIP BES, MARC WAELKENS

In January 2006, a research project[1] was initiated on the role of Roman and Early Byzantine provincial towns as production, consumption and redistribution centres, with the site of Sagalassos (southwest Turkey) and its territory acting as a case study. The main aim of this research project is to establish the mutual relationship between the city and its territory in terms of the exchange of imported and locally/regionally produced goods (i.e. raw materials, artefacts and subsistence goods) and how this relationship may have changed in the course of time. Within the framework of this project the material category of ceramics, and *amphorae* in particular, is also being studied. As a result, large amounts of pottery were reprocessed for the reconstruction and interpretation of find assemblages during the summer of 2006. Thus far, special attention has been given to *amphorae*, be they local, regional or imported, as these are good indicators of exchange between Sagalassos, its hinterland, the wider region and the eastern Mediterranean in general. Hence, the study of the *amphorae* from Sagalassos has become a specific research topic within the *Sagalassos Archaeological Research Project*.

With this paper we have two goals in mind. Firstly, to give an account of our search for a fitting quantification method and the theoretical and practical issues we encountered while processing the *amphorae* from several contexts at Sagalassos. Secondly, we would like to present the first results of this quantification process, carried out at two excavation areas within the town of Sagalassos. By doing so, we will illustrate how relatively insignificant the occurrence of imported *amphorae* is in the overall balance of exchange of an inland provincial town, such as Sagalassos.

The study material derives from several deposits in two different areas of the city. Firstly, we re-examined the ceramic material from two early excavations in the area of the *Neon Library* in the northern part of the town – one dating from the 2nd half of the 1st c. AD (*Site L*) and another from the 3rd quarter of the 4th c. AD (*Site N*). Secondly, we took a closer look at deposits originating from a large 5th c. AD urban mansion situated in the eastern domestic area of the town (Fig. 1). By processing the material from these sites we were able to take a closer look at the presence of local/regional and imported *amphorae* in Sagalassos, and as such to have a first glance at the nature and extent of exchange between Sagalassos, its wider region and the Mediterranean.

[1] The project with reference number G.0421.06 is financed by the *Fund for Scientific Research* of the Flemish Community.

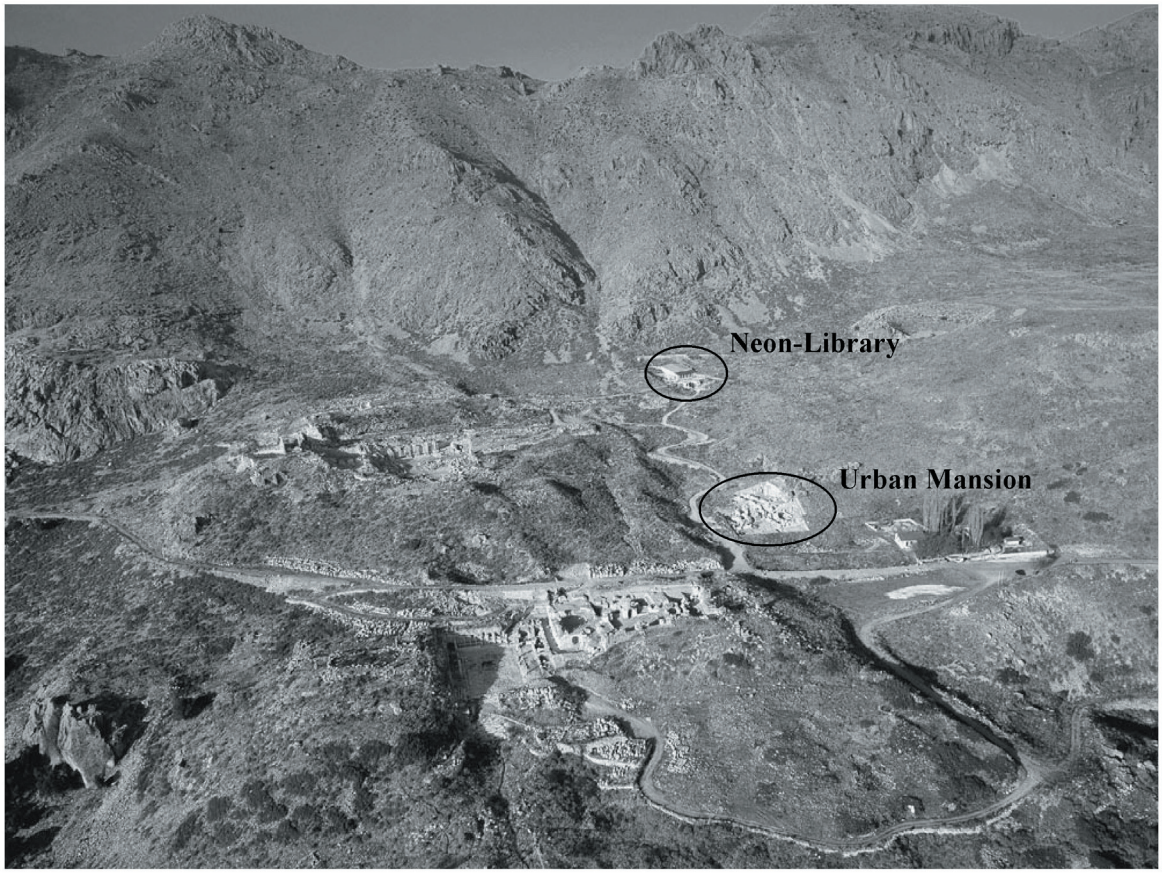


Fig. 1. *Aerial view to the north of the city of Sagalassos, with indication of the Neon-Library and the Urban Mansion (© Atlas Dergisi)*

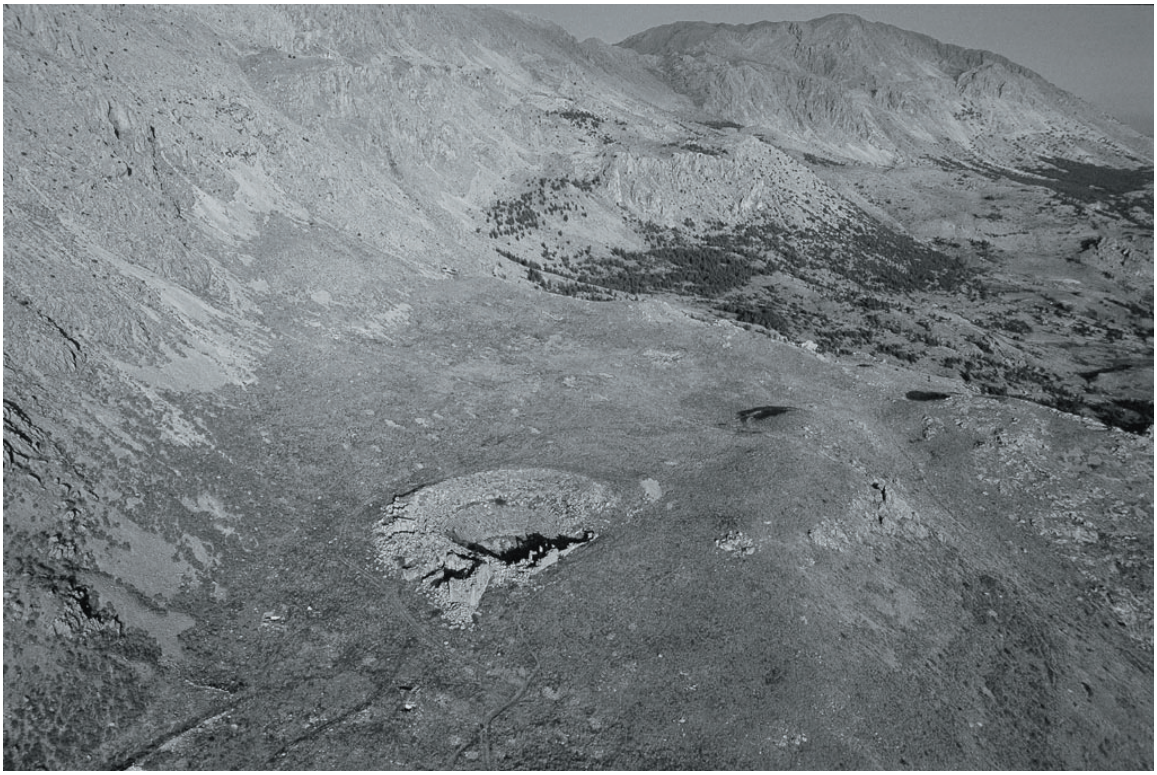


Fig. 2. *Aerial view to the northeast of the Potters' Quarter in the eastern necropolis near the theatre (© Atlas Dergisi)*

Sagalassos and its pottery

Sagalassos is located in southwest Turkey, in the western range of the Taurus Mountains, approximately 110 km to the north of Antalya. The site is situated on mountain slopes at altitudes between 1490 m and 1600 m [2]. In Antiquity, this part of *Asia Minor* was also known as Pisidia. Since 1990, excavations and surveys have been carried out by the *Katholieke Universiteit Leuven*, under the direction of Marc Waelkens. In 2005 a large Classical/Hellenistic settlement was discovered at Tepe Düzen, a hill 1.8 km southwest of the town of Sagalassos[3]. On the basis of ceramological research there are strong indications for a contemporary occupation of Sagalassos and Tepe Düzen. While the latter was gradually abandoned[4], the part of Arrian's *Anabasis* that mentions the capture of Sagalassos by Alexander the Great in 333 BC, refers to the actual town of Sagalassos being besieged[5]. After its conquest, the town became part of a sequence of Hellenistic kingdoms until 129 BC, when Sagalassos was incorporated into the new Roman *Provincia Asia*[6]. Prosperity and stability, which once again reigned over Pisidia, would come to an end in 89 BC with the outbreak of the Mithridatic Wars. It was not until 63 BC that Mithridates was finally defeated. Stability returned when Amyntas was appointed king of an artificial kingdom, located in southern Phrygia and northern Pisidia (39 BC), and eventually also of Galatia (36 BC), and as such also ruled over the town of Sagalassos. In 25 BC, following the death of Amyntas, Pisidia once again became part of the Roman Empire[7]. As a result of the *Pax Romana*, Sagalassos became an important socio-economic centre in the region. Fertile lands generating cash crops such as grain and olives and efficient cattle breeding seem to have contributed to the economy[8]. In 6 BC, the *Via Sebaste* linked Sagalassos with the Pamphylian harbour towns and the already existing Anatolian road system, thereby facilitating transport to and from Sagalassos. The improvement of this road system and the settlement of several colonies of Roman army veterans in Pisidia seem to have boosted regional economic growth as well[9]. At the same time, these favourable economic conditions appear to have been an impetus for the development of artisanal activities, which took place in the so-called *Potters' Quarter*, a large artisanal area to the east of the theatre of Sagalassos, in the same area as a contemporary necropolis (Fig. 2)[10]. Although there is evidence that production already started in the Early Hellenistic period, it was not until the 2nd half of the 2nd c. BC that the production of Sagalassos tableware really took off[11]. By the Early Imperial period the production of *Sagalassos red slip ware* boomed and attained the level of a manufactory[12]. The tableware crafted by the potters of Sagalassos was technologically and stylistically of similar quality as other well-known categories of *sigillata*. Yet, the distribution of *Sagalassos red slip ware* remained predominantly regional, although it has been found at several sites across the Eastern Mediterranean and beyond[13]. While other *eastern sigillata* was reduced to playing a role on a regional level or disappeared altogether by the late 2nd – early 3rd c. AD, *Sagalassos red slip ware* continued to be produced into the 7th c. AD. Throughout its existence it seems to have enjoyed a regional monopoly and its market appears to have been sufficient to maintain mass

[2] Paulissen et al. 1993, 230; Waelkens et al. 1997, 227–229.
[3] Vanhaverbeke et al. in press; Poblome 2006a, 355 f. Pottery sherds found among the urban survey material possibly date the earliest origins of Sagalassos to at least the (Late?) Bronze Age. To confirm this earlier origin of Sagalassos further excavations and subsequent research will be necessary.
[4] The reasons for this move might have been the disappearance of natural springs on the karstic plateau of Tepe Düzen, on which the former town was located, and the abundance of natural springs in the area of the new town of Sagalassos. Poesen et al. 1995, 342–345; Waelkens et al. 1999, 699 f.; Waelkens et al. 2000b, 263–265; Martens 2006, 165.
[5] Arrianus, *Anabasis*, I.28.2.
[6] Mitchell 1993, 72; Waelkens 1993, 40–45; Waelkens 2002, 314; Waelkens 2004, 448.
[7] Mitchell 1993, 72 f.; Waelkens 1993, 45; Waelkens 2002, 314.
[8] Waelkens et al. 2000b, 266–268.
[9] Mitchell 1993, 73–77; Waelkens 2002, 322 f.
[10] Poblome et al. 2000, 39; Poblome et al. 2002, 335. Remains of major quarrying operations, several ceramic dumps and two pottery workshops were discovered during surveying and excavation activities at the *Potters' Quarter*. Moreover, geophysical surveying has brought to light many more kilns and structures associated with the manufacture of pottery. Poblome 2006a, 357.
[11] Poblome 2006a, 356.
[12] Poblome et al. 1998, 57–63; Poblome et al. 2001, 146 f. 159–164; Poblome et al. 2002, 335. For an explanation of the terminology, see Peacock 1982.
[13] *Sagalassos red slip ware* has been unearthed in places as remote as Nubia and Italy. Poblome et al. 2002, 335.

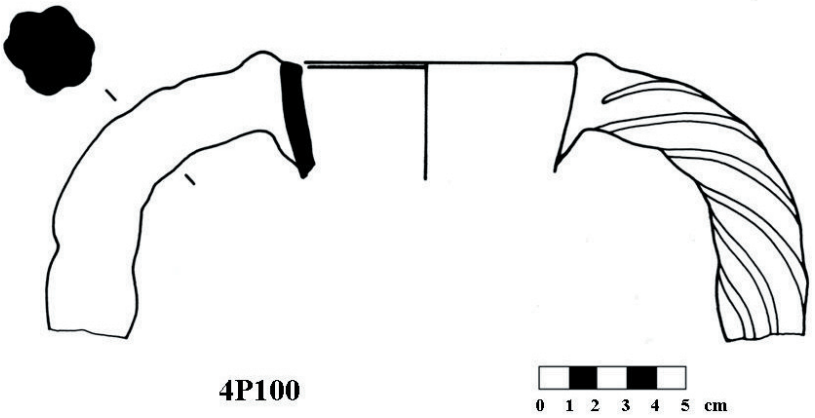
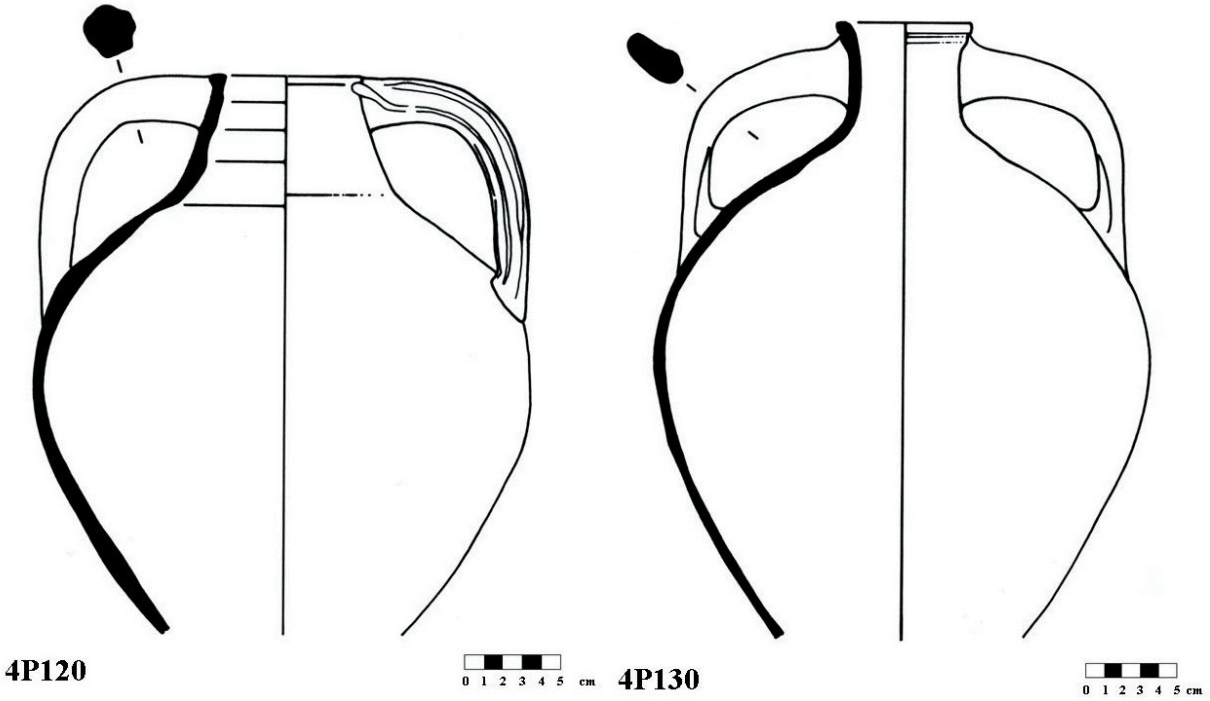


Fig. 3. *Local/regional 4P100 amphora*



Figs. 4–5. *Local/regional 4P120 amphora (left) and 4P130 amphora (right)*

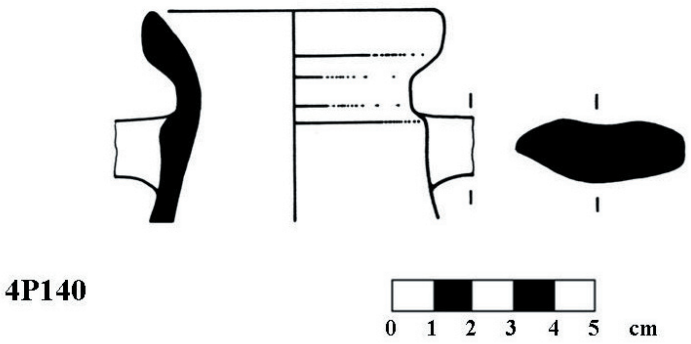


Fig. 6. *Local/regional 4P140 amphora*

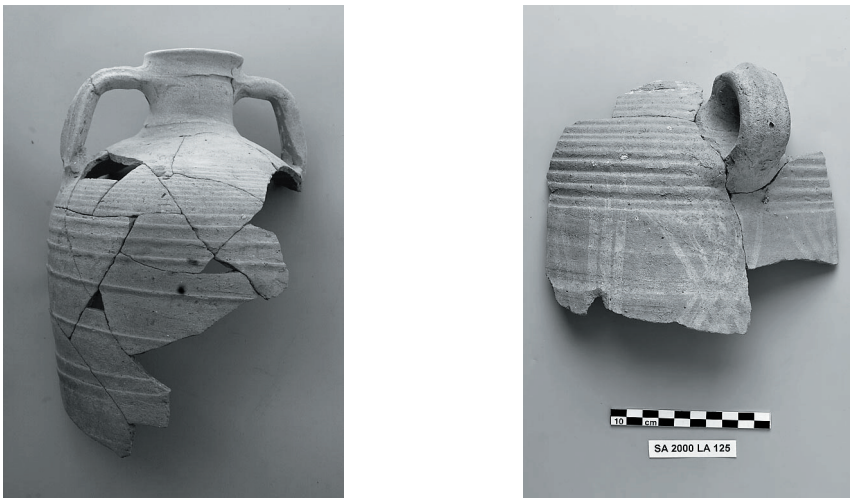
production[14]. As regards the other functional pottery groups, their production seems to have gained momentum around AD 120–160, when a vast building programme culminated in the construction of the *Roman Baths* of Sagalassos[15]. By that time a wide range of ceramic products – including bricks, tiles, water conduits, *pithoi*, storage vessels, cooking vessels, jugs, jars, oil lamps and figurines – were being produced. From the 6th c. AD onwards, signs of urban decline started to leave traces in the archaeological record. A major earthquake, dated to between AD 540 and AD 620, seems to have accelerated this process of deterioration[16]. Nevertheless, pottery production did continue into the 7th c. AD[17] and small pockets of the town remained inhabited as hamlets of the *kastron*-type until the 13th c. AD[18].

The local/regional and imported amphorae at Roman Sagalassos

For the Roman period a total of five main local/regional pottery fabrics were distinguished in and around Sagalassos. *Fabric 1* was primarily used for *Sagalassos red slip ware*, the table ware of Sagalassos, but was also sporadically used as the basic material for jars, jugs and a small proportion of the Sagalassian *amphorae*. *Fabric 2* was the predominant fabric for storage vessels, basins and *mortaria*. For bricks, tiles and water conduits *Fabric* 3 was the principal component. The main source of material for *amphorae* was *Fabric 4*, which was also the fabric commonly used for cooking ware, jugs and jars. Finally, *Fabric 5* was the fabric conceived for the manufacture of large *pithoi*[19].

Fabric 4 is a coarse fabric, which is hard to very hard and yellowish red to red in colour. It has a harsh, sometimes powdery feel and a hackly fracture. Inclusions are sparse to common and are dull white (lime) to deep red (crushed ceramics) in colour. Occasionally, shiny whitish or yellowish inclusions (mica) as well as glistening black inclusions (grit) occur. Mostly, no surface treatment is visible, but the surface can be wiped or smoothed on occasion[20]. A preliminary archaeometrical fabric analysis, indicating the use of ophiolitic clays from the *Potters' Quarter* and flysch clays from the immediate vicinity of the site of Sagalassos[21], as well as the presence of crushed locally produced *Sagalassos red slip ware* as a component of the grog used[22], suggests that the manufacture of *Fabric 4* wares took place in the *Potters' Quarter*. Yet remarkably, no traces of a local production of *Fabric 4* common wares, cooking wares, architectural ceramics or *amphorae* have ever been recorded there. Moreover, the macroscopic study and classification of *Fabric 4* pottery, originating from a variety of chronologically differing deposits, brought to light a previously unnoticed macroscopical compositional diversity[23]. These factors led us to suggest that the clays were obtained from different areas across the territory, and that the production of *Fabric 4 amphorae* and other wares such as cooking vessels, jars and jugs took place elsewhere, as a function of the territory catering to specific urban needs. In this scenario the manufacture of *Fabric 4 amphorae* would have taken place in a multitude of rural workshops and estates which would have been situated close to the locations where their intended contents were being processed[24]. *Fabric 4* pottery has been found in contexts ranging in date from Early Imperial to Early Byzantine times. *Fabric 4 amphorae* have been attested from the 2nd half of the 4th c. AD onwards and therefore are not present in the Early and Middle Imperial assemblages. Therefore, *Fabric 4 amphorae* do not appear in deposits, which predate the backfilling of the *Neon Library*[25]. Morphologically, four types

[14] Poblome 2006b, 201–207.
[15] Poblome 2006a, 356. This picture of the development of pottery production in Sagalassos is yet to be confirmed by the analysis of new contemporary strata.
[16] De Cupere et al. 2009, 4; Waelkens et al. 2006.
[17] Vionis et al. forthcoming.
[18] Martens 2006, 166.
[19] Poblome 1999, 27–246. 341–438; Degeest 2000, 78–87. 109–174. 344–389.
[20] Degryse et al. 2000, 709 f.
[21] Degryse et al. 2000, 715–719.
[22] Degryse et al. 2000, 719.
[23] Poblome et al. 2008, 1002.
[24] Poblome 2006a, 359; Poblome et al. 2008, 1002. Residue analysis carried out by Kerlijne Romanus has already identified wine, olive oil and walnut oil as contents. Romanus et al. 2007; Romanus et al. in press.
[25] Poblome et al. 2008, 1002.



Figs. 7–8. *Fragments of a Late Roman 1 amphora (left) and a Late Roman 5/6 amphora (right), found at Sagalassos*



Fig. 9. *View to the northeast of the Neon-Library with dedicatory inscription above the niches*



Fig. 10. *View to the southeast of the Atrium (Room XLV) of the Urban Mansion of the eastern domestic area*

of *Fabric 4 amphorae* have been distinguished in the reprocessed 4th c. AD backfill deposits. Each type of *amphora* is ovoid in shape, with its largest width predominantly near the shoulder of the vessel. Bases are preserved only rarely, and almost always have a flat or somewhat concave shape. Necks are rather short and for the most part constricted. Handles are usually attached from neck to shoulder and are mostly of the short type. Differences between the four types usually occur on the rims or handles. The shape of the rims is fairly heterogeneous, ranging from open to closed and from rounded to straight. Rims are also sometimes plain or thickened on the outside. In some cases they are collared or show an inner ledge or an outer flange. Also, the shape of the handles shows quite some variation. The most distinctive type of *amphora* possesses twisted handles (4P100). Other types of *amphorae* have multiple-ridged handles (4P120), single-ridged handles (4P130) and lunular handles (4P140) (Figs. 3–6)[26]. *Amphorae* with multiple-ridged handles are most frequent in the *Neon Library* deposits[27]. As to the conceptual origin of the *Fabric 4 amphora*, there are strong morphological indications that it was inspired by the *Late Roman 1 amphora*, which commonly circulated in the eastern Mediterranean from the middle of the 4th c. AD onwards[28].

Fabric 1 is hard and has a conchoidal to smooth fracture. The core is usually red to yellowish red in colour. The feel of the fabric is always smooth. Except for rare tiny voids and small limestone fragments, inclusions are absent[29]. In general, *Sagalassos red slip ware* is always slipped, while storage jars, *amphorae* and other closed vessels can be fully slipped, partially slipped or not slipped at all. *Fabric 1 amphorae* are mainly found in Late Imperial to Early Byzantine assemblages, although there are indications for earlier types[30]. As is the case with *Fabric 4 amphorae*, *Fabric 1 amphorae* show quite some variation as well[31]. Rims can be everted, flattened, thickened, rounded, collared, folded or flaring. Necks are straight, conical or concave. Handles are mostly rounded, can have single or multiple ridges and can appear as vertical or in rare cases as horizontal loop handles. Necks, rims and shoulders can show single or multiple grooves. Slip is mostly orange in colour and is not always applied in a regular way. Both wide-mouthed *Fabric 1 amphorae* and *Fabric 1 amphorae* with constricted necks appear in the archaeological record. Bases are preserved only on rare occasions. If so, they are of the slightly rounded or flat type. Bodies can be ovoid, bag-shaped, round or pear-shaped[32].

As to the imported wares, only preliminary information is available. Although some fabrics are identifiable as imports, the provenance of most can not yet be determined[33]. The Early Byzantine imports include miniature jugs[34], Late Roman *unguentaria*[35] and a range of *amphorae*. *Late Roman 1 amphorae* from Cilicia and/or Cyprus (Fig. 7)[36] and *Late Roman 4 amphorae* from the area of Gaza[37] were identified in some quantity, along with a few *Late Roman 3 amphora* fragments[38], remains of Syro-Palestinian *Late Roman 5/6 amphorae* (Fig. 8)[39] and an almost complete *amphora* imitating an *Agora M334 amphora* which probably originates from Anemourion[40].

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[26] For the concept behind the numbering used in the typology, see Poblome 1999, 27–29; Degeest 2000, 109. For a more detailed account of the morphology of *Fabric 4 amphorae,* see Poblome et al. 2008, 1002–1003.
[27] Poblome et al. 2008, 1003.
[28] Peacock–Williams 1986, 185–187; Piéri 2005, 70–77; Poblome et al. 2008, 1004–1006.
[29] Poblome 1999, 27; Degeest 2000, 79–91.
[30] See also Degeest 2000, 253–257.
[31] Although *Fabric 1 amphorae* are present in the assemblages, have been recognised as such and are an integral part of the quantification results, the typology of the *Fabric 1 amphorae* is not the subject of this article. Further research will be necessary in order to enable us to construct a fitting typology.
[32] See also Degeest 2000, 117–124. 347 Fig. 80.
[33] We are in the process of conceiving a comprehensive reference collection for imported fabrics supported by archaeometrical analyses.
[34] Degeest et al. 2000.
[35] Degeest et al. 1999; Degeest 2000, 88–90; Piéri 2005, 140–142.
[36] Peacock–Williams 1986, 185–187; Piéri 2005, 69–85; Poblome et al. 2005, 227 f.; Putzeys 2007, 170. 175. 209. 211. 246. 393.
[37] Peacock–Williams 1986, 198 f.; Piéri 2005, 101–114; Poblome et al. 2005, 228; Putzeys et al. 2005, 234; Putzeys 2007, 170. 175. 209. 211. 393.
[38] Peacock–Williams 1986, 188. 189; Piéri 2005, 94–101; Poblome et al. 2005, 228.
[39] Peacock–Williams 1986, 216; Piéri 2005, 114–127; Poblome et al. 2005, 227 f.; Putzeys 2007, 376.
[40] Robinson 1959, 115; Poblome et al. 2005, 227 f.

The quantification process of amphorae at Sagalassos

Apart from the choice of the most fitting quantification method, several practical issues concerning the identification of the pottery sherds and their allocation to the different functional groups and pottery types, and a number of theoretical concerns such as the reuse of *amphorae* and other modes of packaging had to be dealt with as well.

As the number of recognisable sherds from *amphorae* is rather limited, it is sometimes difficult to make a clear distinction between *amphorae* and other vessel categories[41]. This applies for instance for large jars and *amphorae*[42]. Not only are their general dimensions similar, resulting in comparable diameters for necks and bases, moreover, it is sometimes difficult to tell whether a handle originated from an *amphora* or rather from a jar. In some cases the handles of the *amphorae* are so typical – as in the case of the *amphora* with twisted handles – that they can easily be identified as such (Fig. 3)[43]. However, this situation is more the exception than the rule. Sometimes an *amphora* can only be positively identified if both handles are still attached to the rim or if two *amphora* handles can be joined together. Without any doubt during the quantification process, certain *amphora* handles ended up as jar handles and vice versa. The same goes for the bases of the local/regional *amphorae*, which were – as is also mostly the case with large jars at Sagalassos – predominantly of the flat, carinated type. As a result, the difference between such *amphora* bases and those of large jars – or even large cooking vessels – is not always clear. In other instances, it is hard to determine the exact function of a given vessel. The globular wide-mouthed *Fabric 1 amphorae* from Sagalassos, for instance, could have been used as large water containers or *hydrias* as well[44]. Needless to say, the identification of *amphorae* at Sagalassos is not always a clear-cut task.

Some general problems concerning the significance of *amphorae* in the quantification process are also valid for Sagalassos. A general concern when dealing with the economic role of *amphorae* is determining whether other means of transporting goods were used on a large scale. Since it is not the *amphorae*, but the goods contained within that are to be considered, other modes of packaging such as leather bags and wooden barrels also have to be taken into consideration. Although this aspect is currently being studied in the Roman East, no evident indications of the use of wooden barrels are yet available – as is the case in some western provinces of the empire – while the archaeological record does not provide any evidence for the option of leather bags either[45]. Also, there is a wide variety of unprovenanced *amphorae* and common wares, which makes the task of finding and attributing imported *amphorae* a rather challenging one. Additionally, the fact that *amphorae* were recycled for secondary use and therefore are believed to have held other contents is certainly also a concern in the case of the Sagalassian *amphorae*[46]. The same goes for the fact that in some cases contents seem to have been transferred from imported *amphorae* to local *amphorae* or storage vessels[47]. Unfortunately, these processes remain difficult to detect in the archaeological record.

In addition to the practical issues and theoretical considerations that have to be dealt with, the choice of an appropriate quantification method is of critical importance. In the past, a full quantification consisting of count and weight was applied at Sagalassos, thereby following a functional pottery scheme. In the case of the common wares from Sagalassos every type of sherd was considered[48]. For the quantification of *Sagalassos red slip ware*, however, only rims were taken into account[49]. In this way, large amounts of pottery could be processed and seriated, by which a typo-chronological platform was conceived for the ongoing excavation and survey programmes. According to the current methodology at Sagalassos, rims, bases, handles and body sherds – from every type of vessel – have to be taken into account, if functional,

[41] See also Degeest 2002, 291.
[42] At Sagalassos the term jar/*amphora* was used in the past for several vessel types, Degeest 2000, 121. 160–163.
[43] Degeest 2000, 160. 379 Fig. 186.
[44] Degeest 2000, 117. 347 Fig. 80; 158 f. 377 Figs. 179–181.
[45] On the use of leather bags and wooden casks for packaging wine, see e.g. Peña 2007, 48–50.
[46] On the reuse of *amphorae* as containers, see also Peña 2007, 51. 61–118.
[47] See also Peña 2007, 49 f.
[48] Degeest 2000, 176–179.
[49] Poblome 1999, 181–183.

typological and contextual information is to be gained from certain contexts. However, if contexts merely need to be dated, only diagnostic sherds are taken into consideration. For contextual analyses, on the other hand, a full quantification is executed. Yet, in the case of the Late Roman *Urban Mansion*, only diagnostic sherds which could be attributed to a certain type, i.e. rims, bases and handles were counted[50]. As an intermediary step towards the creation of a comprehensive platform for the quantification of the pottery from Sagalassos, a broader set of categories was for the first time used in the analysis of the *Urban Mansion* material[51]. The next stage in this process was the creation of the *pottery template*. This template allows every ceramologist at the *Sagalassos Archaeological Research Project* to use one and the same processing tool, with the exact same set of parameters and enables us to record a detailed and reliable quantification of the assemblages.

The method of *Minimum Number of Individuals* (MNI) has been used only sporadically[52]. By determining the MNI, a virtual image of the ceramic record of the past can be generated. The question arises as to the extent to which such an extrapolation can be executed. In general, MNI has been considered less at Sagalassos because of the nature of the deposits. We are not only dealing with a site which has a complex abandonment history, but are also confronted with contexts predominantly belonging to construction and terracing fills, mostly as part of large public building projects. With the application of MNI these deposits give a rather disparate picture[53].

The method of *Estimated Vessel Equivalents* (EVE) has to date not been used at our site[54]. For *amphorae*, the method is not expected to produce reliable results. First of all, *amphora* rims are less representative because of their small circumference[55]. Moreover, the rim sherds of locally/regionally produced *amphorae* from Sagalassos are similar to those of several types of jars and jugs, creating a certain degree of overlap. Also, the base of an *amphora* is not suitable in this respect, as it is, in general, rather small and inconspicuous when compared to the rest of the vessel. Furthermore, the flat bases of *Fabric 4 amphorae* are comparable to the bases of *Fabric 4* jars. Additionally, bases of *Fabric 4 amphorae* are rarely found in contexts at Sagalassos, and as such, are no potential candidates for quantification by EVE. With regard to body sherds, we can only get an idea of the circumference of the vessel if a certain amount of body sherds can be joined together.

After taking into account the advantages and disadvantages of all methodologies mentioned above, the method of counting and weighing rims, bases, handles and body sherds is expected to generate the best results for the quantification of the Roman *amphorae* from Sagalassos[56].

For our reprocessing exercise, two groups of deposits originating from the *Neon Library* were re-examined during the campaign of 2006: the deposits from an area just to the north of the library (*Site L*) and the deposits from within the library itself (*Site N*). These deposits were excavated between 1990 and 1994 and were subsequently processed[57].

On the basis of a dedicatory inscription on its back wall, the *Neon Library* could be dated to shortly after AD 120 (Fig. 9), while the pottery associated with its construction phase dates to the 2nd half of the 1st c. AD[58]. It was rebuilt in the early 3rd c. AD and burnt down at the latest in the 3rd quarter of the 4th c. AD in circumstances that are not yet fully understood. In order to extinguish the devastating fire and to prevent it from spreading to other parts of the town, the destroyed and still burning library was filled with earth, rubble and material originating from artisanal waste dumps[59]. The material used to quench the

[50] Putzeys 2007, 126 f.
[51] Putzeys 2007, 66–69.
[52] MNI was used for instance on assemblages from the *Urban Mansion* at Sagalassos. Putzeys 2007, 72. 126 f.
[53] One of the best examples of a system of establishing the MNI is the French *Protocol of Beuvray*, Protocol Beuvray 1998.
[54] See Orton 1975, 30 f.; Orton 1980, 164–167; Orton 1993, 173; Tomber 1993, 148–149; Peacock–Williams 1986, 18 f.
[55] This obviously does not concern the locally/regionally produced wide-mouthed *amphorae*.
[56] From a methodological point of view, other quantification techniques can, however, be derived from data generated by rims, bases and handles.
[57] In the case of *Site N,* only part of the pottery originating from these excavations was processed for typo-chronological purposes.
[58] Waelkens et al. 2000a, 419; Poblome 1999, 287.
[59] Waelkens et al. 2000a, 425 f.; Poblome et al. 2008, 1001.

fire contained large quantities of pottery, thereby providing a *terminus post quem* for this fateful event[60]. The analysis of the common and table ware assemblages dated the material to the 1st half of the 4th c. AD, tending towards the middle of the century[61]. Yet, the backfilling operation could not have taken place before the 3rd quarter of the 4th c. AD, since the 4P120-*amphora* is believed to have been inspired by the *Late Roman 1 amphora*[62].

The deposits to the north of the library (*Site L*) were the result of a backfilling operation in the area between the northern back wall of the library and a Hellenistic polygonal wall erected just north of the library, and were located underneath the remains of a Roman house. Based on the analysis of the table ware, some of these deposits could be dated to the 2nd half of the 1st c. AD[63].

When we started reprocessing the deposits from the *Neon Library* at the beginning of the campaign of 2006, we decided to try to gain as much information as possible from the sherds, and to continue our common practice of classifying by fabric as well as by typology. As this methodology proved to be very time-consuming, the decision was taken to change the mode of processing ceramics and to only make a distinction by fabric. Only for the small proportion of sherds from local/regional and imported *amphorae*, the information derived from rims, bases, handles and body sherds was fully taken into account. The change of tactics meant a considerable gain of time and enabled us to finish all pottery we had intended to process. This was possible only because the assemblages had already been processed, dated and published previously[64] and because our specific aim was only to review the proportions of local/regional *amphorae* versus imported *amphorae*.

In order to study the representation of imported *amphorae*, contexts from the large Late Antique *Urban Mansion*, located in the eastern domestic area of Sagalassos were also quantified (Fig. 10)[65]. At the time of its greatest extent in the 5th c. AD the complex counted at least sixty-six rooms and was spread over at least seven terraces[66]. During its high days the mansion belonged to a member of the local urban elite and included a large representative wing, two private courtyards, several dining rooms, two service areas, and a private bathing complex. The complex was re-organised and rebuilt in several stages until the 7th c. AD. Although parts of the building were erected from as early as the beginning of the 1st c. AD, the main construction phases are dated to the 5th c. AD[67].

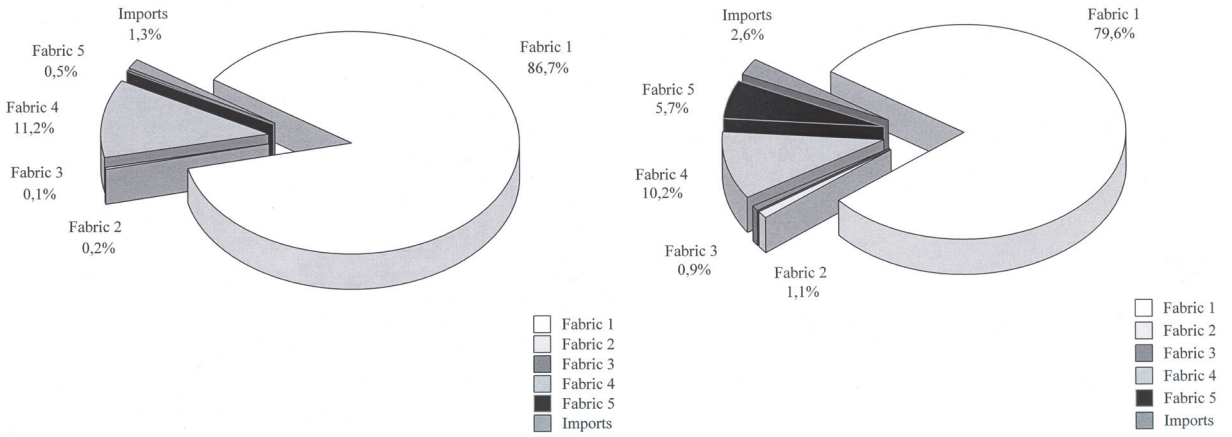
Preliminary results of the quantification process

Taking into consideration all pottery types, *Fabric 1* and *Fabric 4* are the most common fabric types found at Sagalassos[68]. The predominant local fabric recovered from the deposits to the north of the *Neon Library* (*Site L*) and from the deposits of the library itself (*Site N*) is *Fabric 1*, while the second-most common fabric type is *Fabric 4*. By count *Fabric 1* and *Fabric 4* represent 86.7 % and 11.2 % of all the ceramic material at *Site L* (2nd half of the 1st c. AD) and 74.1 % and 24.4 % respectively at *Site N* (3rd quarter of the 4th c. AD) (Tabs. 1–2, Figs. 11–14)[69]. Although there seems to have been a clear evolution in the

[60] Poblome et al. 2008, 1001.
[61] Poblome 1999, 283 f. 287. 316 f.; Degeest 2000, 200–206. 250.
[62] On the suggested inspiration of the 4P120 *amphora* by the *Late Roman 1 amphora,* see Poblome et al. 2008, 1004–1006.
[63] Poblome 1999, 185–189; Degeest 2000, 179–191.
[64] Poblome 1999, 205–318; Degeest 2000, 245–258.
[65] As the large *Urban Mansion* has not yet been completely excavated and only some of the assemblages have been quantified so far, the picture provided by the quantification is still incomplete. Based on these data, definite conclusions of a socio-economic nature can not yet be drawn. Nevertheless, according to the preliminary data we have at our disposal, the relative importance of imported *amphorae* is clear.
[66] As the exact borders of the mansion are not known yet, more rooms are likely to be found.
[67] The large *Urban Mansion* has been excavated by Inge Uytterhoeven since 1995. For detailed information on the excavations in the eastern domestic area of Sagalassos, see Uytterhoeven et al. 2001; Uytterhoeven 2002; Uytterhoeven et al. 2004; Putzeys et al. 2004; Uytterhoeven–Waelkens 2005; Jacobs et al. 2006; Uytterhoeven 2007; Uytterhoeven et al. 2007; Waelkens et al. 2007; Uytterhoeven – Martens 2008.
[68] Architectural ceramics in *Fabric 3* such as bricks, tiles and water conduits were not taken into account for the quantification process.
[69] Notice the different results obtained by the methods of counting and weighing sherds.

Fabric	Count (#)	Count (%)	Weight (g)	Weight (%)
Fabric 1	10036	86,7	87494	79,6
Fabric 2	19	0,2	1172	1,1
Fabric 3	8	0,1	970	0,9
Fabric 4	1299	11,2	11232	10,2
Fabric 5	54	0,5	6284	5,7
Imports	154	1,3	2815	2,6
Total	11570	100	109967	100

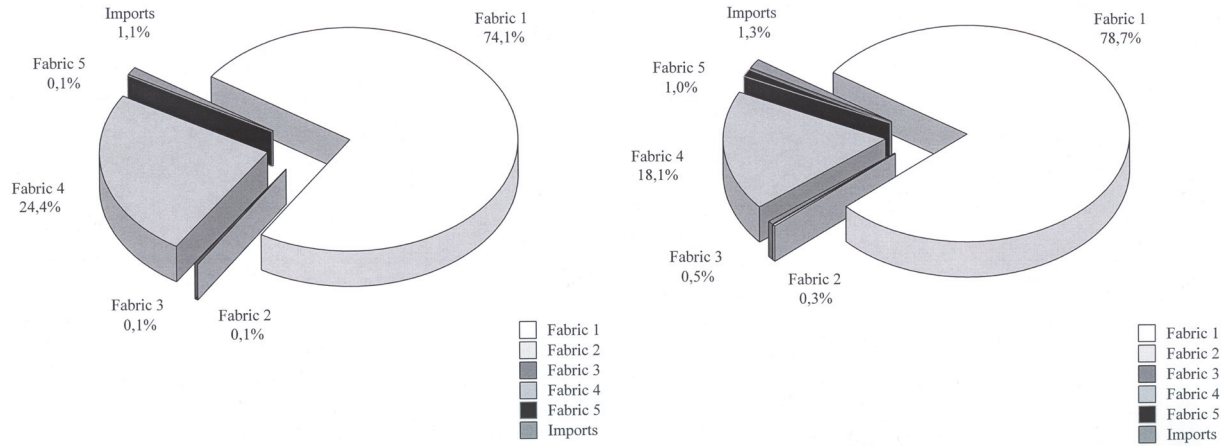
Tab. 1. *The local/regional fabrics and imported wares by count and by weight (Site L)*



Figs. 11–12. *Relative proportions by count (left) and by weight (right) of the local/regional fabrics and imported wares (Site L)*

Fabric	Count (#)	Count (%)	Weight (g)	Weight (%)
Fabric 1	6442	74,1	190816	78,7
Fabric 2	13	0,1	784	0,3
Fabric 3	8	0,1	1122	0,5
Fabric 4	2118	24,4	43973	18,1
Fabric 5	9	0,1	2509	1,0
Imports	99	1,1	3257	1,3
Total	8689	100	242461	100

Tab. 2. *The local/regional fabrics and imported wares by count and by weight (Site N)*



Figs. 13–14. *Relative proportions by count (left) and by weight (right) of the local/regional fabrics and imported wares (Site N)*

proportions between the two sites, the processing of pottery at Sagalassos has proved that, in general, differences in the ratios between the two fabrics are not chronologically related and differ according to the nature of the contexts involved[70].

As to the *amphorae*, the results from the reprocessing exercise confirmed the picture we already had of the chronology of *Fabric 4 amphorae*. The proportion of sherds that may have originated from *Fabric 1* or *Fabric 4 amphorae* in the 1st c. AD deposits located north of the library (*Site L*) is extremely low. Moreover, the bulk of the sherds were body sherds, and the few diagnostic sherds that seem to point to these *amphorae*, could equally have belonged to large jars. Therefore, it has not been concluded that local/regional *amphorae* were present in these deposits. Yet, a considerable amount of locally/regionally produced *amphorae*, especially of *Fabric 1*, could be positively identified in late 4th c. AD deposits originating from the library itself (*Site N*), confirming the dating of the emergence of these *amphorae*. At the same time, the reprocessing allowed us to identify more imported wares from the deposits than had been identified when the pottery was processed originally. As there was an insufficient amount of diagnostic sherds for a valid typological identification and as we lack the possibility to compare the fabrics with reference collections elsewhere, it is difficult to determine the origin of the majority of these imported wares[71]. Yet, considering the absolute and relative figures, we can conclude that the proportion of imports – and in particular of imported *amphorae* – is very limited. The proportion of imported *amphorae* for both groups of deposits remains similarly small, with only about 0.5 % at *Site L* and 0.6 % at *Site N* by count and 1.0 % and 0.9 % respectively by weight (Tabs. 3–4)[72]. These figures illustrate the poor representation of imported *amphorae* at Sagalassos in late 1st c. AD (*Site L*) as well as in late 4th c. AD (*Site N*) assemblages.

A different picture can be obtained from the large *Urban Mansion* in the eastern domestic area of Sagalassos. Remains of imported *amphorae* of a variety without comparison in Sagalassos have been found in several rooms of the residence. At two locations in the building, specifically in *Rooms 13* and *25* of the complex, a considerable amount of fragments originating from *Late Roman 1 amphorae*, which circulated in large quantities throughout the Mediterranean from the late 4th c. to the 7th c. AD and most probably contained wine, were present among the finds[73]. The discovery of *Late Roman 1 amphorae* seemed important, but even if we chart the proportions of all the imported *amphorae* in comparison with the total amount of pottery found in these spaces, the relative presence is fairly limited at only 16.0 % of the ceramic assemblage (Tab. 5 and Fig. 15)[74]. In assessing this figure, we must bear in mind that the largest part of the imports found in the *Urban Mansion* is the result of an exceptional find assemblage in *Room 25* of the mansion, dating to the late 6th or 7th c. AD, when its private courtyards were ruralised and transformed into stables and storage rooms[75]. The discovery of this concentration of (imported) *amphorae* does not allow us to draw any conclusions regarding the social status of the mansion during its last occupation phases. *Amphorae* found in the room, such as the *Late Roman 1 amphora*, circulated throughout the Mediterranean and are not necessarily a sign of luxury or an indication of higher social status for its residents.

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[70] Compare with the relative amounts of *Fabric 1* and *Fabric 4* at the *Urban Mansion*, which differ significantly from those for *Site L* and *Site N*, see Tabs. 5–6; Figs. 15–16.

[71] Again, the imported wares from Sagalassos are subject to current research and the creation of a reference collection for the identification of imports, supported by archaeometrical research, is ongoing.

[72] Again, note the difference between count and weight.

[73] Putzeys 2007, 150–153. 168–171. On the contents of *Late Roman 1 amphorae,* see Peacock – Williams 1986, 187; Piéri 2005, 81–85.

[74] In order to draw valid conclusions we would have to compare with chronologically and geographically similar domestic contexts from provincial towns of comparable size. Also, it would be very interesting to make comparisons with other domestic contexts at Sagalassos. Currently the *Urban Mansion* is the only domestic context at our disposal in Sagalassos. Of course, it is hoped that future excavations will provide a broader picture of the ceramic content of domestic contexts at Sagalassos.

[75] *Room 25* yielded 56.4 % of the total amount of imported *amphorae* and 54.5 % of the other imports. If the find in *Room 25* is discounted, the picture changes, and imported *amphorae* only account for 9.0 % of the imports, see Tab. 6; Fig. 16.

Fabric	Count (%)	Weight (%)
Fabric 1 Amph.?	0,1	0,3
Fabric 4 Amph.?	0,6	1,1
Imported Amph.	0,5	1,0

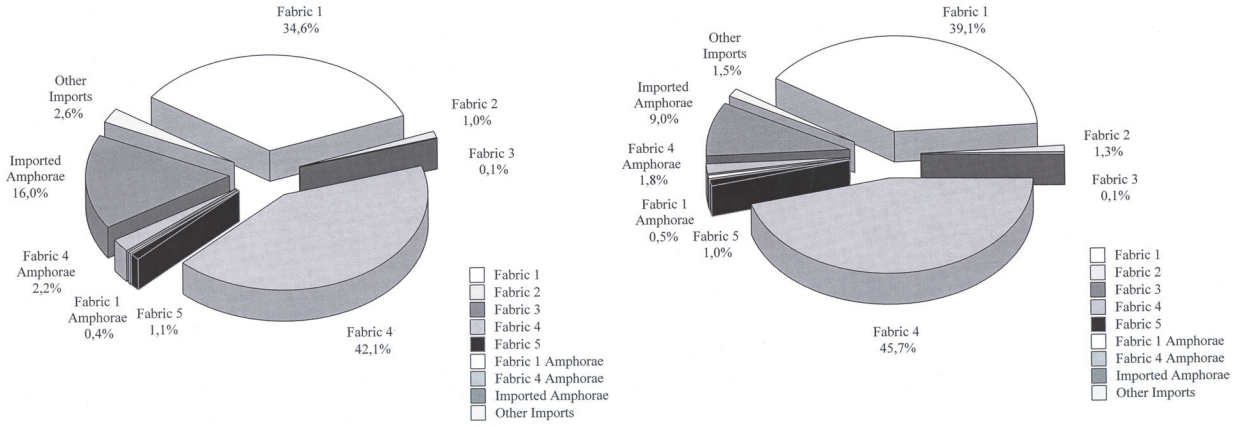
Fabric	Count (%)	Weight (%)
Fabric 1 Amph.	0,1	0,1
Fabric 4 Amph.	4,1	5,4
Imported Amph.	0,6	0,9

Tabs. 3–4. *Proportions of Fabric 1 amphorae, Fabric 4 amphorae and imported amphorae relative to the total amount of pottery for Site L (left) and Site N (right)*

Fabric	Count (#)	Count (%)
Fabric 1	5828	34,6
Fabric 2	174	1,0
Fabric 3	16	0,1
Fabric 4	7097	42,1
Fabric 5	185	1,1
Fabric 1 Amph.	62	0,4
Fabric 4 Amph.	372	2,2
Imported Amph.	2691	16,0
Imports	437	2,6
Total	16862	100

Fabric	Count (#)	Count (%)
Fabric 1	5109	39,1
Fabric 2	170	1,3
Fabric 3	16	0,1
Fabric 4	5984	45,7
Fabric 5	133	1,0
Fabric 1 Amph.	60	0,5
Fabric 4 Amph.	236	1,8
Imported Amph.	1173	9,0
Imports	199	1,5
Total	13080	100

Tabs. 5–6. *Absolute and relative proportions by count of the local/regional fabrics and imported wares for the Urban Mansion, Room 25 included (above), and Room 25 excluded (below)*



Figs. 15–16. *Relative proportions by count of the local/regional and imported wares for the Urban Mansion, Room 25 included (left), Room 25 excluded (right)*

Conclusions

As one embarks on the task of processing large amounts of pottery, it is sometimes difficult to gauge the true extent of the work ahead. At an ongoing excavation and survey project the research topics are always diverse and numerous. As one chooses and develops the pottery processing methodology, one should always bear in mind the questions that will have to be answered in the end. Not every method will lead to an adequate solution to the problems one encounters. A flexible approach towards the quantification process is therefore essential, as is investing the appropriate amount of time and energy which will lead to optimal research results. In this particular case, where fabrics were the primary focus and the chronology of the strata was already known from previous research, the typology of the processed ceramics was of secondary importance. The typology only had to be taken into consideration for the identification of the local/regional and imported *amphorae*. For the remaining functional groups the typology was of little use for the questions asked. By concentrating our efforts on the distinction between fabrics and by focusing on the identification of the local/regional versus the imported *amphorae*, a considerable amount of time could be gained and an answer to each of our questions could be found in due time.

As regards the results of our preliminary quantification process, we can conclude that while the presence of imported *amphorae* in a provincial town such as Sagalassos gives some indication of the extent of its regional and supra-regional exchange, its importance should not be overrated. In the case of the fill of the late 4th c. AD *Neon Library* the presence of imported wares – and in particular imported *amphorae* – is very limited. However, the amount of imported *amphorae* is more substantial in the richer context of the Late Roman to Early Byzantine *Urban Mansion*, for which, based on the presence of *Late Roman 1 amphorae*, we can conclude that exchange with Cilicia or Cyprus, be it directly or indirectly, did indeed exist in the case of Sagalassos. At the same time we have to admit that the influx of this type of *amphora* – and thus the import and the consumption of its contents – was still rather limited. However, the fact that common *amphora* types circulating in the (Eastern) Mediterranean in Late Antiquity such as *Late Roman 1 amphorae*, did arrive at Sagalassos, implies that the town and its hinterland was (or remained) linked to the pan-Mediterranean exchange network of this period. In the past, however, the presence of imports was all too often considered to be an important indicator of active involvement in exchange patterns and flourishing regional economies. At the same time, the find of imported *amphorae*, as seen in the residential context of the *Urban Mansion*, is not necessarily an indication of social differentiation. With this paper we would like to stress that the diverse socio-economic indicators should always be reduced to their true proportions and studied in their proper context.

References

De Cupere et al. 2009
B. De Cupere – S. Thys – W. Van Neer – A. Ervynck – M. Corremans – M. Waelkens, Eagle Owl (*Bubo bubo*) Pellets from Roman Sagalassos (SW Turkey). Distinguishing the Prey Remains from Nest and Roost Sites, International Journal of Osteoarchaeology 19, 2009, 1–22.

Degeest 2000
R. Degeest, The Common Wares of Sagalassos. Typology and Chronology, Studies in Eastern Mediterranean Archaeology 3 (Turnhout 2000).

Degeest 2002
R. Degeest, Continuity and Discontinuity in Early Imperial Sagalassos. The Picture of the Common Ware Ceramics, in: C. Berns – H. von Hesberg – L. Vandeput – M. Waelkens (eds.), Patris und Imperium. Kulturelle und politische Identität in den Städten der römischen Provinzen Kleinasiens in der frühen Kaiserzeit. Kolloquium Köln, 19–21 November 1998, BABesch Suppl. 8 (Leuven 2002) 289–294.

Degeest et al. 2000
R. Degeest – P. Degryse – R. Ottenburgs – W. Viane – M. Waelkens, Miniature Jars of Sagalassos. An Analytical, Quantitative and Typological Overview of a Series of Very Small Pottery Vessels from Late Antiquity, in: M. Waelkens – L. Loots (eds.), Sagalassos V. Report on the Survey and Excavation Campaigns of 1996 and 1997, ActaALovMono 11B (Leuven 2000) 697–708.

Degeest et al. 1999
R. Degeest – R. Ottenburgs – H. Kucha – W. Viaene – P. Degryse – M. Waelkens, The Late Roman Unguentaria of Sagalassos, BABesch 74, 1999, 247–262.

Degryse et al. 2000
P. Degryse – R. Degeest – J. Poblome – W. Viaene – R. Ottenburgs – H. Kucha – M. Waelkens, Mineralogy and Geochemistry of Roman Common Wares Produced at Sagalassos and their Possible Clay Resources, in: M. Waelkens – L. Loots (eds.), Sagalassos V. Report on the Survey and Excavation Campaigns of 1996 and 1997, ActaALovMono 11B (Leuven, 2000) 709–720.

Jacobs et al. 2006
I. Jacobs – J. Vermeersch – M. Kiremitçi – M. Waelkens, 2. The Domestic Area Excavation, in: M. Waelkens – J. Poblome – N. Kellens – I. Uytterhoeven – T. Putzeys – M. Corremans – P. Bes – J. Claeys – B. Vandaele – K. Ertuğ – N. Da Silva – P. Pesaresi – E. Risser – S. Ercan – E. Torun, Report on the 2004 Excavation and Restoration Campaign at Sagalassos, XXVII. Kazı Sonuçları Toplantısı, 2. Cilt, Antalya 30 Mayıs – 3 Haziran 2005 (Ankara 2006) 272–274.

Martens 2006
F. Martens, The Diachronic Research of Urban Water Management at Sagalassos, Southwest-Turkey, in: G. Wiplinger (ed.), Cura Aquarum in Ephesus, 1. Proceedings of the Twelfth International Congress on the History of Water Management and Hydraulic Engineering in the Mediterranean Region, Ephesus/Selçuk, Turkey, October 2–10, 2004, BABesch Suppl. 12 (Leuven 2006) 165–174.

Mitchell 1993
S. Mitchell, Anatolia: Land, Men, and Gods in Asia Minor. 1: The Celts in Anatolia and the Impact of Roman Rule (Oxford 1993).

Orton 1975
C. Orton, Quantative Pottery Studies. Some Progress, Problems and Prospects, Science and Archaeology 16, 1975, 30–36.

ORTON 1980
C. Orton, Mathematics in Archaeology (Cambridge 1980).

ORTON 1993
C. Orton, How Many Pots Make Five? An Historical Review of Pottery Quantification, Archaeometry 35, 2, 1993, 169–184.

PAULISSEN ET AL. 1993
E. Paulissen – J. Poesen – G. Govers – J. De Ploey, The Physical Environment at Sagalassos (Western Taurus, Turkey). A Reconnaissance Survey, in: M. Waelkens – J. Poblome (eds.), Sagalassos II. Report on the Third Excavation Campaign of 1992, ActaALovMono 6 (Leuven 1993) 229–247.

PEACOCK 1982
D. P. S. Peacock, Pottery in the Roman World: an Ethno-archaeological Approach (London 1982).

PEACOCK – WILLIAMS 1986
D. P. S. Peacock – D. F. Williams, Amphorae and the Roman Economy: an Introductory Guide (London 1986).

PEÑA 2007
J. T. Peña, Roman Pottery in the Archaeological Record (Cambridge 2007).

PIÉRI 2005
D. Piéri (2005) Le commerce du vin oriental à l'époque byzantine (V^{e} et VIIe siècles). Le témoignage des amphores en Gaule, Bibliothèque Archéologique et Historique 174 (Beyrouth 2005).

POBLOME 1999
J. Poblome, Sagalassos Red Slip Ware: Typology and Chronology, Studies in Eastern Mediterranean Archaeology 2 (Turnhout 1999).

POBLOME 2006a
J. Poblome, Made in Sagalassos. Modelling Regional Potential and Constraints, in: S. Menchelli – M. Pasquinucci (eds.), Territorio e produzioni ceramiche. Paesaggi, economia e società in età romana. Atti del Convegno Internazionale, Pisa 20–22 ottobre 2005, Instrumenta 2 (Pisa 2006) 355–363. 420 f.

POBLOME 2006b
J. Poblome, Mixed Feelings on Greece and Asia Minor in the Third Century AD, in: D. Malfitana – J. Poblome – J. Lund (eds.), Old Pottery in a New Century. Innovating Perspectives on Roman Pottery Studies. Atti del Convegno Internazionale di Studi, Catania, 22–24 Aprile 2004 (Catania 2006) 189–212.

POBLOME ET AL. 2005
J. Poblome – P. Bes – P. Degryse, The Decline and Fall of Sagalassos, a Ceramic Perspective, Rei Cretariae Romanae Fautorum, Acta 39 (Abingdon 2005) 225–230.

POBLOME ET AL. 2001
J. Poblome – O. Bounegru – P. Degryse – W. Viaene – M. Waelkens – S. Erdemgil, The Sigillata Manufactories of Pergamon and Sagalassos, JRA 14, 2001, 143–165.

POBLOME ET AL. 2008
J. Poblome – M. Coremans – P. Bes – K. Romanus – P. Degryse, It's Never Too Late… The Late Roman Initiation of Amphora Production in the Territory of Sagalassos, in: I. Delemen – S. Cokay-Kepçe – A. Özdibay (eds.), Euergetes. Festschrift für Prof. Dr. Haluk Abbasoğlu zum 65. Geburtstag, II (Antalya 2008) 1001–1012.

Poblome et al. 1998
J. Poblome – P. Degryse – I. Librecht – M. Waelkens, Sagalassos Red Slip Ware: the Organization of a Manufactory, MünstBeitr 17, 1998, 52–64.

Poblome et al. 2000
J. Poblome – P. Degryse – M. Schlitz – R. Degeest – W. Viaene – I. Librecht – E. Paulissen – M. Waelkens, The Ceramic Production Centre of Sagalassos, Rei Cretariae Romanae Fautorum, Acta 36 (Abingdon 2000) 39–42.

Poblome et al. 2002
J. Poblome – P. Degryse – W. Viaene – M. Waelkens, An Early Imperial Pottery Workshop at Sagalassos, in: V. Kilikoglou – A. Hein – Y. Maniatis (eds.), Modern Trends in Scientific Studies on Ancient Ceramics, BARIntSer 1011 (Oxford 2002) 335–342.

Poesen et al. 1995
J. Poesen – G. Govers – E. Paulissen – K. Vandaele, A Geomorphological Evaluation of Erosion Risk at Sagalassos, in: M. Waelkens – J. Poblome (eds.), Sagalassos III. Report on the Fourth Excavation Campaign of 1993, ActaALovMono 7 (Leuven 1995) 341–356.

Protocole Beuvray 1998
Protocole Beuvray, Protocole de quantification des ceramiques, in P. Archelin – M. Tuffreau-Libre (eds.), La quantification des ceramiques. Conditions et protocole (Glux-en-Glenne 1998) III–XVII.

Putzeys 2007
T. Putzeys, Contextual Analysis at Sagalassos. Developing a Methodology for Classical Archaeology (unpublished Ph.D. diss. Catholic University of Leuven, Leuven 2007).

Putzeys et al. 2005
T. Putzeys – J. Poblome – P. Bes, Functional Analysis of Early Byzantine Contexts at Sagalassos, Rei Cretariae Romanae Fautorum, Acta 39 (Abingdon 2005) 231–236.

Putzeys et al. 2004
T. Putzeys – T. Van Thuyne – J. Poblome – I. Uytterhoeven – M. Waelkens – R. Degeest, Analyzing Domestic Contexts at Sagalassos: Developing a Methodology Using Ceramics and Marco-botanical Remains, JMedA 17, 1, 2004, 31–57.

Romanus et al. in press
K. Romanus – J. Poblome – M. Demarcke – P. Degryse – P. Jacobs – D. De Vos – M. Waelkens, Assessing the Content of Local/Regional Fabric 4 amphorae from Sagalassos (SW Turkey), in: J. Poblome – P. Monsieur – F. Vermeulen – M. Waelkens (eds.), From Amphorae to Modelling the Late Roman Economy. International ROCT Workshop, 5–6 December 2005, Ghent, Facta Suppl. 1 (Pisa in press).

Romanus et al. 2007
K. Romanus – J. Poblome – K. Verbeke – A. Luyspaerts – P. Jacobs – D. De Vos – M. Waelkens, An Evaluation of Analytical and Interpretative Methodologies for the Extraction and Identification of Lipids Associated with Pottery Sherds from the Site of Sagalassos, Turkey, Archaeometry 49, 2007, 729–747.

Tomber 1993
R. Tomber, Quantitative Approaches to the Investigation of Long-distance Exchange, JRA 6, 1993, 142–166.

Uytterhoeven 2002
I. Uytterhoeven, 3. The Domestic Area DA1, in: M. Waelkens, The 2000 Excavation and Restoration

Season at Sagalassos, XXIII. Kazı Sonuçları Toplantısı, Ankara 28 Mayıs–2 Haziran 2001, 1. Cilt (Ankara 2002) 15 f.

UYTTERHOEVEN 2007
I. Uytterhoeven, Urban Aesthetics in Late Antique Sagalassos. II. The Private Palatial Mansion, Acts of the Turkish Congress of Aesthetics. Ankara, 22–24 November 2006 (Ankara 2007) 473–488.

UYTTERHOEVEN – MARTENS 2008
I. Uytterhoeven – F. Martens, Private Bathing and water consumption at Sagalassos (SW–Turkey) and Asia Minor, in: C. Ohlig (ed.), Cura Aquarum in Jordania. Proceedings of the 13th International Congress on the History of Water Management and Hydraulic Engineering in the Mediterranean Region. Petra/Amman, Jordan, March 31–April 9 2007, Schriften der Deutschen Wasserhistorischen Gesellschaft, Siegburg, 285–300.

UYTTERHOEVEN – WAELKENS 2005
I. Uytterhoeven – M. Waelkens, 2. The Domestic Area, in: M. Waelkens, Report on the 2003 Excavation and Restoration Campaign at Sagalassos, XXVI. Kazı Sonuçları Toplantısı, Konya 24–28 Mayıs 2004, 1. Cilt (Ankara 2005) 432 f.

UYTTERHOEVEN ET AL. 2001
I. Uytterhoeven – T. Helsen – T. Vereenooghe – M. Waelkens – J. Poblome – R. Degeest, The Domestic Area I Excavation, in: M. Waelkens, The 1998–99 Excavation Campaign at Sagalassos, XXII. Kazı Sonuçları Toplantısı, Izmir 22–26 Mayıs 2000, 2. Cilt (Ankara 2001) 167–169.

UYTTERHOEVEN ET AL. 2004
I. Uytterhoeven – T. Putzeys – M. Waelkens, 3. The Domestic Area, in: M. Waelkens, Report on the 2002 Excavation and Restoration Campaign at Sagalassos, XXV. Kazı Sonuçları Toplantısı, Ankara 26–31 Mayıs 2003 (Ankara 2004) 217 f.

UYTTERHOEVEN ET AL. 2007
I. Uytterhoeven – I. Jacobs – M. Kiremitçi, 1. The Domestic Area, in: M. Waelkens, Report on the 2005 Excavation and Restoration Campaign at Sagalassos, XXVIII. Kazı Sonuçları Toplantısı, Çanakkale 29 Mayıs–2 Haziran 2006, 2. Cilt (Ankara 2007) 317–319.

VANHAVERBEKE ET AL. IN PRESS
H. Vanhaverbeke – M. Waelkens – K. Vyncke – V. De Laet – S. Aydal – B. Mušič – B. De Cupere – J. Poblome – D. Braekmans – P. Degryse – E. Marinova – G. Verstraeten – W. Van Neer – B. Slapšak – I. Medarič – H.A. Ekinci – M.O. Erbay, The 'Pisidian' culture? The Classical-Hellenistic site at Düzen Tepe near Sagalassus (SW Turkey), AnSt, in press.

VIONIS ET AL. FORTHCOMING
A. Vionis – J. Poblome – M. Waelkens, The 'Hidden' Material Culture of the 'Dark Ages'. Early Medieval Ceramics at Sagalassos (Turkey): New Evidence (ca. AD 650-800), AnSt 59, 147-165.

WAELKENS 1993
M. Waelkens, Sagalassos. History and Archaeology, in: M. Waelkens (ed.), Sagalassos I. First General Report on the Survey (1986–1989) and Excavations (1990–1991), ActaALovMono 5 (Leuven, 1993) 37–81.

WAELKENS 2002
M. Waelkens, Romanization in the East. A Case Study: Sagalassos and Pisidia (SW Turkey), IstMitt 52, 2002, 311–368.

Waelkens 2004
M. Waelkens, Ein Blick von der Ferne. Seleukiden und Attaliden in Pisidien, IstMitt 54, 2004, 435–471.

Waelkens et al. 1997
M. Waelkens – Sagalassos Team, Interdisciplinarity in Classical Archaeology. A Case Study: the Sagalassos Archaeological Research Project (SW Turkey), in: M. Waelkens – J. Poblome (eds.), Sagalassos IV. Report on the Survey and Excavation Campaigns of 1994 and 1995, ActaALovMono 9 (Leuven 1997) 225–252.

Waelkens et al. 1999
M. Waelkens – E. Paulissen – M. Vermoere – P. Degryse – D. Celis – K. Schroyen – B. De Cupere – I. Librecht – K. Nackaerts – H. Vanhaverbeke – W. Viaene – Ph. Muchez – R. Ottenburgs – S. Deckers – W. Van Neer – E. Smets – G. Govers – G. Verstraeten – A. Steegen – K. Cauwenberghs, Man and Environment in the Territory of Sagalassos, a Classical City in SW Turkey, Quaternary Science Reviews 18, 1999, 697–709.

Waelkens et al. 2000a
M. Waelkens – H. Kökten Ersoy – K. Severson – F. Martens – S. Sener, The Sagalassos Neon Library Mosaic and its Conservation, in: M. Waelkens – L. Loots (eds.), Sagalassos V. Report on the Survey and Excavation Campaigns of 1996 and 1997, ActaALovMono 11 A (Leuven 2000) 419–447.

Waelkens et al. 2000b
M. Waelkens – E. Paulissen – W. Viaene – W. Van Neer – S. Deckers – M. Vermoere – P. Degryse – D. Celis – K. Schroyen – B. De Cupere – I. Librecht – K. Nackaerts – H. Vanhaverbeke – J. Poblome – R. Degeest – Ph. Muchez – R. Ottenburgs – E. Smets – G. Govers – G. Verstraeten – A. Steegen – K. Cauwenberghs, Sagalassos und sein Territorium. Eine interdisziplinäre Methodologie zur historischen Geographie einer kleinasiatischen Metropole, in: K. Belke – F. Hild – J. Koder – P. Soustal (eds.), Byzans als Raum. Zu Methoden und Inhalten der historischen Geographie des östlichen Mittelmeerraumes, Veröffentlichungen der Kommission für die Tabula Imperii Byzantini, Band 7 = DenkschrWien, 283 (Vienna 2000) 261–288.

Waelkens et al. 2006
M. Waelkens – H. Vanhaverbeke – F. Martens – P. Talloen – J. Poblome – N. Kellens – T. Putzeys – P. Degryse – T. Van Thuyne – W. Van Neer, The Late Antique to Early Byzantine City in Southwest Anatolia. Sagalassos and its Territory: A Case Study, in: J.U. Krause – C. Witschel (eds.) Die Stadt in der Spätantike - Niedergang oder Wandel? Akten des Internationalen Kolloquiums in München am 30. und 31. Mai 2003 (Stuttgart 2006) 199-255.

Waelkens et al. 2007
M. Waelkens – T. Putzeys – I. Uytterhoeven – T. Van Thuyne – W. Van Neer – J. Poblome – N. Kellens, Two Late Antique Housing Units at Sagalassos, in: L. Lavan – L. Özgenel – A. Sarantis (eds.), Housing in Late Antiquity. From Palaces to Shops, Late Antique Archaeology, Suppl. I (Leiden 2007) 495–514.